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School of Management

Information Technology in Practice of Organising

Meeting Fragmentation and Interdependence by The Incremental Political Delivery of Information Systems in Financial Services

by

Vladimir Diatlov

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ABSTRACT

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INFORMATION TECHNOLOGY IN PRACTICE OF ORGANISING: MEETING FRAGMENTATION AND INTERDEPENDENCE BY THE INCREMENTAL POLITICAL DELIVERY OF INFORMATION SYSTEMS IN FINANCIAL SERVICES

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The thesis explores business issues of strategic alignment, productivity, and discontinuity of information technology in financial services. Managers meet these issues with simple rules, like 80-20 rule, no key-man dependence, and process orientation. The thesis discovers how simple decision premises enhanced by politics and incremental methodology are tools for managing the scale-free co-evolutionary change of information technology and people in organisational contexts. In doing so, the thesis develops and tests a research design integrating the models of interdependence, power, and incrementalism.

There are seven chapters to the thesis. Following the identification of the major issues in the introduction, chapter 1 operates with a probability-based approach to power and develops applications of power patterns in process management within the framework of 'the Pareto Dynamics of Strategic Adaptation'. An initial description of the behaviour of highly interdependent socio-technical systems is provided in chapter 2, particularly such systems allow no independent variables consuming resources. Chapter 3 outlines the research methodology and establishes epistemological bases by presenting some useful presuppositions and ways of description from multiple positions and on multiple levels.

The empirical analysis is presented in chapters 4, 5, and 6. Chapter 4 explores how the several stable shared simple decision premises make the emergent complex of software, people, and institutions aligning to authority and cause-effect rationality. The construction of technologies for coordination purposes is investigated in chapter 5. Chapter 6 reviews the practices of IT support, training, resource allocation, evaluation, and management and identifies further detail on incremental change managing and balancing on the edge of scarcity of the information technology resources.

Chapter 7 concludes with 'thinking directions' that show how others can use the research. For researchers, there are ways of configuring organisational analysis with concepts from complexity and economic thinking in a qualitative design. And for practitioners, there are recommendations on the use of 'incrementalism' and 'practice lens'. On the whole, the situation of constraining and functionally overloaded software studied indicates that IT runs well in advance of our cognitive and relational competencies. Therefore, the thesis concludes that a stronger cognitive perspective upon strategic alignment is needed.

The appendices to the thesis illustrate data as well as the intriguing spin-offs of the research. Appendix 3 describes similarity between the patterns of power and the principles of learning through operant conditioning. Appendix 8 presents a map of scarcities of the information technology resources of the firm.

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Acknowledgements

I dedicate this thesis

to

Roderick Martin

in appreciation for giving me

his intuitions about

power in human relations

and nurturing my understanding of

Organisation.

for his many careful suggestions

to the many revisions to

this piece of work

I hope

offers you,

the reader,

precision in recalling experience,

rendering a perspective,

and carrying out successfully powerful action upon

nested organisational

realities.

Introduction

This introductory chapter pursues two goals in two respective sections. The first is to outline the main objectives of the research, and in doing so to indicate its distinctive contribution to integration of the fields of information systems and organisation analysis. The second is to provide an overview of the challenges to the organisation-centred research in information systems and a transition through the research on IT and politics onto in-depth modelling of power and incrementalism by Chapter 1.

1 Objectives and contributions: Thesis's Design

This thesis has three objectives. The first objective is the development of an approach for studying information technology as practice, beyond the imperatives of social construction and technological determinism. The second objective emerged as modelling the role of power in information technology delivery. The approach and the model were applied in order to understand strategic information systems change in a large financial services organisation. The third objective is to carry out clear epistemology that preserves multiple perspectives (lenses) and multiple ways of data generation and analysis. The multi-method and thesis's design are results of an interdisciplinary configuration of concepts from organisation analysis and information systems research, with the infusion of concepts from strategy, complexity and human cognition studies, as appropriate.

(i) First objective: a practical approach for studying information technology

Information systems discipline grows in a discontinuous way with some issues, such as technology acceptance and use of groupware, studied much more than others. Yet, practical handling of even the most developed issues cannot be realised without fundamental knowledge about how technology relates to what makes people specialise and prioritise tasks, enact hierarchies, and share resources as well as problems, in other words, what holds people together in 'the organisation' with 'the IT function'. This thesis contributes with a multi-level investigation of the interaction of 'the organisation' and 'the IT function' down to the level of observable practices, particularly the practices of task prioritisation within the amorphous IT function that have direct but hardly explored impact upon productivity. Even centring on the organisation, I found organisation analysis of little help for studying practices of information technology, because of the domination of rigidified macro-level frameworks, such as the statistical correlation between 'contingency' and structure. In line with the 'beyond imperatives' principle, this practical approach for studying IT in large organisations develops its own intentionally simplified version of organisation analysis, focusing upon relations rather than nominalizations.

I began the research conventionally, by pinpointing linkages between contextual circumstances (e.g., software facilities, technology properties and task environments) and outcomes of organisational structure, which is a framework of contingency theory (Donaldson 1996). Chapter 2 'Interdependence-Contingency Perspective on Technology and Organisation' reviews the elements selected as useful or as misleading from technology-organisation design studies (Mintzberg 1979, 1983; Thompson 1967; Woodward 1965), institutional theory (DiMaggio and Powell 1983) and behavioural theory of the firm (March and Simon 1958). By the end of that review, I began to think that the conceptual tools of 'institutions' and 'contingency' are inadequate to studying contemporary information technology and organisations. The latter is dynamics, whilst the former is outcomes. Therefore, Chapter 2 concludes with an attempt at describing behaviour of IT infrastructures and large IS projects as highly interdependent, scale-free and co-evolutionary dynamics in socio-technical systems. This definition encompasses many characteristics of complex adaptive dynamics, but perhaps the simplest of them is the idea that organisational design and outcomes of technology use change radically as organisations approach 'the threshold of high interdependence'. Practically that means, people need to support more relations in order to remain effective in their ordinary jobs, and sometimes, they are not aware about work relations that they carry out because of 'technological disjoint' and 'passive use'. Empirically, Chapter 4 and Chapter 5 illustrate these terms by discussing what happened with IT, operations and sales functions of Alpha organisation, as they approached the threshold of high interdependence. The outcomes include disembodiment, lack of opportunity for reciprocity, ambidextrous and transient organisational structures and intensification of risk-based politics. Chapter 5 also contributes with a review of 'generic coordination practices' and examples of how people assemble simple facilities of office software into crucial 'technologies of coordination'.

For a study of technology through its use, structuration theory (Giddens 1984), its variant adopted for studying technology use (Orlikowski 1992, 1999, 2000), and actor-network approach (Ciborra et al. 2000) seemed to be more promising but lacking specificity. Two major drawbacks of those approaches are being abstract without a need and studying details but retreating to macro-explanations, such as institutions. This research proposes to improve those approaches by the reference to cognition and epistemology, particularly awareness of micro-macro duality and the issues of studying organisations 'across' the levels of analysis (p. 155). Specifically, this thesis proposes that the levels should not be treated as scales, for example, change in corporate strategy is a 'strong' move, but that does not mean that it will affect all local parts of in the organisation. The levels of

organisational analysis do not follow the model of hierarchically embedded logical levels (Bateson 1979). Empirically, I found the work by Wanda Orlikowski (1992, 1999, 2000) useful but not useable, i.e., insightful about impact of technology but hardly transferable as a way of study. Therefore, I developed her technology-in-use approach into a method that is based upon the following elements (p. 174): first, observed, cognitive and institutional definitions of 'practice' and considerations of how practice can be studied; second, 'the technology-in-practice matrix' that combines facilities-norms-interpretative schemes framework with physical-technological, sensemaking-interpretative, and organisational-institutional conditions and purposes of use of software. If the technology-in-practice matrix is filled with a real-life data, it provides answers to the issues of contextualised and unexpected technology use, such as how particular technology causes change in organisational design and how agency and beliefs of different stakeholders affect technology practices, particularly (a) designers via their intentions and imbedded structures, (b) IT professionals via their custody and support routines, and (c) end-users via their balancing among 'preferred', 'perceived' and 'out-of-awareness' experiences with software. These elements constitute my Practice Lens approach for studying information technology and support the thesis's third objective of pursuing a clear epistemology. The empirical application of the Practice Lens (e.g., 'Live On-Line Business Process Material' in Alpha case) provides many insights, such as confirmation of the generic pattern of early congealment of software use, despite the amount of functionality and flexibility designed into it. That happens because of the scarcities of IT support and ways of task allocation and prioritising within the IT function, which this research calls 'politics'.

(ii) Second objective: modelling power and incrementalism

Empirical issues, especially unclear authority in large IS projects and uneven delivery of IT support to different parties, brought me to an elaborate modelling of power in Chapter 1. Attention to political behaviour of IT professionals and top managers provided an effective way of operationalisation of the complexity of information technology delivery. Combining political and practical lenses, this research presents the routine politics of organisational life as a set of practices that are useful in 'getting things done', a definition of power by Pfeffer (1992), such as timely gained commitment, communications and decisions made in deviation from usual sequences, frequent review of certain issues, and engineering of irreversible discontinuities. The ideas about power were found insightful to understanding how IT jobs are prioritised and allocated in the semi-autonomous and purposefully amorphous structure of the IT function. For example, 'the paradox of the strength of power' suggests that it is difficult to gain power out of grassroots operations

with information technology (e.g., configuration of operation systems or drawing diagrams for software design), because such operations are easily reversible and dependent upon several decisions of top management. As a result, commitment and institutional practices play a significant role in software purchase and roll-out.

Those applications of 'the ideas about power' became possible only after this research revisited power literature and developed its own model, named 'Precision for Power'. The model goes beyond the customary reference to the nominalizations of 'authority', 'legitimacy' and 'power' as a force and black-boxed variable. In doing so, the model re-defines power as probability and notices that 'successful exercise' is expected of power, i.e., power is defined in terms of its outcomes. In common life, power is frequently applied through expectation of power or threat. Classics of power, e.g., Weber (1947), Dahl (1957) and Lukes (1974, 2005) also defined power as probability (see Appendix 1), but no research specified these ideas and tested them empirically in functional domains, such as information systems. The Precision for Power model sorts the literature on power into three domains, e.g., domain I of power processes, domain II of power resources and domain III of power outcomes, and shows that each domain bears its own presuppositions and methods for studying power. The model also operationalises practices of power by proposing the three main kinds of power exercise, named as 'orders of power-action', each of which has its own time before impact, durability, acceptable frequency, applicability and irreversibility. The power law distribution of probabilities was found helpful as a heuristic to the relation between frequency (axe X) and 'strength' (axe Y) of power exercise. The power law highlighted the clusters of 'the strength of power' that correspond to the orders of power-action, e.g., immediate impact of a physical or persuasion action, positional impact of reputation or authority (including non-decisions), and durable irreversible impact of a decision premise (presupposition).

The exploration of relations among the orders of power-action pointed out at the pattern between incremental and radical actions. With information systems, some things are developed gradually, such as IT human resources, whilst other things are resolved radically, such as a strong policy on end-user computing or major software purchase. This research discovered that IT managers prefer to use politics in order to balance among the developments of different dynamics. The incrementalism-radicalism pattern is recognisable in practicing vs. drift in strategy (Clemons 2000; Johnson 1988), learning vs. forgetting in sensemaking (Weick 1990, 2000), and inertia vs. radicalism in culture (Hatch 1997). These findings concur with the ideas of 'the co-evolutionary change' from

computational agent-based modelling. The co-evolution of the organisation and technology (a) has both incremental and discontinuous sides simultaneously, (b) is associated with time-paced and ambidextrous organisational structures, and (c) has no scales, i.e., there are no 'small' or 'large' actions or events, there are actions that fit pattern in the right place at the right time. That is why the literature finds the effects of information technology as "indirect and likely to moderate outcomes of the processes that typically existed prior to the use of technology" (Dewett and Jones 2001). Finally, this research found information technology innovation as discontinuous rather than incremental, because learning-by-doing of software use inside the organisation is frequently shaken by changes in versions and standards coming from IT industry at a high rate of change (velocity). Here, the ideas of co-evolutionary change help to understand why even financial organisations balance on the edge of scarcity of IT resources and skewed power distributions, that both drive politics.

(iii) Interdependence, Power and Incrementalism in one research design

Three years of empirical practice-oriented research allowed me to link interdependence, power, and incrementalism in one sensible research design and conduct an empirical test in the context of large banking systems implementation. To my knowledge, such was not achieved before. Interdependence is a way to describe structure and context (where). Power is defined as process with its purposeful content and outcome (what). Whilst interdependence and power are concepts, incrementalism is a method for detecting and managing certain dynamics into strategic patterns. Incrementalism is supposed to answer the questions of 'how' and 'when'.

This research develops incrementalism from a theoretical concept of strategy formation into a practical method in the context of information systems project management. In doing so, it defines the kinds of incrementalism (e.g., logical, processual, remedial, disjointed, irrational and results-driven) and components of incrementalism: agency (e.g., self-activation and proactive position), purposefully designed sequences, reviews of outcomes at each increment of delivery, and interlocked stochastic processes (e.g., simultaneous formulation and implementation). This research also reviews practitioners' methods that operationalise incrementalism, the Results Driven Incrementalism methodology for software implementation (Fichman and Moses 1998) and the Cynefin framework for assessment of complexity levels (Kurtz and Snowden 2003).

This research proposes theoretically that the processual, remedial and disjointed kinds of incrementalism are outcomes of skewed power distribution, bounded rationality and

learning from experience at acceptable cost. That proposition produces advice that is proposition for making discontinuous IT change coming in acceptable forms:

> *If naturally remedial incremental decision-making (known as 'garbage can') is countered with purposefully incremental strategies, the requisite change comes in less radical forms (p. 92)*

Showing that such abstract heuristic ideas of complexity science become more sensible, if analysis is conducted through a Political Lens, is a major theory-building contribution of this thesis. Empirically, Chapter 6 applies 'the power-action model' and 'incrementalism' in order to make sense of diverse practices of routine IT support and implementation of International Comprehensive Banking Systems by Alpha. Without that careful configuration of ideas in one research model, those practices would appear un-ordered 'garbage can' dynamics. In addition, I reviewed cases of organisation-wide information systems implementation in Applegate et al. (2003), Ciborra et al. (2000) and Davenport et al. (2000) and discovered that the successful implementations utilised elements of incrementalism and politics, as specified by this thesis, distinctively and naturally.

(iv) Third objective: multi-method and epistemology

The thesis presents empirical cases of a building society (Alpha, name changed) and an insurance company (Skandia). Alpha case was studied in-depth with the techniques of interview, observer-as-participant ethnography, and full access to documents, corporate intranet, and new banking information systems being implemented. Skandia case had few interviews but more e-mail communication, and medium access to paper documents and an electronic discussion forum about Dolphin Navigator, a multi-level balanced scorecard system. Industry reports and the case studies of similar financial organisations and IT infrastructures were used for comparison. On top, this research features two original techniques. First, 'interdependence ontology', a formalised data set of work relations, was complied using Protégé software and applied for network traversal and cross-check of data during interviews. The dataset helped to trace that Alpha's IT function of 60-70 people produced more than 900 distinctive work relations, thereby reaching 'the threshold of high interdependence'. Second, a hundred IT task requests were sampled for content analysis that was illustrative about levels of understanding between IT specialists and end-users.

The research methodology is grounded in a well-defined epistemology that is based upon the works by Gregory Bateson on ecology of mind (1972), psycholinguistics and complexity science. Keeping organisational analysis clear of the legacies of physics and science was an important epistemological task of this research, because social and psychological phenomena bear no laws of mechanics, energy conservation or entropy. If

those physical models are taken as real, mystification occurs. By how it utilises the constructs of strength, catalyst, quantum theory and the power law, this research shows an alternative way of borrowing from sciences.

Research into information systems delivery involves all aspects of organisational life from belief systems to political interaction to organisational design to co-evolutionary dynamics of socio-technical systems. Drawing effectively from such different fields would not be possible without the use of *epistemological shortcuts*, which purpose is to preserve logics whist linking ideas of different fields. The first shortcut is Batesonian epistemology that consists of the distinction between map and territory, the model of logical levels, natural hierarchies of communication and learning (e.g., single and double loop learning), positive and negative feedback loops, thinking in terms of restrictive conditions, control via inverse variables, and awareness of the limitations of purposive consciousness that represents 7+-2 chunks out of circuitry or pattern (Bateson 1972, 1979; DeLozier and Grinder 1987; Miller 1956). The second shortcut is two psycholinguistic developments of 'the Syntactic Environments for Identifying Natural Language Presuppositions in English' and 'the Meta-Model', a set of twelve language patterns that suggest questions for clarifying nominalisations, deletions and generalisations of language (Bandler and Grinder 1975; Chomsky 1965). The third shortcut is heuristic ideas of complexity science that describe the co-evolutionary change, specifically, the power law, the construct of scale-free networks, the unified framework of the four stages of emergence, and the distinctions among nonlinearities, e.g., deterministic chaos is different from irrational incrementalism.

In doing this research, I have sought compact ways of data presentation and 'modelling elegance' that is: finding minimum distinctions in order to describe the phenomena studied, such that distinctions should be invariant to many empirical contexts and drawn from at least two positions (i.e., double description condition of epistemological well-formedness). Such epistemological distinctions are both significant theoretically and useful practically, because they counter the linguistic nominalisations of 'social construction' and 'technological determinism', 'resistance' and 'technology acceptance' and alike terminology that received considerable attraction from the information systems field. Adoption of the technology-in-practice and Big-O approaches by this research provides a useful set of such distinctions, for example, between technology-in-use and technology-in-box and between an issue and the organisation or production system as a whole (Heath and Sitkin 2001). These are simple ideas but not usual ways for people to approach routine issues, which occurs because of cognitive biases. This research contributes with

identification of the steady cognitive bias of thinking in terms of software functionality rather than business goals, which actually delays IS implementation. Another example of a cognitive bias occurs when authors literally write about 'implications for systems development', and their transderivational search excludes 'implications for humans'. Chapter 3 Research Methodology continues this discussion on epistemological distinctions for organisation analysis by describing differences between variance and process research, core and periphery of organisational dynamics, content and context as well as between 'cause-effect' and 'catalyst'. An empirical application of epistemological distinctions and shortcuts is this research's illustration of multi- and cross-level organisational analysis, which emerged to be a central methodological issue.

(v) An Overview of Configuration Analysis

This thesis simultaneously operates with multiple lines of argument that, in turn, are framed in multiple logics and languages of sociological power studies, strategic management, organisation design, complexity heuristics, software implementation methods and human cognition studies. Preservation of these multiple perspectives upon the same organisation in one thesis is a case of 'configuration analysis' that deals with the drawbacks of 'middle-range' contingency analysis, institutional theory or structuration theory, if applied alone (Child and McGrath 2001; Weick 1989). An empirical implementation of 'configuration analysis' that is clear about 'which construct of which theory is applied for what' is a distinctive contribution of this thesis.

This Introduction presented the main objectives of this thesis. The noun 'objective' has just two lexical definitions, first, "the goal intended to be attained" and, second, "the lens or system of lenses nearest the object being viewed"[1]. In this thesis, the selected choices of organisation analysis are joined in *Lenses*. The purpose of any lens is to focus and magnify, the theoretical Lenses developed by this research help to see through some organisational layers and focus on the layers as necessary. The Lenses and ideas on how to slice the layers of the organisation are presented on Figure 1.1 that is a map to the thesis.

Given the conclusion that organisational levels are not hierarchically logical (p. 15), this research treats the levels of organisational design as emergent; therefore, each level is formed to a different degree, for example, the level of IS project directorship is clearer in

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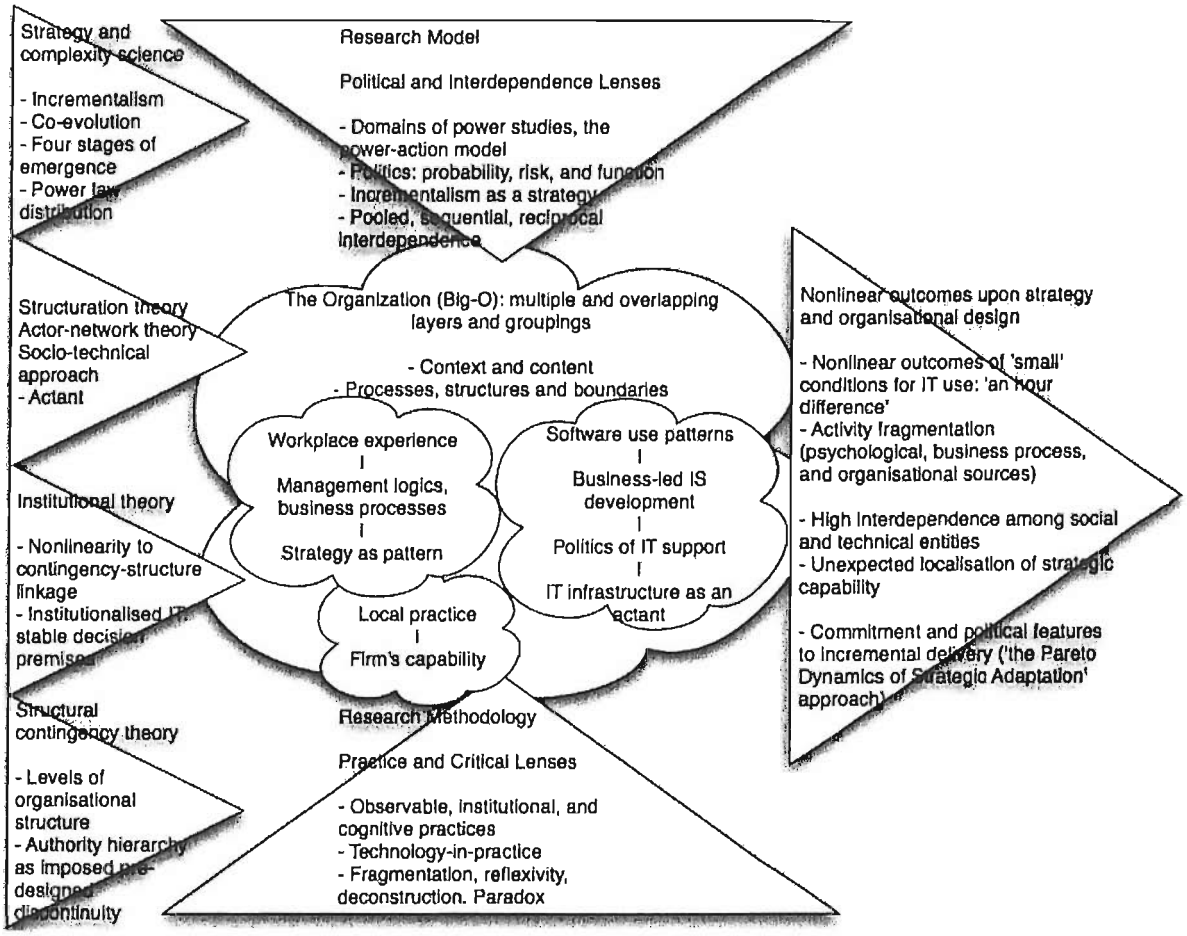
[1] Definition by WordNet, a reference system based upon psycholinguistic theories of human lexical memory. Cognitive Science Laboratory. Princeton University, http://wordnet.princeton.edu/ Accessed 18.05.05.

its responsibilities and powers, than the level of business process team leaders. This thesis contributes with an attempt at representation of the multi-layered organisation beyond an authority hierarchy, focusing on differences between the layers of local practice—firm's capability and workplace experience—management logic. Organisational layers and levels are similar to the layers of onion vegetable, some of which are as stiff as formal structure, others are as delicate and hard-to-peel as management beliefs and politics. Purposeful metaphors, like this one, are also used by this thesis as tools of thinking (p. 163).

Figure 1.1 IT and the organisation: configuration analysis lens



The Lenses are strong metaphors themselves, which has two consequences. First, the lenses exercise the presupposition effect, for example, IT issues being analysed through political lens will appear political. Second, the lenses separate foreground content from background context to the dynamics studied. Figure 1.1 presents this functional separation between Research Model foreground and Research Methodology background (e.g., the insights of Political Lens help to fine-tune the use of common research methods). Finally, the right side of Figure 1.1 lists interesting outcomes that were found important in shaping 'strategy as a pattern'. Those outcomes are nonlinearities that create discontinuities in otherwise logical incremental processes.

The design of this thesis presents lenses in a looped sequence that shapes certain perspective of thought upon the organisation. Chapter 1 draws Political Lens and Chapter 2 recounts more conventional ideas about contingency theory and organisational design as Interdependence-Contingency Lens, these chapters constitute the Research Model. Then Chapter 3 builds Research Methodology that seeks epistemologically sound ways of thinking about 'practices', 'structures' and 'information systems', using the selected elements of institutional theory, critical management studies, structuration theory, actor-network approach and ideas about studying strategy-as-practice.

Chapter 4 introduces Alpha as the main empirical case study through Practice Lens by describing institutional-interpretative, technological complexity, structural, and institutional-environmental 'conditions' that are critical to integrating software, people and institutions in one organisation. Chapter 5 uses the concepts developed in Chapter 2 in order to describe coordination in highly interdependent socio-technical 'systems' empirically; the chapter concludes by showing how different waves of interdependence stem from different stages of the IS implementation lifecycle. Chapter 6 is an elaborate empirical test of 'the Precision for Power' model presented in Chapter 1; the model helps to understand how diverse practices of IT support, resource allocation, evaluation, training and communication join in a patterned incremental, political and successful delivery of Alpha's new banking systems.

Chapter 7 brings together the concepts that were particularly useful in understanding empirical findings and concludes with 'thinking directions' that show how this research can be used by others, for researchers, there are ways of configuring organisational analysis with concepts from complexity and economic thinking in a qualitative design, and for practitioners, there are descriptions of which frameworks can be used and how as well as advice concerning functional overload of contemporary software. The chapter argues for a stronger cognitive perspective upon 'strategic alignment' of information systems.

The tables and figures of this thesis serve as compact ways of data presentation. The appendices also present data as well as intriguing spin-offs of this research. Appendix 3 links the probability-based approach of power to behavioural science, by noticing patterns of power in the principles of learning through operant conditioning. Appendix 8 draws a simple map of scarcities of the IT resources of the firm. All appendices fully contribute to explanation and configuration of ideas from multiple disciplines.

2 Preparation for research on politics and information systems

Before progressing from the overall objectives of this thesis to the detail of power modelling in Chapter 1 Precision for Power, a transition is necessary. This second section of Introduction presents a synopsis of extensive interdisciplinary critical literature review that identifies issues and findings that are necessary to know for the organisation-centred research in information systems. Rather than being conclusions, the findings presented by this section generate questions about the distinctive culture of IT professionals, governance of IT function, flatter but ambidextrous organisational design, conceptual closure of technology and powerful users. Theoretically, such combination of issues provides rationale for studying subtle and routine IT politics that makes the difference between failure and success. Practically, attention to these issues will improve IS implementation by suggesting ideas for sustaining awareness at the necessary decisions, stages and areas of a typical lifecycle of IS implementation in a large service organisation.

(i) Culture of IT professionals as a source for autonomy and politics. A technical mindset?

This research takes culture as a peripheral matter and separates 'cultural' from 'political' as one of its tasks. However, both dynamics are intertwined, with the closed subculture of IT professionals embracing, if not stimulating, political ways of working. IT professionals prefer autonomy and demonstrate lower interaction needs, they live in federalised units and tend to conceal their work organisation in order to have the freedom to do their jobs (Beath 2004). IT professionals value high degree of expertise and see self-development through technical performance (Feraud 2000). There is professional commitment to the standardised field (e.g., long-term careers in IT are valued more). IT professionals are inconvenienced with measuring long-term impacts and business results (Markus 2000). These and other research observations indicate 'the technical mindset' of IT specialists as a tangible phenomenon that includes but is not limited to technical rationality, binary choices of right and wrong, and negation of politics at the explicit, surface level (Davenport et al. 2000). Studies claim that the technical mindset is a result of self-selection into the field, educational preparation that is weighted towards technical subjects, and reinforcing impacts through on-job training and technical enculturation – such incremental and long-term nature of acquiring IT skills contributes to the culture.

The research on 'culture of IT professionals' is more sceptical about their political skills and power resources then the research on 'power and IT' (reviewed from p. 30). The importance of IT staffs will diminish with their becoming 'supporting cast' rather than

'stars' (Drucker 2000). IT professionals are not usually educated and socialised to handle the political aspects of organisations (Markus 2000). Erasmus (in: Davenport et al., 2000) characterised managers and IT professionals as two sociological groupings that speak different languages with conversations being limited in scope and learning. The initial conclusion is that *IT professionals are not likely to be engaged in coalition activity.* Such is counter-productive, because the scope of the IT function's work requires coordination of cross-functional activities and management of organisation-wide and process-based abstractions, such as capability, flexibility, agility, stability, mindfulness, resilience or risk. The solutions proposed by literature are as radical as structural change, and if structural change is inappropriate, interventions must target IT mindset directly (Markus 2000).

Besides stimulating politics, implications of the special culture of IT professionals are few but critical. First, contrary to being attributed with having technical jobs and 'a technical mindset', the IT professionals studied by this research prefer to manage decision premises, use IT policies (Proposition 6.3), and create power resources from proprietary knowledge and other scarcities of IT resources.

> *To the extent that organisational members perceive that their use of IT is increasing their effectiveness in fulfilling organisational goals, their use of IT will become self-reinforcing... employees find new and appropriate uses for the technology. Huber (1990)*

Second, malleable information technology is subject to self-fulfilling prophecies and the agency of IT professionals (e.g., reactive or proactive position) affects attitudes and expectations towards software that shape their experience and use patterns (Finholt 2004). Non-testable beliefs in information technology, such as whether it improves or complicates work, are themselves resources for effective and efficient technology application. Measuring attitude, confidence and competence of end-users became a generic institutional practice, as was done by Alpha through the surveys administered at the several stages of new banking systems roll-out. The attitude of the organisation can be represented by 'the mandate' given to the corporate IT, such as centrally planned, leading edge, free market, monopoly, scarce resource or necessary evil (Earl 1989). But 'the mandate' varies, depending upon which functional or managerial group issues it. With the preference for political solutions, the IT function needs to rely upon a suitable mandate from top managers, which makes it less sensitive to its end-user customers and raises the issue of IT governance.

(ii) Participation in the politics of IT-driven change. IT governance?

The politics of delivery of information systems is a circuitry among IT professionals,

groups of end-users and the organisation, which constitutes main multiple positions of IS research. IS researchers are often on the side of IT specialists, in terms of the profession, common perspectives and values, and dependency upon research access. Organisational researchers are not proficient in studying IT. Therefore, the 'organisational side' of IT politics is overlooked, which forecloses the opportunity for specific modelling of what is called 'soft factors' in systems design and implementation. That area is largely represented by in-depth case studies, such as ones by Lynne Markus (2000) and Wanda Orlikowski (2000, 2001) that are illustrative, insightful but hardly transferable.

IS research constantly seeks for traces of 'soft factors' and 'impacts of IT' through 'hard' statistically analysable evidence of organisational design. The results of that search indicate presence of the co-evolutionary dynamics (p. 17), as the review of Applegate et al. (2003) Ciborra et al. (2000), Davenport et al. (2000), and Dewett and Jones (2001) suggests. From one side, organisation becomes flatter with less hierarchical levels, yet they gain ambidexterity that is when specialised units stand out to the periphery under the dedicated authority of corporate executives (O'Reilly and Tushman 2004). Communication and coordination between decentralised decision-makers is facilitated and improved. Decision-making authority is placed across a greater range of levels without sacrificing decision quality or timeliness, or even reallocated down the hierarchy in order to realize efficiency opportunities and take advantage of local specialisation. Increased formalisation, controlled decentralisation, and 'seamless integration' with systems' procedures substitute for authority hierarchy. From the other side, discontinuous innovation by IT pressures vertical decision flows, make organisations integrate vertically and make their external boundaries blurred (Afuah 2001). This contradiction between the sides is another reason for studying how scarcities of IT resources are 'socially structurated' and how skewed distributions of various powers shape a nexus of several key decision premises, upon which many actual IT decisions rest over the long term (as shown empirically in Chapter 4).

Research on 'IT impacts' will benefit from a heuristic idea that *technology use is local but outcomes are not.* The idea is useful in guiding a qualitative study of IT management and investment evaluation, because it clarifies issues with ownership of costs-benefits, cross-level coordination, and location of 'strategic capability'. First, the responsibility for system development (costs) is charged to the federalised IT function, whilst the responsibility for delivery of cost efficiencies (benefits) is charged to line management. The IT function typically controls most of large projects' expenditure but has little

incentive or legitimacy "to pursue these savings rigorously, or insist on accountability for achieving them" (Yetton 1994, p. 105). This research confirms that such situation holds, even if the responsibility for IT investment is formally shared among different stakeholders. Second, the IT function is vested by cross-level coordination duties (e.g., by delivering management information or datasets to different parts of the organisation), but tends to exercise external-like influence upon other functions. Third, the grail of strategic capability occurs is localised in unexpected places across organisational layers, such as in the stockpile of routine IT task requests.

Those issues underline the story of IT politics presented by this thesis, but the more profound research goal is to understand performance and success of IT professionals in 'getting things done'. Research on performance implications remains limited with recipes, such as 'The Right Mindset for Managing IT' (Bensaou and Earl 1998) or 'Six IT Decisions Your IT People Shouldn't Make' (Ross and Weill 2002), both in Harvard Business Review and concern with issues of how much to spend on IT, which business processes should receive IT money, which IT capabilities need to be companywide, how good do IT services really need to be, what security and privacy risks are acceptable, and whom to blame if an IT initiative fails. Popularity of such advice gives another argument for seeking for politics in IT support.

A continuation of the Big-O approach would be to trace participation of non-IT professionals in IT decisions. In most cases, as well as in Alpha, such participation test does not hold for operational management of IT, for example, in order to obtain operational plans a request to CIO is needed. A political perspective allows a useful classification of non-IT professionals that hold stake in IT decisions: some of them are within the federalised IT-Operations function itself (e.g., business analysis and experts in change of systems configuration) and some of them are out and typically disorganised and geographically separate, fortunately to 'the power differential' of the IT function that then can safely rely upon support of top management teams, rather than any coalitions. Hence, regardless of 'soft decentralising changes' in organisational design, the management of IT itself is likely to be centralised. Traditionally, top and middle managers guard control over IT-related change closely as a part of their prerogatives over work organization (Frenkel et al. 1999; Zuboff 1988). Information systems literature takes end-user participation in systems design as expensive and rather unusual practice (Saunders et al. 2000). This trend has many appearances, largely in form of arrangements that prevent increase in demands by end-users and intra-organisational boundaries. This research proposes that intra-

organisational boundaries contribute to the emergence of skewed power distributions (p. 73) and studies such emergence and its outcomes.

(iii) Provisional stability of information technology-in-use. Powerful conceptual closure?

'IT governance' is a label to what keeps technology-in-use stable within 'the current order' for all within organisation. Conceptually, the stability of technology and its application is only provisional (Tushman et al. 1997). For analytical convenience, technologies are considered as stabilized-for-now, which helps "to seek bounded generalizations about the types of technologies-in-practice likely to be enacted by particular types of users with specific technologies in various contexts and times" (Orlikowski 2000, p. 421). This thesis continues to develop a Practice Lens as a way of capturing generic patterns of technology-in-use, such as the following. First, one of such patterns is early congealment of ways of software use, despite the amount of functionality and flexibility built-in. Wanda Orlikowski linked such congealment and reification to the separation of technological development from end-users as a form of economising and lack of IT support, which brings us back to 'participation test' and discussion of IT politics. Second, IT solutions in organisations are never built from scratch and evolve through improvement, damage and re-building. "It is likely that the increased complexity and internetworking accompanying the growth in global infrastructures will require these artefacts to be more standardized, interconnected, and interdependent. Hence, their use may be less malleable" (Orlikowski 2000, p 409). Consequently, *the more a particular technology is integrated into a larger system, network or technological configuration, the narrower the range of alternative uses becomes, whilst opening advanced forms of use and preserving the probability of radial drifts.* This is the case for any IT infrastructure, because it is build through interconnectivity, which contributes its purpose and value, as Chapter 2 discusses (p. 127).

Finally, 'participation test' is important, because *powerful users*, especially if organised into communities, "intervene in the interpretation of the technology through their comment on the product's name, capacity, use and value" (Orlikowski 2000, p. 409). Too powerful users foreclose future options of technology, "a community of users engaged in similar work practices typically enacts similar technologies-in-practice, where through common training sessions, shared socialization, comparable on-the-job experiences, and mutual coordination and storytelling, users come to engage with a technology in similar ways. ...Over time, such technologies-in-practice may become reified and institutionalized, at which point they become treated as predetermined and firm prescriptions for social action"

(Orlikowski 2000, p. 411). Hence, rather 'unplanned' scarcities of IT resources, automatic high interdependence and political outcomes contribute to technology being stable in use as strongly as purposeful logical intent and project management.

(iv) Research transformation: from 'power and IT' to 'political delivery of information systems'

Having briefly considered challenges of the culture of IT professionals, 'flatter ambidextrous federalised structures', IT governance, and provisional stability of technology. Such combination invites a search for new and subtle forms of IT politics, which first, should provide insights unreachable by other approaches and, second, should facilitate simple heuristic solutions to complexity of IT implementation envisaged from 'a political perspective'. And the next question becomes: which conceptual tools to use in such re-search? This subsection assesses preparedness of the current political perspective in IS research, by reviewing, first, state of affairs in the research on power and IT and, second, fundamental but unexplored place of technology in definitions of power, which sociologists indicated but not investigated. These issues also provoked the in-depth modelling of 'power' by this research, which is well-beyond common information systems studies and even organisational analysis.

> *While there is agreement that power and politics play an important role in IT implementation, there is surprisingly little attention given to them in the recent IS research literature. Brian Butler et al. (1998)*

Linkages between power and information technology were developed for practical issues of resistance (Markus 1983), negotiations for building organisation-wide IT infrastructures (Ciborra et al. 2000), use of groupware Orlikowski (1992, 2000. Characteristically, the research on power and IT in other areas remained untouched, perhaps except a review on the power of the IT function by Saunders et al. (2000), then Jasperson et al. (2002).[2]

> *One area of power research that appears dead is research on power of the IT function... perhaps the 1990s proved more favourable to the IS function that did the 1980s, as a result, the IT practitioners are less interested in bringing attention to their newly-won power. Saunders et al. (2000, p. 347)*

This trend is similar to the punctuated way of development of power and technology research. As a result of the punctuation, interoperability among the studies requires more careful attention to definitions, units of analysis, and presuppositions—sensitivity is

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[2] The review of a sample of 82 articles from 12 management and IS journals published 1980-1999s.

needed beyond the frameworks, such as 'technological, organisational and emergent imperatives'. The punctuation is also understandable in terms of epistemological deficiencies and practicalities of doing IT and power research, as follows:

> *...Situation prompts several questions about the theoretical and practical value of the power and political perspectives on IT implementation.*
>
> *The discussion of IT and power has been based on very loose definitions of power and politics, resulting of literature which is of limited value as a foundation for future IS research.*
>
> *[For power-based IS research] the benefits of applying this perspective rarely outweigh the costs (and risks) of conducting it. Brian Butler et al. (1998)*

I assessed the state of affairs in IT and power research by taking a sample of all papers with 'politics' and 'power' keywords from the ISWorld eLibrary that stores papers from ICIS and AMCIS, major conferences of the information systems field.[3] Then, papers relevant to intra-organisational dynamics were selected, their abstracts were read in full and content was read selectively, for the papers to which politics was main rather than incidental theme or finding (i.e., they intended to study politics or found it is as a significant factor in conclusions). Another criterion for such papers is that they usually have a developed definition or mini-model of 'power'. This review confirmed the deficiencies as above and also found useful to categorise papers using the framework of the domains of power studies (described in Chapter 1), as follows: the main share of papers was of process domain I (i.e., 'politics around IT'), a small number of papers were of resource domain II (i.e., 'IT as a source of power'), and most papers shared the presupposition that malleable IT has ambiguous outcomes (i.e., domain III of power outcomes). Further, the outcome of *empowerment* is mentioned in a significant number of papers, and its definition varies broadly from demise of authority hierarchy to power differential between IT professionals and end-users to improved management information (e.g., Wilson and Howcroft 2000).

The mainstream of 'power and technology' is even broader than 'power and IT' research. Recent literature considers technology at organisational, industry or institutional-social level, treats technology as a single variable, and describes 'the dynamics of technology evolution' in rather broad terms and social implications (Butler and Gibbons 1997; Munir and Jones 2004; Zollo and Winter 2002). As with domains of power studies, this research developed something integrative to those broad but punctuated endeavours, for example,

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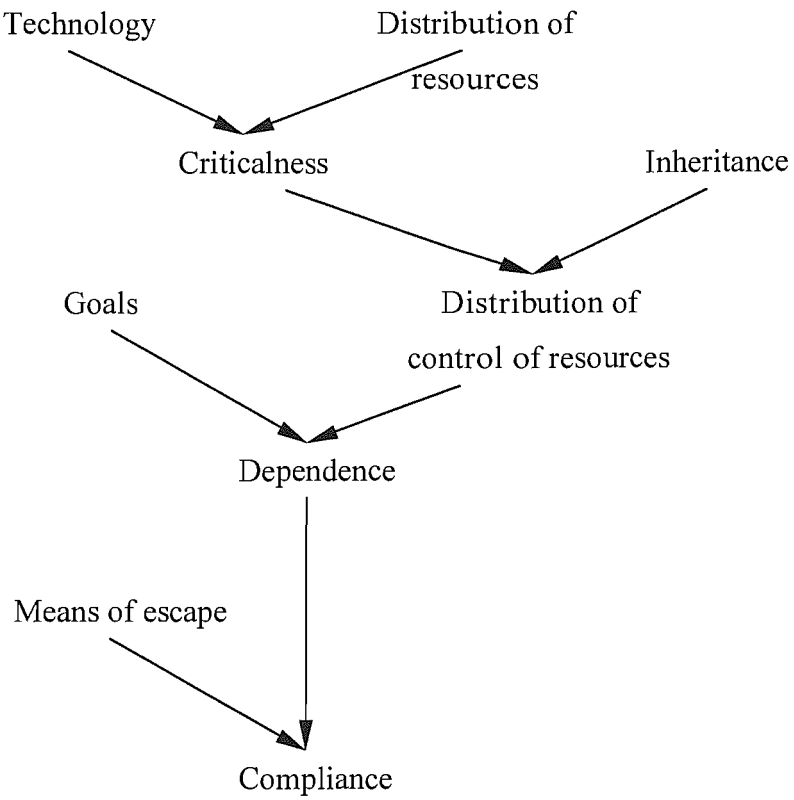
[3] http://aisel.isworld.org/ Accessed 18.10.04.

Butler and Gibbons (1997) modelled how social structures and resource dependencies surrounding individuals impact technology diffusion and arrived at the distinction between passive versus politically motivated technology diffusion—this important distinction points at 'the catalyst role of power' as defined by 'Precision for Power' research model. Overall, Power and technology studies are rooted in sociological studies of power that put technology and resources to the grounds of power definition, as Figure 1.2 shows. That is a rather fundamental position. They acknowledged, "differences in power are built into the design of the technologies or the definitions of relations among positions, and these power differences are normatively justified" (Edwards 1979), but they did not specify.

Figure 1.2 A case of sociological conceptualization of power



Based: Martin (1977)

Methodology Note 1. IT is not only 'a source for power': the impact of IT upon power is neither completely random nor completely subject to how people use technology. It is best to reflect nonlinearities by the following statement: information systems create and constrain choices, structure the difference between 'actual' and 'possible', and provide actionable 'institutional memory' for power, for example, by information access privileges and system profiles for different job roles.

Information systems and IT policies are robust and durable repositories for politics, because even if choices are not retrieved for a long time, they are always available. For example, it is easy and instant to re-configure access to information on the corporate

intranet globally. Methodologies for information systems design bear the presuppositions of the multiplicity of purposes, divergent potentials and possibility of rapid change.[4]

The co-evolutionary dynamics of simultaneous incrementalism and discontinuity indicates that those outcomes are not just possible but prone to emerge (p. 17). Since the scale-free dynamics proposes no 'small' or 'large' events, but only successful actions that fit pattern in the right place at the right time, this qualitative study of power should provide characteristics of such strategic actions and sketch the patters. Theoretically, this research proposes to arrive at simple solutions for complex adaptive dynamics using 'a political perspective'. Practically, the fundamental study of power would serve for better dealing with nonlinearities of IS implementation, resistance, and the condition of intensified politics but limited IT governance (p. 26). However, 'a political perspective' itself is not defined well enough to be used as a tool. First, literature on power and technology is developed at or above organisational level and occupied with the high-level nominalizations of 'diffusion' and 'domination' (Butler and Gibbons 1997; Munir and Jones 2004). Second, studies of information systems and politics are non-specific with their 'imperatives' and debates about 'empowerment' and 'emancipation' (Saunders et al. 2000). Third, there are no ready activity-based models of 'power in work organisation' that would link intents and behaviour of different stakeholders of the IT function to stabilisation of information technology in 'irreversible decisions' and 'provisional but stable use practices'. In order to deal with these drawbacks, this research revisited the fundamentals of power studies and developed its own Political Lens.

[4] See the Multiview methodology by Avison and Fitzgerald (2003, p. 508) for example.

Chapter 1 Precision for Power

1 Presuppositions of mainstream thinking about power

Every handbook on organisational behaviour has a chapter on power (Clegg et al. 1996; Hatch 1997; Jackson and Carter 2000). In-depth research reviews of power studies have been available for many years (Martin 1977; Pfeffer 1992). Yet the field of power studies remains diverse and fragmented especially after the development of postmodern perspectives (Voronov and Coleman 2003).

> *On the whole, however, power is a disappointing concept. It gives us surprisingly little purchase in reasonable models of complex systems of social choice. James March (1988, p. 149).*

Indeed, despite wide reference to power, low amount of specific research was done for the last decade (Heath and Sitkin 2001). This modelling review seeks to break through the problem of a black-boxed power variable with rigorous epistemology, empirical investigation and above all, precision. The first way to achieving the precision is by consistent application of specific modelling that this chapter offers using heuristics of complexity science, Batesonian epistemology (e.g., "how do authors know that they work with power") and cybernetic thinking in terms of restrictive conditions (Bateson 1988), and elements of psycholinguistic analysis with Transformational Grammar and the Meta-Model (Bandler and Grinder 1975, Chomsky 1965; Grinder and Elgin 1973) for the illumination of presuppositions behind the definitions and theories of power by so much different writers from Lukes to Foucault to March.

The second way to being precise is treating every power study on its own terms, exploring its positive purposes, and pinpointing its method. The third approach to precision is seeking, using, and generating new distinctions that make the difference to our understanding of the multi-level nominalization upon generalisation of "power." Appendix 1 presents definitions, concepts and metaphors of power literature reviewed and clusters them into groups of *ability and agency, influence-resistance dynamics, probability, difference and cause, mobilization, communication, relation, resource, and medium.* This set of constructs provides sometimes non-overlapping, sometimes contradictory choices for power definition and is requisite in order to grasp the contemporary power studies; whether this set is exhaustive and whether "power" is finitely definable are open questions. Probability-based approach to power generates new to power theory distinctions of catalyst, consequentiality and irreversibility, frequency, subtlety, recursivity and others as necessary. The fourth and powerful way to being precise is just to connect to actual

practices in real-life organisations – the direction is set from the beginning by Methodology Note 1 and continued by methodology notes of this chapter, tests for power, and refining what practitioners do. Therefore, the core of this chapter is Patterns of Power in Practice that outlines initial ideas about appearances and applications of the patterns of Pareto Dynamics in strategy formation, information systems delivery, and more generally in incremental processes.

> *Disagreements over how widely to extend the concept of power... typically stem from methodological concerns. How are we to determine which counterfactuals are relevant? How do you decide which unintended consequences to consider? How do you study inaction and its consequences? Of course, such concerns can be met by making a series of definitional decisions*
> *Steven Lukes (2005, p. 110)*

The basic logic of this chapter was developed as the key probable pattern of action: Interdependence – Power – Incrementalism and the groundwork for this chapter was laid down in circumstances of research on power, technology and information systems, both were presented in Introduction to the thesis. *Studying power means affecting the phenomena studied.* That is why it is crucial to develop awareness of presuppositions of power, which this modelling review starts to present right away.

(i) Power without conflict? Lukes's 'faces of power'

Lukes's (1974, 2005) integrative works on power showed the ambiguity and composite nature of the power construct that was defined through three faces of overt decision-making, non-decisions, and securing willingness to comply. Those 'faces of power' are attempts at making epistemological distinctions, around which power studies argue still. Does power exist without *conflict*? Is power exhausted when it is exercised or power is a capability concept?

Classic studies by Lukes (1974) and Pfeffer (1992) argued for the conflict base of observable power. However latent, there is an institutionalized conflict in the organisation, and any difference in social structures or personalities could trigger conflict. "Power may be a form of influence if sanctions are not involved" and "influence is a non-coercive element of power" (Lukes 1974, p. 32). Distinction between authority and influence is often drawn using legitimacy: authority is legitimate, whilst attempts to exercise influence may or may not be legitimate. Authority structures (e.g., hierarchy, responsibility distribution, control system, signification symbols) are both the part of 'the normative context' and tools of influence, which is an instance of duality of structure (Giddens 1984). Since each positional difference in the normative context is potential power that might or

might not be used, such omni-potentiality and isomorphism of power make it difficult to measure and operate with.

(ii) Activation, conditioning and depletion of power: March's modelling

The works of March and Simon (1958) and March's (1988) Power of Power article continued the argument about the degree of clarity possible for any power definition. They targeted latency and process of power with deconstruction of extant theories of power down to three modelling assumptions of power activation, conditioning, and depletion. *Activation* is related to power specialization and focus: not all power of all agents is used at all times; in other words, agents specialize on issues. Activation presupposes that before use power remains latent as a resource, which is known as *sleeper effect* in political science (Woodhouse and Collingridge 1993). *Conditioning* is related to power utilization and potential: power resource-base is continuously changed and some resources might not be appropriate to apply in given circumstances (more of contextual-institutional level). *Depletion* is related to the fact that any exercise of power is a gamble with initial rules: power actions are necessary in order to get things done and successful power actions gain more power, but any unsuccessful power action leads to considerable loss in power resources. *Threshold effect* defines at which stage depletion of power resources accelerates.

(iii) Is power a force? Missed process

It is not so much power that corrupts as the myth of power. Gregory Bateson (1988, p. 242)

Social power is a natural and context-situated phenomenon produced by the very agents upon whom it impacts. March (1988) treated power as a force that is external to the social systems and "produces monotone response from the structures of social choice." Definition of power as a force deserves caution for imposition of physical laws upon social dynamics. Whilst such transfer is metaphoric, most authors write as if the models of physics are real at the risk of making recursive self-fulfilling prophesy, because a social system tend to accord to the laws imposed (Morgan 1998).

The notions of "force," "energy," "program" and other legacies from mechanics, physics, and computer science are frequently subtly and inappropriately dragged into explanations of social or psychological phenomena, for which there are no laws of mechanics, energy conservation or entropy, but there are all kinds of "quantum leaps" and "collateral energy" when responses are hugely disproportional to "the amount of energy" applied. The danger of creation of models that mystify, magnify and affect actual social phenomena emerges when those physical models are taken as real. This study offers alternative treatments of

the metaphors from physics theory, specifically, the constructs of strength, catalyst, and quantum theory. Power is the central subject of this study, but in human relations power is frequently a catalyst rather than central ingredient in interaction.

Defining power as one black-boxed variable, "a thing in itself, " is another epistemological flaw, which is noticeable when impact is attributed to the innate properties of reified phenomenon rather than to a patterned interaction in the specific context with specific agents. Positivistic and economic modelling represents interaction through variables, which requires reification and conceptual closure. Yet resource-based view and positivistic models, such as ones by March, provide useful distinctions, whereas postmodern research papers treat power as a force (e.g., "power over") and a black-boxed variable altogether without awareness (Voronov and Coleman 2003). Hence, before and after March (1988) power studies *were blind to the process of power exercise* often for methodological reasons; they offer formal models with linear mathematical functions and variables that annihilate differences (e.g., power potential and power utilization OR reputation (perceived) power and actual power). Calculations and assumptions of adjustment between actual power and reputation are not equally trustworthy. Finally, formalisation of political processes with game theory made authors acknowledging themselves, "exercised power is lost" and "unexercised power disappears" (March 1988, pp. 138,142).

Timing of power: conflict anticipation and foreclosure

Timing is even more shadowy in texts about power than process. Yet power is an outcome of its own effective exercise, and any power study makes assumptions about time, for example, what researchers see as dominative *post factum* appears as a lively political process to its partisans. Time itself is a means of power. Time is used for setting boundaries and constraints. The sequencing of events, decisions, actions or speakers, deadlines and sign-offs with automatic agreement if no concerns are raised in presence – all are classic power practices.

Attention to time resolves the argument of whether power exists without conflict. Different stages of a conflict require different types of power-actions (e.g., self-reproduction, mobilization or deterioration of resources). Power is most effective when applied in anticipation of a conflict, as literature agrees: some actions and institutions anticipate and foreclose conflict before it can come to the surface of organisational life. Prevented conflict costs less and has no ramifications; and the major gain of power comes from "a notice of something that may cause a difficulty before there are any obvious signs of

trouble" (Klein 1997, p. 111).

(iv) Reconciliation of objective force and subjective will for definition of power

Capability—agency and resource—skill sides of power definition

> *'Exercise fallacy': power is a dispositional concept, identifying an ability or capacity, which may or may not be exercised. Steven Lukes (2005, p. 109)*

The conceptualization of power with the ideas of capability and agency presupposes process and interaction. There is someone who possesses ability and ability is evident through its exercise in the interaction of agents. The construct of "power as capability" is applicable to the aggregated agency of units comprising more than one human agent, such units conceal their internal interactivity through demonstrating their own behaviour (i.e., cultural or institutional supervenience). In most cases, the behaviour of such aggregated unit is *emergent*.

Agency cannot be taken for granted for either human agent or socio-technical actant, because

> *Agency is a skill. Emirbayer and Mische 'What Is Agency?' (1998, p.1012).*

Agency is a skill of timely action and ability to self-activate, both of which are widely applicable sources for power. Emirbayer and Mische continue, "key to understanding the variable orientations of agency towards its structural contexts lies in a more adequate theorization of the temporal nature of human experience. *Actors are always living simultaneously in the past, future, and present*, and adjusting the various temporalities of their empirical existence to one another...in more or less...reflective ways." More formally, Emirbayer and Mische (1998, p. 962) defined agency as "a temporally embedded process of social engagement, informed by the past (in its "iterational" or habitual aspect) but also oriented towards the future (as "projective" capacity to imagine alternative possibilities)...." The definition is decomposable as follows: "iterational" is gradual building of experience through learning and practicing (retrospectively, human experience is represented as gained gradually and through practice), whereas "projective" is discontinuous consideration of alternatives and attention to probability.[5]

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[5] This decomposition in done using understandings of incrementalism-radicalism and stochasity of power, both are the parts of Pareto Dynamics presented later in the work.

The definition of agency as a skill is confirmed with the failure of equation of agency to human will only. Organisation theory defines *power through effectiveness, getting things done and committing, which does not equate to agency of options selection and abilities to act*. Commitment outcome and goal of power make it possible to realise capability and take control over probability, but simultaneously commitment forecloses other choices and capabilities (Burgelman and Grove 2004). Linguistics (etymology) defines human agency through individual ability and free will, whilst capability through collective ability, for example, to achieve coordinated action. The constructs shall be applied accordingly.

Agent-based complexity for power: Structuration, Embeddedness and Emergence

Structuration. Structuration theory interprets power as merely constructed in collective action and inter-subjectivity (Giddens 1984). With the notion of duality of structure, structuration theory reconciles the dialectics of "power to" (i.e., transformative capacity of individual agents associated with the process and social construction) versus "power over" (i.e., constraining force of society associated with resources and institutions). Structuration analysis also offers two sets of useful distinctions, specifically the framework of legitimation-signification-domination modalities of instructions and the difference between allocative and authoritative resources.

Embeddedness. The notions of "aggregated agency" in sociology, "multiple layers of the organisation" in organisational theory, "causality of mutual loops" nested into some cybernetic circuitry, nested interdependence patterns of Thompson's framework (1967), "actor-network" in socio-technical approach, and "embeddedness" in complexity studies are names for the same class of phenomena. Even Parsons's (1969) "power as system resource" defined power as something shared and complex. A system could act on its own and be subject to the agency of a higher system and so on. The agency of each sub-system incorporates an additional layer of agent interaction and contributes to the nonlinearity of formation and use of power resources, with the following implications for power research. First, any analysis of power in a group or social system of more than certain amount of agents (therefore, layers) is possible only indirectly (i.e., through patterns and stochasity rather than causality). Second, the use of embedded and self-referent power-as-system-resource by a human agent is limited by his or her internal bounded rationality and external boundaries, for example, one cannot estimate reliability of a reference to reputation of having an ability of affecting corporate strategy that, in turn, is contingent upon… – this is a simple example of complex embeddedness.

Emergence. For tackling the relation between the number of agents and embeddedness, Lichtenstein and McKelvey (2004) proposed 'the unified framework of the four stages of emergence' unfolding as follows: interaction among agents leads to emergent networks, the presence of networks allows emergence of groups (horizontal causality), and the presence of groups allows emergence of hierarchy (vertical causality), then coordination means emerge. Within the framework, they suggest the power law relationship between embeddedness (the number of agents) and frequency of emergence of a higher stage as follows: "for 10,000 network formation attempts in an industry, only 1000 actual groups might solidify into continued existence" (Lichtenstein and McKelvey 2004, p. 23).[6]

Emergence plus Embeddedness plus Recursiveness indicates how *complex power resources* are structurated. "Resources, such as raw materials, might seem to have a real existence but their materiality does not affect the fact that such phenomena become resources only when incorporated within the processes of structuration" (Giddens 1989, p. 33). Structuration theory distinguishes between *allocative resources* (e.g., materials, technologies, money, and artefacts) and *authoritative resources* (e.g., organizational design and time-space paths in social structure, technological facilities and rigidities, embodiment, and chances of self-development) (Giddens 1989, p. 258). Access to the professional legal help paid out of government budget in a court case against a tax payer (Pfeffer 1992) and buying stock brokers' services in order to occupy their time and manage their agency, the subtle tactic of George Soros – are examples of how complex authoritative power resources can be. Appreciation of the complexity of power resources offers choices for new thinking about power: first, non-economic uses of power are more probable than it might conventionally believed, and second, power is over-theorised as the case of struggle for scarce resources.

2 Domains of power studies: ordering with epistemological distinctions

Assumptions, trade-offs, and the concepts of power considered so far fall effectively into three epistemological domains that classify our knowledge about power. Each domain

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[6] The Power Law Distribution is the representation of Pareto Distribution on the logarithmic scale. The term 'power law' refers to the algebraic operation of power in the probability density function. There is certain ambiguity between the power law and social phenomenon of power, yet the term "power law" settled in complexity science, and there is a meaningful connection between power in social relations and the power law.

bears distinctive presuppositions, assumptions about power, research methods as well as different timescales for representation of power.

Domain I of power exercise captures most of power dynamics and process. There is a whole continuum of power processes from positioning of interests to coordination games to interpersonal influence to power exercise with a physical or symbolic action to use of legitimacy, and so forth. These processes are labelled "politics" contrasting with more general and inertial "power", but finer distinctions are yet to be made.

Domain II of power sources captures what has long been called "latent power" of diverse sources from authority hierarchy to temporary commitments to imbalances of interdependence to any positional difference in the organization (i.e., latent power and conflict can come from anywhere in the organisation).

Domain III captures outcomes and properties of power, some of which are common sense (e.g., domination) and some are introduced for analytical convenience (e.g., recursively). Frequency, latency, recursivity, and irreversibility are examples of the properties of power, and their dynamics associated with contribution of power to the effectiveness of an action are discussed in the section on characteristics of the effective power process (p. 51).

One might tempt to equate the domains I, II, and III of power studies to the framework of process, structure, and outcome by Andrew Pettigrew (1985). Such complex equivalence would be remote, because the domains were developed in order to classify specific theories similarly to how it was done by the domains of strategy process and content.

Appendix 2 presents The Composite Phenomenon of Power framework that maps what we know about power using these epistemological domains. It will help if you actually familiarise yourself with Appendix 2 before continuing to read, because Appendix 2 is a sensemaking device that helps understanding presuppositions behind power studies and illustrates how power is enacted across all three domains in the cycle of institutional reproduction marked with transparent arrows. The circuitry shows that *definition of power from within one of these domains separately makes no sense either in theory or in practice*. One needs to consider resources for power, deployment of those resources in a political process, and legitimised outcomes of that process. Neither power resources (e.g., authority) nor power actions (e.g., signification) nor power outcomes (e.g., domination or commitment) alone mean "power".

(i) Domains of power: issues of control over contingency and resource-based view

The definition of "power as control over contingency" is Domains II-III definition, because it substitutes process with artificial linkage of resource with outcome-contingency[7]. "Introduce any form of *ambiguity*—environmental uncertainty, competing goals, varied perceptions, scarcity of resources—and politics arises" (Mintzberg et al. 1998, p. 236). To add to this list of nominalized sources for politics, any *positional difference* (e.g., in opinions, in networks, in job definitions) and any *boundary* contribute to power.

The review of power studies dealt with the definition of power as an objectified resource, a thing. Yet, the process-based approach to power is problematic to achieve, because difference between the domain I of power exercise and domain II of power sources is sensible but difficult to implement in practice, because of the issues (and inherent properties) of power latency and subtlety encountered by many studies which described their difficulties as follows. *First*, there is "absence of any neat, constant, and direct relationship between power as a potential for determinative action, and power as determinative action itself... the reputational method assumes an equation of potential for power with the realization of the potential" (March 1988, p. 136). *Second*, both individual's potential power that comes from position in networks and the level of authority (domain II) and behavioural tactics of assertiveness, ingratiation, and exchange (domain I) contribute to other's perceptions of the individual's power independently (Brass and Burkhardt 1993). *Third*, previous power position (domain II) is the main predictor of subsequent power and control over contingencies (domain I) does not lead to power gains automatically (Lachman 1989, the study defined power as a way coping with uncertainty, that is made non-substitutable).

The definition of power as a resource is improved by reconciliation of objective force and subjective will with attention to agency as a skill, i.e., by answering Meta-Modelling questions, such as "power as resource of whom for doing what?" (Bandler and Grinder 1975). Power sources are many, dynamic and disparate in the organisation. Patterns of usage of power sources, that are stable over time, are typically referred to power resources

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[7] "Contingency" and "uncertainty" only imply process. They themselves are nominalizations, not true nouns. Because social processes are not causal in the Newtonian sense of cause-effect in mechanics, there are all kinds of collateral energies and quantum leaps, when effect is disproportionably small or large compared

too. The confusion is multiplied by the fact that power resources involve *complex* processes of maintenance, reproduction, and consumption. *Not all contextual sources (differences) become power resources* and *not all power-actions or politics affect power resources.* This is another way to restate the assumptions of power activation, specialization, and depletion (March 1988). Yet, *whilst not all effective power-actions contribute to building up power resources (e.g. reputation), practically all ineffective power-actions contribute to depletion of power resources.*

(ii) Domains of power: differences in time and beyond

Necessity of reconciliation of objective force and subjective will arises again, if power is defined as a force or institution. Such is a common way of Domain III power conceptualisation through its outcomes, such as domination and stabilization. Yet, outcomes become evident only upon time, after the process has been completed. *What is considered domination post factum might appear as a lively political process to its participants-agents.* A researcher should be epistemologically aware that "what are commonly referred to as norms and values... are themselves by-products of actors' engagement with one another in ambiguous and challenging circumstances" (Emirbayer and Mische 1998, p.1012).

Not all properties of power require the boundary of an even or outcome. And some properties of power either do not stretch in time OR have their own assumptions about time. For example, in the framework of influence—authority—coercion (Martin 1977, p. 48), influence is processual and most effective in present time, authority is taken for granted and associated with past (history and reputation), and coercion works through past memory of actual punishment associated with imaginary future. Hence, the most automatic exercise of coercion links past and future in a way that is discontinuous to the present. Overall, the construct of time facilitates reconciliation among the epistemological domains of power studies as follows: power resources are associated with the past, politics is present and continuous, and outcomes are either evident in the past or expected in the future, where past can be projected into the future and future can be planned as if something has been done.

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with cause. If "contingency" or "uncertainty" is named as a cause for organisation structure, that does not answer which specific nonlinearities are in play.

Time is not the only distinction between the domains of politics and power outcomes. In fact, they are of different logical order. For example, the framework of the "forms of structuration of institutions" signification—legitimation—domination (Giddens 1984, p. 29) offers means of power that are likely to appear in certain domains, for instance, signification of a rule by a CEO is a strong means of power-action, while legitimation is rather longer and collective process aimed at formation of power resources.

Also, the definition of the outcome presupposes that such stand-alone outcome should be "observable" from somewhere, e.g. the environment of organisation or viewpoint of researcher. The organisational boundary is a matter of both the organisation and its environment, and the definition of organisational boundary affects relation between intra-organisational process and organisational outcomes. For example, "while emergent strategies are generated through the interaction of human agents [within organisation as a system of rules], their accumulative impact [outcome] can only be defined... in terms of environmental adaptiveness" (Lichtenstein and McKelvey 2004). Hence, the sources for patterns of power inside the organisation should be researched for in unconventional places.

3 Probability-based approach to power

We cannot refuse chance models of power. James March (1988)

There is a common *pattern* to the definitions of power as diverse as "A prevails over B," "non self-regarding action," "capability to make difference," "being able to do otherwise," and "getting things done," the pattern is *change of probabilities* for viable ways of action in the organization.

The extant definitions of power also take for granted that a power-action should have "strong impact" in the sense of being effective-successful, otherwise it is not a power-action, in other words,

Proposition 1.1 (Axioms of power definition) The power of an action is defined by its outcome. The fact that power is defined in terms of its consequences implies uncertainty and anchors power into the future.

Proposition 1.1 proposes that the very existence of power is subject to its effectiveness in terms of its own successful application. This is the recursivity of power. The Proposition 1.1 is presupposition to the well-known principles of *equifinality* (i.e., focus on achieving successful outcome rather than on means of achieving) and *satisficing* (i.e., achieving satisfactory results is far better than failing to achieve optimal results).

Methodology Note 2. Because the power of an action is defined by its outcome, strength (or impact) of the power-action can be equated to expectation of such strength (or probability). This opens a way of analysing power with probability distributions.

Whilst it is analytically convenient to assess power through "the strength of outcomes of the power-action," *the probability of an outcome of the power-action as perceived is NOT the probability of the power-action.* The very perceptions and "assured outcomes" are a means of power; thus, it might guide the prediction of power, but "true" probability distribution of power is inaccessible for direct measurement, because of "absence of any neat, constant, and direct relationship between power as a potential for determinative action, and power as determinative action itself" (March 1988, p. 136), which has already been cited as the main difference between domain I of power processes and domain II of power resources.

The relation "between the strength of the power-action" and "probability of that power-action" can be inducted from a simple observation that a strong power-action is NOT likely to be frequent. Complexity science found that the relation between size and frequency is described with the power law. Later in the text, the power-action model will present proportions between certain uses of power: each kind of use is "strong" under its own circumstances and timing. It is common sense that frequently the difference of effective power use resides just in the right timing.

Looking from the future, the probability of the power-action seems to be determined by preceding power-actions (see Proposition 1.6). "It is hard in retrospect to recognize roads not taken, but in almost any interaction there are seemingly small steps that can tip a negotiation in one direction of the other" (Wheeler and Morris 2002, p. 9).

There is a dichotomy between power applied instantly and power applied through a threat or expectation, and in the recent centuries power application was dramatically shifted to its communication means. Yet, Proposition 1.1 shows something more than difference between "instant application" and "threat", it shows that in any case of power use there are probabilities and consequences, and opens a way of working with power through known probability functions as presented in Appendix 3 in the form of stochastic apparatus.

(i) Shaping probability of power: commitment, consequentiality and irreversibility

Proposition 1.2 (Axioms of power definition) A power action is committing and mainly irreversible.

Organisation behaviour literature, particularly on group dynamics shows that a singular power-action escalates, i.e., given resources and no other power influences, the power-action takes all of its consequences possible (Pfeffer 1992). This heuristic fits with the rules for conversion of power-actions into power resources proposed by the power-action model and has a mathematical representation as "exponential oscillation" (see Appendix 3).

Proposition 1.3 (Axioms of power definition) A power action is consequential and strategic.

Consequentiality and commitment of power form a duality that leads to irreversibility. Commitment has interesting (psychological and social) consequences: once something has been committed, people rearrange things and understandings around such commitment. Hence, consequentiality is result of commitment, whilst commitment requires many consequences to be grounded in, which results into irreversibility. *The difference between commitment and irreversibility becomes clear, when one imagines "backwards interaction" of a social system.* One can undo some of actions, such as return product to a store or withdraw patented technology. The difference between actions that one can but doesn't undo and can't undo is precisely,

- commitment (can but doesn't);
- irreversibility (can't).[8]

Methodology Note 3. The axioms of power definition are "power tests" for identification of power. Table 1.1, offers a set of questions for testing presence of power as well as for tracing compliance and inescapability (invariability) of outcomes of power use.

The questions are arranged in the continuum between "subjective" and "observable" AND "commitment" and "irreversibility". In use of Methodology Note 3, it essential to remember that power is only presupposed, if one detects consequential, committing or irreversible action in the past.

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[8] Commitment is more of a subjective matter; irreversibility is more of a social constraint. Commitment is regarded as a matter of psychology, whilst consequentiality and irreversibility are matters of social theory.

Table 1.1 Questions for testing power through commitment and irreversibility

	Social, behavioural or otherwise observable	*Subjective (values and perceptions of choice)*
Irreversibility and consequentiality (social)	Was the action irreversible? Has the action changed the course of things (e.g., behaviour)?	Which (how many) consequences has the action had or *promised to have*?
Commitment (subjective)	How committing was the action to its participants?	How committing was the action to you? How has the action altered the choices (of yourself and other participants), which choices did become opened and which foreclosed?

Irreversibility of any power-action is rarely ideal, because the strong forms of power are not applied in the zones of indifference (March and Simon 1958), but irreversibility makes the power-action strategic. The amount of resources that it might take to reverse irreversibility, and the amount of time before consequences (e.g., decisions, commitments, or otherwise conceptually closed events) are put under review are power tests, as elaborated in the section about frequency and timing of the effective power process.

Commitment and irreversibility are tools of social choice. "Commitment makes it possible to... take control over probability, but simultaneously commitment forecloses other choices and capabilities," wrote Burgelman and Grove (2004) in their research on strategy for information processing industry firms. The probability-based definition of power explores "why things are the way they are, how successful actions were taken and outcomes achieved," which is similar to the questions of strategy research.

(ii) Differential probability. Practicalities of probability-based tests for power

The early probabilistic approach towards power (i.e., testing for power activation and whether an outcome is a result of power exercise or not) was Dahl's (1957) *differential probability* defined as follows: "difference between probability of a specified outcome occurring with a power signal as observed [*after*] and probability of specified outcome occurring without a power signal anyways."

$$M\left(\frac{A}{a}:w,x\right)=P\left(\frac{a,x}{A,w}\right)-P\left(\frac{a,x}{A,\overline{w}}\right)=P_1-P_2$$

Where, M is A's power over a, with respect to the response x, by power means of w; P_1 is opportunity cost/probability with the power-action and P_2 is opportunity cost/probability without the power-action. If there is no difference in probabilities of action with or without the power-action (i.e., $P_1=P_2$), then there is no power relation (M=0) (Dahl 1957, p. 205; Martin 1977).

It is common to measure power through the degree of institutionalized latent conflict (Hayward and Boeker 1998). If differential probability is evaluated *before* the power application (or instead of power application, or in case of power application through expectation), differential probability is estimation for successful outcome of the power-action, and is a measure of conflict latency, as follows:

- When expected differential probability is high, it is a condition of anticipated conflict, under which the consequential and strategic power-action is applied to prevent conflict (Proposition 1.3).
- When expected differential probability is low, it is either a condition of low conflict under which no noticeable power-action is required OR a condition of revealed conflict which implies that differential probability is measured post-factum of recent power use, when the more committing and immediate power-action has been performed in order to deal with ramifications of revealed conflict (Proposition 1.2).

Power as a catalyst: addressing issues of differential probability measurement of power

> *The appearance of... different interests in the forum of reflection [leads to] reconstruction of the social world, and the consequent appearance of the new self [emergence] that answers to the new object. George Herbert Mead (1964, p. 149)*

Whether Dahl's formula evaluates probability post factum or pre factum, it uses *as if* frame that presupposes both the ability of an interviewee to re-evaluate its representation of the entire context into a new reality AND the ability of a researcher to reconstruct situations with and without the power-action concerned. For an interviewee, the very value systems of two realities with and without certain power are different, if not incompatible to keep in one mind. Ironically, while practical application of Dahl's formula involves re-evaluation of the context, Dahl's interpretation of his own formula avoids the context and considers the power-action between two parties stressing importance of an individual agency versus the organizational context of power sources and relations. The ramifications become clearer when Dahl's formula is used in immediate power measurement in an interview

question, for example, "Would has the same decision been made without the Director in place?"

- "Yes" implies that the Director's power equals nothing and the context equals everything, leaving aside the considerations that it might be the Director who articulated conditions, speeded up the decision, or mobilised political will for getting the decision done and implemented.
- "No" implies that the Director's power equals everything, and the decision has been made without rational reference to the firm's context. Answer "possibly no" begins to imply the interviewee's understanding of the role of the Director working out the decision.

Doubly ironically, the advantages and issues of Dahl's power test altogether suggest the most correct application of the test is when the power-action serves as *a catalyst* that speeds up the implementation of a decision that has already been made or legitimised. Noteworthy, that the reverse option of power as *an inhibitor* that slows down the process is possible but less frequent application of power.

> *Of course, politics is also a factor in the resistance to strategic change, but perhaps not so effective as the force of culture. Henry Mintzberg et al. (1998, p. 261)*

Because effective power exercise is latent, subtle, and unobtrusive, even for an consequential and irreversible power-action, differential probability is likely to be measured as low. In other words, differential probability of the power-action to occur is of little use for prediction of the strength of "power as determinative action" (see Methodology Note 2). Therefore, this research adopts a careful treatment of power as a catalyst to the strong, consequential and possibly irreversible outcome, which is an elegant answer. The role of catalyst exists only in relation to the interaction of other components, such as cost factors of information systems and types of project management. In chemistry, catalyst is a substance that initiates or accelerates a reaction without itself being affected. Here, *the catalyst role of power makes minimum presuppositions about what power is.*

(iii) Getting control over probability: power as 'getting things done'

> *Getting things done. A definition of power by Jeffrey Pfeffer (1992)*

The definition implies probability realised in the course of action and certain irreversibility. The definition is common sense and neutral; therefore, the definition is useful in communication with practitioners. The definition points out that *no negative or positive connotation could be attached to power phenomenon per se* and only subjective interpretation of power outcomes could be negative or positive (e.g., domination or

potential realised)—in the same way, evolution processes cannot be "positive" or "negative". If "power is inherent in social relations" (Foucault 1983), power is hardly a subject to moral judgement, whatever ways of power use exist.

While scholars or practitioners might or might not acknowledge the presence of politics, it is not the point to discuss. Recognition of political reality is just a special mode of interpretation of management issues that helps their resolution. Sometimes the shift from planning to politics is "a slight twist of perception" (Mintzberg et al, 1998, p. 235).

The absence of the agent in Pfeffer's definition does not mean exclusion of human agency and individual belief systems and value systems. Power and leadership studies stayed in domain II of power holders and power resources for long time.

Methodology Note 4. Studying power from the viewpoint of followers rather than leaders could provide practical accounts of how power operates, because FIRST, followers comply with power-actions, thereby they bring power into verifiable existence (i.e., compliance) and SECOND, in agent-based systems leaders might have more network connections or otherwise preferential positions than followers, but leaders are agents too and subject to the same shared belief systems and normative context.

Getting things done: through overcoming self-regarding?

Methodology Note 4 brings up power tests that were used in power studies for long: first, having verifiable outcome, such as demonstration in behaviour and second, behaviour should demonstrate *non-self-regarding compliance* (Martin 1977). First, the assumption of power as non-self-regarding is at the core of Dahl's power test of differential probability and misses the functions of power, such as being a catalyst and taking control over destiny. Second, "power for overcoming self-regarding" has its thresholds, for example, "because of attacks by opponents, each voice, not matter how self-serving, is forced to justify its conclusions in terms of the broader good—the interests of the organization at large" (Mintzberg et al. 1998, p. 243). Therefore, non-self-regarding test will not work, if politics is intensive enough, which is precisely the frequent condition proposed by Proposition 1.9. Third, non-self-regarding approach sees only discontinuous mobilisation with "power over," power of social system over the individual. There is another kind of discontinuity with "power to," power of the individual psychologically provides states of powerfulness that make an individual self-indulgent in his or her own behaviour, yet more susceptible to self-influence and more sensitive to the organisational environment (Galinsky et al. 2004).

Compliance that is based on consensus (i.e., self-regarding is aligned with social-regarding) is not considered as a result of power use, which is an example of "domain II thinking" that presupposes objective reputation by which power is measured and influence-resistance dynamics. The concept of self-interest provides only one viewpoint and no perspective. The alignment of interests and discovery of "what is shared" requires political skills (Perrewe et al. 2004). A reference to agents and their political skills is an example of "domain I thinking" or cross-domain thinking.

4 Domain III characteristics of the effective power process as power tests

There are some properties or outcomes that the effective uses of power share in common. These properties are governing and even generative rules for how power dynamics unfold. An interesting feature of these properties is that they are applicable to various scopes of power dynamics in a scale-free manner, for example, frequency of a word in personal communication, frequency of Board meetings, and frequency of review of business process all can be used as tests for power.

(i) Frequency and timing of power

This group of properties includes frequency, rate of change, and intensity of a sequence of power actions. Frequency is a factor that links effectiveness of power and time. Power is a process that is enacted recurrently, and effectiveness of power exercise is a function of frequency of power actions.

Frequency is related to number of events over a period of time. High frequency required maintenance of reality of organizational integration (and effectiveness of power pattern) is at odds with the definition of a power signal as strong and committing. Because each unsuccessful power exercise creates issues, there is a *trade-off between high frequency of signals required for effectiveness of power exercise and high stakes, if power signal is unsuccessful.* One illustration of the trade-off is when forecasting and intelligence are replaced with repetitive and overlapping messages—a mass of such messages appears as rhetoric and propaganda. Further consequences are discussed as the paradox of the strength of power.

Stability (and reality) of power resources are achieved through frequent, pervasive, and intensive acting that creates a socio-cultural structure of high density that can not be "pushed through". Such social construction holds for cultural processes whose stability is based upon frequent reproduction (Hatch 1997). Power reproduction processes and their

integrative role to the organisational identity are discussed further as communicative implications of the power-action model (p. 63).

Towards time-based power tests

Time-based power tests applied in this work are based upon *frequency*, for example, frequency of meetings, frequency of action prescribed by strategy such as frequency of surveying end-user opinions, and frequency of review of a business process and *duration*, for example, duration of a meeting and duration of review process. Duration is the amount of time; frequency is precisely the reverse to the amount of time, a fraction of time. *The amount of time it takes before a decision is reviewed—that is durability of the outcomes of power-action—is particularly indicative power test.* Studies suggest that power of mangers is proportional to the amount of time before their actions and decisions are put under review, and the income of managers is proportional to the irreversibility of their decisions (Jaques 1956). *High and low frequencies as well as variation from the average duration are interesting in terms of testing for power.* The following questions define time for power:

- When to close process into a decision outcome?
- Which time to refer to in legitimation (e.g., past experience, current resources, or future strategic expectations)?
- How to arrange time discontinuity (e.g., when to forget old decisions, when to act "as if," and when to discontinue time with a threat or coercion)?

The role of frequency in specification of the power-action model is crucial. Whilst the model itself will be presented soon on page 54 the generic rule is simple: the power-actions of 1st order (e.g., oral persuasion or software configuration) do not require long time for being reviewed, whilst the power-actions of 2nd and 3rd order (e.g., reputation or appointment) are durable and not reviewed as frequently as the power-actions of 1st order.

(ii) Latency and subtlety of power

This group of properties includes latency, subtlety, and unobtrusiveness. *Latency* is inherent property of the power construct, because any power resource (e.g., interdependence) could become power in its full sense with exercise and outcomes. Latency is activated and conditioned (March 1988). *Subtlety* is about style of power exercise, and the style is an outcome.

Latency and subtlety are important factors of power's strength. Although power activities are not easy to acknowledge and study in organisations, organisational members use them

daily and widely (Pfeffer 1992). Unobtrusive (and preventive) exercise of power contributes to its effectiveness. Action research shows that salient agreement with application of power in agenda formulation and sensemaking "only drives power differences underground rather than removing them" (Kurtz and Snowden 2003).

While power is evident through traces, it is methodologically difficult to study (and prove existence of) latent conflict, latent power, and associated governance mechanisms like Chinese Walls. Types and ways of operation of governance mechanisms that foreclose conflict were not reported by reputation analysis done with either interviews with community members or statistical assessment of prestige and institutional standing (Hayward and Boeker 1998).

Because power is most effective in its foreclosing-catalyst application, the very effectiveness and unobtrusiveness make power and conflict unseen.

(iii) Recursivity and self-reference of power: egg or chicken?

This group of properties includes recursivity, self-reference, self-pointing, self-reproduction, self-construction, and autopoiesis. The recursive nature of power appears in its definition through effectiveness of its own outcomes. Another case for recursivity of power processes is the fact that they are self-referential, because they aim to be exclusive of other power processes, for instance, influence include persuasion AND undermining other influences (Luhmann 1995). Yet another illustration of powerful recursivity is push-and-pull social and psychological arrangements, when agents are not only attracted towards but also foreclosed from escape or threatened with negative consequences.

Mintzberg et al. (1998, p. 244) describe some discontinuity benefits of politics as "to stimulate necessary change blocked by the legitimate systems of influence" and "ease the path for the execution of change." The necessity to ease the path and build coalitions-alliances presupposes that there is intensive politics in the first place (or intensive politics will occur if institutions are touched), which is a vivid example of the self-reference of power.

Recursivity of power is rooted in human cognition and based on memory. Reproduction of power with certain frequent actions makes people learn and be reminded. It is common to expect power of power (March 1988), for instance, a power-action seeks to gain legitimacy and legacy legitimacy is a base for power action. Proper re-use of power resources

increases them and their quality, which is known as "increasing return" in economics and complexity studies (Arthur 1996).

Self-reference of power is also evident in Pareto dynamics, for example, with the pattern of incrementalism-radicalism (Proposition 1.6), a sequence of power-actions of one type is likely to provoke a reciprocal power-action of other kind. The recursivity of power is supported with the duality of structure, when the structure constitutes and is constituted (Giddens 1984). So called "institutional reproduction of power" is a recursive cycling across power domains I, II, and III as illustrated with large transparent arrows in the diagram of The Composite Phenomenon of Power (see Appendix 2).

To summarise here, the self-reference of power is rooted in human cognition and archival organisation of human memory; the self-reference of power indicates the presence of cyclic social relations which can be represented plainly as "interdependence"; the self-reference of power makes power effective but provokes discontinuity; the self-reference of power appears in the structuration of complex power resources and management decision premises; and finally the self-reference constitutes each pattern of power, for example, exclusion of other processes and influences as well as power of power.

5 Domain I of power process and exercise: the power-action model

Probability-based approach to power specifies how power exists through its effective exercise – any appearance of power leaves traces in both organisational material systems (e.g., documents and software) and individual psychological "systems" (e.g., beliefs).

Methodology Note 5. (Activity-based approach to power) Power involves an action always. Even the most automatic uses of power, for instance, authority, legitimized position of a teacher, or reputation, leave traces.

Some power-actions are more immediately strong than others, which makes them more observable as power-actions. *The timeframe of observation matters.* Just as with the length of physical wave, measurements that capture short waves will not capture waves of action with long-term consequences. To continue the comparison, measurement that captures reputation for power is akin to the measurement of medium depth waves, and measurement that captures immediate impact of oral persuasion is akin to the measurement of surface waves. Decision premises and beliefs are equal to long waves, but just like in radio translation ultra-short waves (i.e., strong immediate action) may have quantum impact of being unexpectedly received over very long distance.

Information about power processes gets hidden or lost for political reasons, but power leaves traces: hard and analysable evidence in documents, communication patterns, structure of technological artefacts, and the ways in which institutional and strategic processes are patterned.

Criteria for an action being "the power-action" have been offered as consequentiality, commitment, and irreversibility and frequency, subtlety, and recursivity. The following are examples major variation of power actions and signals:

- immediate physical action;
- (immediate) remote action performed technical mediation;
- symbolic action or signal performed as communication; and
- inaction, such as indecision, non-participation or keeping an issue off the agenda.

(i) Definition of the orders of power: 1st, 2nd, and 3rd

Any action has a degree of power, but only action that is effective for achieving its purposes and making irreversible change in social choice is named "the power-action". Not all power-actions affect power resources, which makes the difference between domains II and I. Generalised heuristics of the power-action as "exponential oscillation" suggests that power-action alone tends to escalate.

The oscillation dynamics are most evident for the power-actions of *1st order*[9] that are physical, interpersonal communicational and behavioural. For the power-action of 1st order, some consequences and strength of outcome are evident rather immediately. That makes 1st order power-actions noticeable, but it is difficult to recognize full escalation of consequences of the 1st order power-action immediately. "How to recognize all consequences of a hallway conversation?" 1st order power-actions have broad zone of volatile outcomes of power (uncertainty); thus, 1st order power-actions alone are difficult to interpret without other types of power-actions intertwined.

Even the most automatic, latent, and unobtrusive power exercise still involves a special action (e.g., sign of authority, mentioning of reputation, confirmation of a position, or confirmation of possession of rights to sanction). Any use of power resources involves

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[9] 1st, 2nd, and 3rd orders of power-action have been introduced as terms. Therefore, here and in the text they are used without grammatical definite article "the", for example, "1st order".

accessing. These power-actions of *2nd order* are used for access to and maintenance of power resources.

The probability-based approach to power suggests existence of power smoothers that operate symbolically, in communication and do not "change the agent's behaviour" but alter the options that are available to the agent. Such power-actions of *3rd order* are employed for "normative justification" and other forms of legitimation, signification, a quick proof for "what is true" without verifying collective knowledge empirically, and sensemaking.

> *Truth isn't outside power...Truth is a thing of this world; it is produced only by virtue of multiple forms of constraint. And it induces regular effects of power. Each society has its regime of truth, its "general politics" of truth... which it accepts and makes function as true. (Foucault 1983, p. 49)*

> *To change the world, one has to change the ways of world-making. (Bourdieu 2002, p. 242)*

These definitions of the orders of power-action are compact descriptions of the most possible ways of power use.

(ii) Relations between the orders of power-action: non-causal "power laws"

Any immediately strong power-action (1st order) is associated with past and future reputation for that action (2nd order) and all sorts of symbolic operations with that reputation that allow gaining more power or transfer power to other domains of activity (3rd order). This omnipresent pattern of *epistemological ordering with logical levels* is elaborated in regard to power in Table 1.2 – such and hierarchical distinctions between logical levels were naturally observed in learning and communication (Bateson 1988; Russel and Whitehead 1913). The function of each level is to organise the information on the level below. The rules for changing on one level are different from the other rules for changing on a lower level. Changing something on a lower level could, but would not necessarily, effect the upper levels. Changing something on the upper levels would necessarily change things on the lower levels in order to support the higher-level change. The presupposition of such ordering is behind authority hierarchy, 4-stage model of emergence and power law (e.g., networks-groups-hierarchies-emergent coordination) as well as power-actions. However, the case of power seems differ from communication and learning specifically, because with power there are paradoxical shortcuts and quantum leaps from one level to another, when some power-action of 1st order may inevitably and immediately produce strong and durable impact, which obliterates hierarchy and counter embeddedness. This is nonlinearity that violates the strict logical levels model as well as

conventional thinking of power for building up a hierarchy pyramid. However, with comprehending the dynamics between "evidently strong" and "small but apparently strong" actions as one pattern, the nonlinearity will be resolved (Proposition 1.6).

Table 1.2 Ordering of power using quantum perspective of power-action or signal

	Epistemological ordering	*Communication and interpretation dimension*	*Outcome and resource dimension*
1st order	Immediate (A)ction, physical action. Examples: lobby talk, oral persuasion, technological action, physical action Direction towards situational and contextual	Power message: sending, perceiving, and responding by agent (i.e., stimulus-response behavioural dynamics) Immediate influence or persuasion	Operation with power resources physically, immediately Zone of (highly) volatile outcomes of power
2nd order	(R)eputation for or from action (A) Action/signal of 2nd order represents conceptually closed set of actions of 1st order Example: reputation for expertise or ability to influence Direction recursive: power from reputation, power of power	Power message: storage and structure (encoding/decoding) (i.e., syntax and semantics of the message and corresponding syntax and semantics of behaviour) Presentation and maintenance of stabilised and continuous messages	Maintenance of power resources, where knowledge and structures are stable inputs but only inputs for gaining actionable power Structuration of complex and authoritative power resources including • stochastic resources of options, dependencies, commitments, social capital; • equilibrium resources of authority, legitimacy, trust, positional difference, participation in the networks; and • resources like identity or capability.

3rd order	(S)ymbolic confirmation of (R)eputation (most symbolic, most based upon symbols), signal in order to confirm reputation. Signification Example: membership in a network (e.g., strategic committee), decision premise, belief, framework, interpretative shame, and knowledge verification Direction towards normative	Power message: sensemaking and cognitive processing (i.e., "black box of mind" and supposed generative transformations of generalisation, deletion, and distortion) Symbolic operations of influence. Signification Setting decision premises, rules of verification of truth, and structure for knowledge	Operation with power resources symbolically The action of 3rd order provides opportunities for immediate actions of 1st order and confirms reputation of 2nd order Symbolic stabilisation Zone of smoothing of power in order to decrease volatility of the power-action (of 1st order). "Power smoothers" are themselves power-actions (of 3rd order) to a degree to which sensemaking or thinking is an action. From the rules of dynamics of 1st order, power-actions of 3rd order might seem weak (see paradox of the strength of power: immediacy versus durability for the power-action).

(1) Downstream power law of power actions: *power-actions of 3rd order provide meaning for the power-actions of 1st order that would otherwise escalate, which is a recursive linkage*, a classic cybernetic feedback. The following effect is recursive linkage as follows: at the 1st order it is difficult to distinguish between domination and freedom of will (i.e., is the act of opening the door into somebody's office a dominative one?). Meaning for the power-actions of 1st order is created with decision premises and "rules of what is true" defined at 3rd order.

Looking on Table 1.2 from bottom to top (S->R->A), many 3rd order power-actions are required to provide meaning or catalyse or legitimize a strong 2nd or 1st order activity (e.g., in order to build a building, a number of papers, negotiations and commitments are required). One-to-many proportion between 1st and 3rd order is "downstream power law" for power.

(2) Upstream power law of power-actions: *power-actions of 2nd order serve as a symbolic confirmation of power-actions of 1st order, and power-actions of 3rd order serve as a symbolic confirmation of power-actions of 2nd order.*

Looking on Table 1.2 from top to bottom (A->R->S), many 1st order power-actions are required to create reputation (2nd order) and to achieve formation of a strong durable decision premise (3rd order). Many-to-one proportion between 1st and 3rd order is "upstream power law" for power.

(1+2) In practice of power use, downstream and upstream of power are alike to the molecule of DNA, where two spirals are interwoven and sometimes interlocked into one activity that carries action and interpretation simultaneously. Many-to-many relation between 1st and 3rd order actions makes power use appear as one act or event. However, such activity is multi-level action-communication that simultaneously carries 1st and 3rd orders and is likely to have double binds. The interlockage between 3rd and 1st orders drives self-reference and self-reinforcement of power, as the following example shows: 3rd order membership on the committee provides with the access to the committee's members, meetings and materials, right to speak, and potential to influence through persuasion, which is a set of 1st order power-actions that, subject to being exercised successfully, return in reputation, capability, and other power resources of 2nd order that can bring the resource holder a membership in the important committee that is an action of position legitimation of 3rd order—all of which shapes a cyclic structure that can be fractal (i.e., embed other cyclic structures).

The power law appears as a scalability tool for working with the dynamics of power-actions interwoven into one activity. Knowing how actions of 1st order correspond to actions of 3rd order will make possible to understand the conversion of certain micro activities into power resources and conversion of macro legitimacy back onto micro activities and commitments (e.g., authority of a position into orders or legitimacy of policy into rules and legislation)

(3) Looking on Table 1.2 from the middle row of 2nd order (S->R<-A), confirmation of reputation is done with 3rd order power-actions far more frequently, rather than with "strong" and immediate actions of 1st order that might have led to that reputation originally.

The vertical axis of Table 1.2 appears as "a scale" of the strength of power. However, it is not a typical scale, because it represents epistemological ordering, threshold – qualitative differences, and quantum leaps among the orders. Key thresholds are the rules of conversion between the orders (i.e., the amount of 1st order actions to create 2nd order reputation or to affect 3rd order decision): *1st-3rd order distinction is immediacy of impact vs. durability of consequences, 2nd-3rd order distinction is amount of resources committed (and risk of resource depletion), and 1st-2nd order relation is a relation between action and reputation from and for that action.*

However, such "scale" is not linear itself, as the double bind spiral dynamics of upstream and downstream power laws of symbolic ordering suggest. "The strength" and overlap of the orders are peculiar ideas. Simply, 3rd order action is not always "stronger" in terms of consequences than 1st order action, and one 1st order action can communicate much persuasively and credibly as 3rd order actions could not. The difference between 2nd and 3rd orders is often just in the amount of power resources engaged (and related risk of depletion of the power resources at stake in case of unsuccessful outcomes). The untypical scale of the strength of power is presentable as a spectrum with its major pattern of power law and nonlinearities, one of which is the paradox of the strength of power: immediacy versus durability, a major pattern of power.

(iii) The power-action model as a method: issues with causality and inaccessibility

Resolving issue of the level of analysis with ideal cases of quanta

The title of Table 1.2 incorporates a purposeful metaphor of 'the quantum perspective'. It is useful to understand the orders of power-action as quanta for their being (a) the smallest units of analysis available or selected to be the smallest finite units in order to show patterns on certain level and (b) ideal cases – nobody directly measured the quanta, yet the presupposition that quanta exist is helpful for explanation of the phenomena registered. The differences among the orders of power-action are considerable enough for the model to have explanatory value and discriminate validity. Nonetheless, the power-action model is a map to the variety of usages of power. The separation itself is a secondary to the question of how separated units of analysis interact among each other in patterns.

The quantum perspective also facilitates understanding constraints of power research, met by literature. First, power research is ultimately probing among all organisational studies possible: even with the most precise definitions, it is not possible to trace every little political move and every power activity in the organisation for obvious reasons of

complexity and recursivity of power which prefers to stay latent and which might be damaged by exposure. Second, for any power activity caught, non-behavioural research is not likely to predict outcomes precisely enough to utilise the full power of the probability-based approach (see also the issues with 'different worlds' explained in regard to Dahl's differential probability test).

The power-action model is created as a tool for domain I research of *power process* and *individual level of analysis* in line with 'micro' direction set by the Methodology Note 4. Chapter 3 Research Methodology continues this description of useful ways of treatment of the power-orders and discusses the distinction between 'micro' and 'macro' as unsafe.

The power law for the spectrum of power-actions

Each order has its own strengths and areas of application (e.g., power conditioning), so that the relations between the orders of power-action appear not as a scale but as *a spectrum*. A spectrum normally has an integrating root pattern, for example, the sequence of rainbow colours and infra-red/ultra-violet of the light spectrum are ordered according to the length of wave. The *length of wave* is associated with frequency (e.g., in sound). In physics and complexity theory, the power law is the root pattern between frequency and size, abstractly. In this study, a step is made to apply the power law as a pattern between *frequency and strength of power-action*, where strength depends upon consequentiality (irreversibility) and embeddedness (interdependence). Common sense of literature on power and organisational design positions interdependence as a condition for frequency of power exercise (Proposition 1.8).

The power laws between the orders of power-action are not causal: 1st and 3rd orders of power normally remain many-to-one proportion, but there are exceptions with timely 1st order actions that worth many words (e.g., an action by the CEO for the rest to follow).

The power law exemplifies various forms of emergence (Lichtenstein and McKelvey 2004). In this thesis, the power law is applied to multiple phenomena at once, specifically, the relations between the orders of power, distribution of political practices of IT support, and definition of high interdependence. This and the following sections of this thesis focus on the use of the power law heuristic:

- Agent-based complexity for power: Structuration, Embeddedness, and Emergence (uses the framework of the four stages of emergence).
- Relations between the orders of power-action: non-causal "power laws"

- From power resources to processes: power law, high interdependence, and boundaries
- Incrementalism-Radicalism Pattern
- Pareto Dynamics for Technology Management: political delivery of information systems (including the subsections that consider nonlinearity between strategic response and accumulation of business needs).
- The difference between "high" and "not high" interdependence? The power law!
- Application of the power law heuristic in information technology management
- Interdependent constant – spectrum metaphor – power law heuristic

The metaphor of spectrum leads to the metaphor of *palette* that represents a major principle of modelling elegance and coding, specifically, the most compact representation. It is possible to represent all colours through combinations of red, blue and green. Similarly, it is possible to represent organisational politics by power-actions of 1st, 2nd, and 3rd orders.

This inaccessibility of power with direct measurement is the issue of embeddedness and non-causality and subject to advance of complexity science and modelling. There are different kinds of uses of power with their own kinds of strength. There is use of power through expectation or threat: the expectation of strong, consequential, and irreversible outcomes will contribute to the powerfulness of an action in present. The discussion of these questions continues with further specification of 1st, 2nd, and 3rd orders of power and the paradox of the strength of power between immediacy and durability. The same questions will float up in the empirical Chapter 6 The Political Delivery of Information Technology, where practices of IT support are sorted to 1st, 2nd and 3rd orders of power-action and patterned by the power law of technology management. The causality among those actual practices is tentative: many 1st order technological actions do accumulate into 3rd order policy or strategic radical shift in technology but in nonlinear manner.

(iv) Power-actions in the hierarchy

Downwards, in relations with peers and super-ordinates agents are most likely to *gain* power with power-actions of 1st order (e.g., oral persuasion) and *manoeuvre* for workable pathways in power infrastructure of decision premises (3rd order), for example, a subordinated agent is supposed to response on implementation rather than formulation of a strategy or programme, and the drift from organisational goals is met with a strong power-actions, if noticed. Upwards, in relations with sub-ordinates agents are likely to *apply* power with power-actions of 2nd and 3rd order (e.g., provision of instructions, official interpretation, and boundaries), in other words, there are processes of reference to

established power resources and mechanisms of their use. Naturally, super/sub-ordination in relation depends upon circumstances that make power subject to specialization (i.e., agents exchange roles depending upon tasks).

Authority hierarchy AND proportions between orders of power (e.g., in certain circumstances certain amount of 1st order actions is required to affect 3rd order) provide the landscape for power-actions, where the following trajectories are most likely: interpersonal influence of 1st order and solutions of paths in decision premises flow upstream in order to get things done within the given rules and context, WHILST rules and commitments flow downstream in order to provide grounds for sensemaking and reduce ambiguity of 1st order actions. For example, expected silence of subordinates in presence of super-ordinates as well as priority of expression by super-ordinates are the means of ensuring the most efficient flow of power-actions under the condition of hierarchy and in order to sustain that hierarchy, where the hierarchy is defined as predominance of vertical causality in managing the organisation.

(v) Power as special communication: purposeful mistakes, sequences, and multi-level depth

As today most powers are exercised symbolically rather than physically, the truism of "information or communication is power" becomes truer. Symbolic exercise and labour of power fall under the way of power exercise as or via a threat, expectation, or reputation. In other words, in power communication, reframing of consequences and even threat are presupposed; the strong possibility is mentioned but not carried out; furthermore, the escalation of such power communication will lead to the closure of interdependence loop that is (attempt of) realisation of those consequences possible. This is the first step in approaching the intuition of *power is a special mode of communication* proposed by Roderick Martin (1977). The intuition can be extended with a number of points.

(1) Exercise of power through threat can be shown using example of elemental coordination in an animal world, in order to realise dominance via threat "the dog... would start in attack position and then it would counter it with a non-attack position" (DeLozier and Grinder 1987, p. 284). This is a purposeful mistake in communication that can be exercised on both sides of initiator and receiver (or in any other multiple positions, e.g. observer, mediator, super-ordinate).

(2) Hence, "a part of the whole sequence (which constitutes the activity) is offered but

there is something not quite right about it; it is either reduced in intensity and/or other parts of the sequence are not present" (DeLozier and Grinder 1987, p. 284). There is a purposefully structured and even specific ambiguity in power communication.

(3) In operating with sequences of structured communication of power, it is important to use anything but the first or the last part of the sequence. Being out of sequence creates specific ambiguity that communicates certain class of power signals. Yet, there is ambiguity but no confusion as long as "communicating consequences" sequence is not mixed with "doing consequences" sequence. Here, "communication" appears as always a wrong form of "doing", a purposefully wrong form. One intent and presupposition of power communication is to point out at outcomes and consequences without spending resources on reaching them.

(4) Power communication is multi-level; perhaps the three orders of power represent major levels of power communication. For example, oral persuasion is physical at 1st order but relies on 2nd order nominalizations of reputation, trust, and rapport and operates with symbolic outcomes at 3rd order. For example, significations of 3rd order that instruct what to do, threaten or alter choices in any other way (e.g., with modality of X is required or Y will occur) are normally marked with intonation. Even the smallest power-action, namely, a word conveys much meaning with its context and represents multiple levels of depth.

Actions rarely have one intent and meaning and are perceived differently from the multiple positions of initiator, recipient, and observer. Hence it is feasible to envisage interlinked webs (ecologies) of power-actions of 1st, 2nd and 3rd order, in which patterns of power-actions form a certain subset of the patterns of communication that appear in who talks to whom, frequency of e-mails between parties, and (mistakes in) the routing of requests and decisions.

Ordered symbolic constructs real

Power communication is a part of the managerial job of building organisational identity. If "symbolic violence" is subtle socialization patterns that constrain people and keep their actions consistent with the cultural field (Bourdieu 1993), then ordered symbolic activity must be enough for achieving the purpose intended and as such is a finite experience, even if what is involved is a piece of language syntax with semantically well-formed. Most of such managerial symbolic labour is aimed at creation of the image of *organisational continuity* (Huy 2002) that supports a set of beliefs about identity (self-concept) that has

operational value as people use it for guidance (Andreas 2002).

The orderly and frequent flow of power-actions shapes the image of cohesiveness and integration of the organisation. As 3rd order activity provide meaning or even substitutes for the activities of 2nd and 1st order; thereby, it contributes to unobtrusiveness and effectiveness, of power exercise and masks the diversity of actual practices, so that the image of stability and sense of agreement are projected, and the organisation is authored just like a text (Jackson and Carter 2000). The impression of unity is common to every newcomer or outsider to the organization, as he or she experiences intense symbolism in the physical environment as well as appearance of consensus in rules, language, and cognitive habits. *Even organisational charts present linkages rather than differences or lack of relation.*

6 Patterns of Power in Practice

(i) Paradox of the strength of power: immediacy versus durability for power-action

Power definitions and probability approach use the term "strength of the power-action" that requires specification. "The strength of power" is different "power as a force" and one black-box variable class of definition. Strength is a purposeful metaphor that puts altogether qualitative trade-offs among immediacy of impact, consequentiality, irreversibility and commitment, yet paradoxically so. "The strength of the expected outcome of the power-action" is a heuristic for prediction of power use. The scale of the strength of power is precisely the subject of the model of 1st, 2nd and 3rd orders of power-action. Each order has its own strengths the relations between the orders of power-action comprise a spectrum patterned by non-causal power laws. The absence of causality in that class of relations is the subject of this section.

Paradox between 1st order of technological actions and 3rd order of decision premises

Power actions of 1st order are strong in sense of immediacy of impact at least in some of their consequences, volatile radical-dramatic outcome (e.g., a hallway conversation might shift strategy agenda considerably), and rigidity-irreversibility of their impact (e.g., "one can't catch the word said") (Proposition 1.2). Power-actions of 1st order enfold non-linear outcomes. Power-actions of 3rd order are strong in the sense of their durability; their consequences are evident over long term and over larger, strategic consideration of affairs; and in terms of immediacy, power-actions of 3rd order are about immediate signification of consequences rather than consequences themselves. At least by managerial intent, power-actions of 3rd order are used as predictable and in order to improve control over situation.

Durability of 3rd order power-actions is supported by the fact they are interwoven into webs of stable and shared decision premises, where inertia, obstacles, amount of effort and cost of review are highly "socially constructed" with commitments. 1st order power-actions carry much or no meaning, so that the meaning(s) of 1st order power-action depends upon the context of 3rd order. This implies, that the meaning of 1st order power-action is volatile and might not be known before the action will unfold or indeed oscillate. On the level of practice, the power-action of 1st order serves for immediate but short-term influence upon others' minds, whilst the power-action of 3rd order serves for management of structural conditions (e.g., decision premises and context) that will affect others' minds over time. Hence is the paradox: *Are there any activities that are strong in both immediacy and durability of impact? Are there any activities that have both dramatic and long lasting outcome? Are there any activities that simultaneously serve both gradual practicing and radical change?* The initial answer would be "no", because radical change is not continuous in social systems and the strong power-actions tend to be irreversible. Yet, power is intuitively associated with the probability of radical change and mobilisation in order to break through social processes reproduced recurrently. Power is a mean to both discontinuity and stabilisation, so power flips on both sides of incremental continuity and radical discontinuity. The paradox of the strength of power is an answer to co-evolution of complex adaptation.

However paradoxical, power exists in practice. Thus, the paradox is reconcilable, and one way of reconciliation is to describe how power-actions 1st and 3rd orders are intertwined in different activities of organisational life. Technological operations of 1st order have representation on 3rd order and vice versa. The heuristic of non-causal "power law" proportion is a guide for navigation in the webs of sequences of power-actions (Table 1.3 see that contextualises "power laws" from Table 1.2 in life situations).

Table 1.3 Combination of 1st and 3rd orders in 'the paradox of the strength of power'

	Act of opening the door to somebody's office	*Meeting, oral communication*	*Action with a computer information system (e.g., change in systems configuration)*
1st order	Immediately consequential case of "power as ability"	During meetings members may powerfully shift not only the agenda itself, but also many other aspects of power infrastructure	Technological actions-local decisions are made by IT professionals at 1st order are rigid with immediate impact, but they are easily reversible technically (but sometimes, not economically as in the case of systems design decisions).
3rd order Power for meaning and stabilisation	Supports "sense of being able" Has no meaning, but might appear dominative	Meetings and formal communication involve intense symbolic exchange of 3rd order. Whether shifts in agenda/power during the meeting will be reflected in power resources, is defined by decision premises, legitimation and other actions of 3rd order that come from the source of power concentration (e.g., CEO issuing a document).	Technological actions are not only easily reversible, but strongly dependable upon rather irreversible decisions by top managers, such as purchasing a software package or setting a corporate IT policy (e.g., levels of service). Decisions and actions made by top management in regard to IT are not rigid on 1st order because they are words in abstract language but difficult to review and reverse on 3rd order.
Non-causal power law	*One action – many meanings*	*Many meanings – one decision*	*One decision – many actions*

One important consequence of the paradox of the strength of power is particular juxtaposition of 1st and 3rd orders in technological activities (the last column of Table 1.3):

Proposition 1.4 (Getting power out of IT) Local IT expertise is beneficial to its holders. However, within the organisational boundaries, it is difficult to gain power (resources) out of grassroots operations with technology, because they are very dependable upon decision premises and easily reversible.

The paradox of the strength of power concerns ideal cases of power-actions. As such the paradox is useful heuristic (power-test) for differentiation among the orders of power and interpreting power-actions in the natural context of interwoven practice of power exercise.

Start of the paradox: non-economical uses of power (between 2nd and 3rd orders)

2nd and 3rd order power-actions serve as pointers, reminders or smoothers for power, rather than activities that were supposed to have immediate implications, implementations or be consequential otherwise. For instance, a 2nd order power-action could be a pointer to reputation, whilst a 3rd order action could be an indicator of profound moves (e.g., move of financial resources or new appointment at the senior level). Initial considerations of proportion among the orders of the power-action suggest that whilst power-actions of 2nd order point at resources, power-actions of 3rd order engage power resources, which leads to gaining more resources or (quick) depletion of current resources (see Table 1.2). *Hence, the difference between 2nd and 3rd orders is at least in three thresholds: the amount of resources referred (amount of impact at the start), duration of resources involved, and the amount of resources changed (amount of impact at the end—in the outcome).* The thresholds are linked in nonlinear manner (i.e., the initial amount of resources guarantees NEITHER shorter duration of power exercise NOR amount of outcome resources NOR durability of the outcome itself).

Power patterns are stochastic. Power-actions oscillate in their consequences and create situations when a resource that was just referred to in the beginning of power exercise (2nd order) will be necessary to exploit (3rd and 1st orders). Whether significant resources will or need to be involved is not clear at the beginning, which contributes to the emergence. One variable for prediction of how much power resources are to be spent is the degree of institutionalization (e.g., governance arrangements, shared understandings, or any institutional praxis), which IT professionals prefer to establish and use. (Condition 1) In fully institutionalised contexts—definition is adopted by Tolbert and Zucker (1996) as presence of developed webs of decision premises, foreclosing governance mechanisms, and stabilised patterns of technology use—3rd order power-actions bear less *transaction costs* (at least in short-run) rather than rigid 1st order power-actions. (Condition 2) When resources are abundant, power processes might appear routinely accepted (fully

institutionalized) and non-political and performed with pointers of 2nd order, so that power dynamics is shifted to domain II. However, when resources are scarce, the same power dynamics intensifies and shifted to 1st and 3rd orders and domain I. Yet, regardless of politics intensity, what makes certain 3rd order power-actions strong is their role in mid and long-term resource allocation (e.g., systems purchase decisions, project funding, setting incentives and pay structures, and determining structure of overt or covert intra-firm markets). Because of the amount of resources involved and high liquidity of symbolic 3rd order, economics-related power actions combine the strengths of both 1st order (immediacy of impact) and 3rd order (durability and difficulty of review).

The paradox of the strength of power is a starting point for quaking domain II economical explanations of why particular uses and relations of power emerge. If politics is "synonymous with the exploitation of power in other than purely economic ways" (Mintzberg et al., 1998, p. 234) and goes beyond resource allocation, then the paradox of the strength of power starts from that boundary as well.

(ii) Pareto Dynamics of Strategic Adaptation: process management and incrementalism

> *Strategy formation is shaped by power and politics, whether as a process inside the organization or as the behaviour of the organization itself in its external environment. Mintzberg et al. (1998, p. 260).*

Management of stochastic processes: taking control over destiny

This section elaborates the probability-based approach to power in an attempt to understand *the function of power in management of stochasity and fragmentation of organisational processes.*

Taking control over probability is a core pattern that stands behind any strategy of the complex organization, as has been appreciated for long time:

> *When organisations commit future control over resources in exchange for present solutions to contingencies, they create limitations on their abilities to adapt to future change of technologies or task environments. Thompson (1967, Proposition 9.12).*

> *[Strategic action] involves binding trade-offs in resource allocation and commits the company to a course and direction that cannot be easily reversed. Strategic action helps to gain and maintain control of one's destiny. Burgelman and Grove (2004).*

These statements reveal a paradox of strategic process, specifically, *the future is opened through imposition of order* with commitment and resource allocation. "Decisions made

early in the strategy-formation process, although appropriate given the initial learning situation, later served to constrain the range of strategic choices" (Miles 1982). Yet, "the validity of strategy lies... in its capacity to capture the initiative, to deal with unknowable events, to redeploy and concentrate resources as new opportunities and thrusts emerge" (Quinn 1982). Resource allocation, a carrier process for power and strategy, is itself informally stochastic, "a process of study, bargaining, persuasion and choice spread over many levels of the organization and over long periods of time... with substantially separate processes at work" (Bower 1970, pp. 320-321).

"Two great stochastic processes" inside and outside of the organisation

One way to reconcile the paradox of *opening the future through committing* is *the duality of "two great stochastic patterns"* of internal stochastic variation that generates choices and external stochastic variation that generates conditions for organising agents (Bateson 1988). At the level of ecology, there is always evidence how these patterns control each other, co-evolve. "The real strategy tends to evolve as internal decisions and external events flow together to create a new, widely shared consensus for action. ... In well-run organizations managers pro-actively guide these streams of actions and events incrementally towards conscious strategies" (Quinn 1980, p. 15). There are organisational internal stochastic processes of power, strategy, and choice-making AND external stochastic processes that are out of organisational control (not impact), unless the organization monopolises its environment with increasing returns or superpower, then ecology and its mechanisms including "two great stochastic patterns" cease.

The *ecology model* of Karl Weick (1989, 1995, 2001) proposes variation (enactment), selection, and retention for the same interplay between two great stochastic processes with variation-selection within certain constraints, and then retention with other constraints. Usage of power drive *Darwinian evolution*, for example, "politics as a system of influence can act in Darwinian way to ensure that the strongest members of an organization are brought into positions of leadership" (Mintzberg et al. 1998, p. 243).

Micro-power and Macro-power

In parallel to the model of two sources of variation, the organisational and strategic literature has adopted simple separation of *macro-power* and *micro-power*, *where macro-power is applicable widely but micro-power produces striking nonlinearities due to its specialized reach* (Jackson and Carter 2000, Mintzberg et al. 1998). Macro-power reflects the interdependence between the organization and its environment, for instance, government and institutions are sources of durable and legitimate macro-power. Whilst

agents exercise micro-power in use of technology at their workplace, and for example, they might make mistake in a bank account record of the head of the nation without major consequences even for their job position.

There is a considerable discussion of IT industry overpowering other industries not to mention individual firms, because they are out of control of their own IT infrastructures not to mention technologies (Arthur 1996; Burgelman and Grove 2004; Dunleavy 2004; Sunders et al. 2000). Therefore, information technology and its industry are macro-power, to which individual firm adapt and exercise micro-power. At the level of technology use practices, the organization is macro-power and end-users who enact practices exercise micro-power. Dramatic micro-power innovation might and does come from end-users and individual companies as punctuation or discontinuity in the story of innovation portrayed in retrospective sensemaking.

Initial formalisation of stochastic patterns of power with complexity theory

Strength of initial conditions and deterministic chaos. "In chaotic systems, small disturbances multiply over time because of nonlinear relationships and the dynamic, repetitive nature of the system... such systems are extremely sensitive to initial conditions which make forecasting very difficult" (Levy 1994). "A central tenet of chaos theory is that simple sets of deterministic relationships [such as incrementalism] can produce *patterned yet unpredictable* outcomes" (Levy 1994, p. 168) and in these systems that "are not random but look random... appear to proceed according to chance even though their behaviour is in fact controlled by precise laws" (Lorenz 1993, p. 4).

Strength of recent values. Power process can also be seen as a Markov process that is a random process whose future probabilities are determined by its most recent values. Whilst inheritance of legitimacy matters, power resources are most affected by the recent state of affairs, because of the nature of risk (e.g., power resources deplete quickly in case of unsuccessful power application).

Reconciliation of initial conditions and recent values. Systems that are very sensitive to the *initial conditions* are chaotic systems, whilst systems that are sensitive to the *recent conditions* involve Markov process. In actual organisations, incremental "small disturbances" of business needs, unexpected linkages, and powerful escalation of strategic issues are present, yet the organisation continues with certain degree of predictability. *Individual power resources* are most affected by the recent state of affairs and deplete

quickly in the case of unsuccessful power use. *Skewed power distribution in the organisation* is a strong initial condition that opens opportunity for determinism. A resolving proposition is:

Proposition 1.5 (Designed Discontinuity) In social 'systems' discontinuity can be planned or facilitated, even without purposeful logical intent, in order to re-set the initial conditions, so that a system would respond to recent conditions and be close to actual.

For example, both empirical descriptions of incremental organisational processes and sensemaking research showed that in order to proceed discontinuity is necessary in form of commitment, conceptual closure or stabilisation-for-now—this is utilised in the formulation of the meta-strategy of incrementalism (p. 84).

Pareto distribution: evidence, conditions, and implications for process management

Skewed Pareto distribution for wealth, attention, and outcomes of peer pressure

> *Standard organisational pyramid was designed around power—to maximize the power of the guy at the top to influence action. James Brian Quinn (1998, p. 4)*

Pareto distribution was originally formulated as concentration of 80% of property in the hands 20% of families in Italy in early 1900s by Vilfredo Pareto, and such distribution of wealth continues today (Buchanan 2002). In order to understand emergence of such wealth distribution, agent-based simulations were run and revealed that Pareto-type concentration does not depend upon either individual or contextual factors (e.g., game rules and institutions) in systems with medium number of agents (starting with a thousand) and over a long term (Buchanan 2002).

Pareto distribution also happens to describe the pattern of visits to websites at the Internet as follows, i.e., small amount of sites receives unproportionally large share of overall visits (Adamic and Huberman 2000). The Internet is a phenomenon of the society level, yet at the level of business organisation, classic economic models by Simon (1982) are built on the same notion of the scarcity of attention.

Yet another instance of Pareto distribution was reported for the outcomes of peer pressure, specifically, the distribution of crimes in certain groups with high peer pressure was found different from conventional normalised Gauss distribution (Cook et al. 2003).

Wealth in a society, peer pressure in a street group, attention in the Internet and attention of organisational decision-makers are exemplary power resources in their respective domains of human activity. The fact that the very different manifestations of power reveal Pareto

distribution empirically is a foundation of the argument about which patterns and behaviours lead to and utilise skewed power distributions. Asymmetric and skewed Pareto distribution appears as a plausible heuristic to what is referred to as "power distribution" in common organisation studies. Powers are concentrated in the hands of TMTs: allocative powers of resources and money AND complex authoritative powers that affect real options of organisational agents and entire "rules of the game" or "rules of truth." Contrary to the discussion of advanced federalised and networked organisational forms, it is surprising how much key decision powers are actually retained at the top.

From power resources to processes: power law, high interdependence, and boundaries

The Pareto distribution of those various power resources was found by statistical analysis of datasets, which the knowledge of domain II. The next questions of domain I are "why Pareto distribution?" and more practical "how does the Pareto distribution of power resources persist and appear in such different human activities?" Or, in terms of organisation analysis, first, which characteristics of the Pareto distribution of power resources[10] are boundary conditions to human activity in organisations and, second, which heuristic characteristics of the Pareto distribution coming from its applications elsewhere are helpful to studies of power. In addition, the agent-based modelling method will be enriched by investigation of the impact of skewed distribution of power, i.e., "how does the introduction of several extra-powerful agents affect the behaviour of system?" The last question should highlight the difference between the impacts of 'authority hierarchy' and 'federalisation' upon the organisation.

(Power Law: Complexity Signature and Pattern)

The first step from resource-based to process-based treatment of power is usage of Power Law Distribution that is simply the logarithmic scale representation of Pareto Distribution. Power law is the heuristic and foundational scalability law in complexity science. "Power law relationship is exemplified by distribution of emergent forms in the world" (Lichtenstein and McKelvey 2004), or simply, power law defines log-log relation between two dimensions of a phenomenon: size-weight-embeddedness and frequency. For the purposes of the power studies, power law would define the pattern of strength and frequency of power-action OR level of interdependence and frequency of power-action, as it was treated in the power law for the spectrum of power-actions section.

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[10] The power law distribution is just a logarithmic representation of the Pareto distribution.

(High Interdependence)

In physics and agent-based modelling, appearance of *Pareto distribution is related to high interactivity of the components* (Cook et al. 2003). Pareto distribution is typically found in systems with highly interdependent parts. The study of reciprocity by Thompson (1967), modelling of reciprocity in the political collective of the U.S. Senate by Axelrod (1984), the impact of peer pressure (Cook et al. 2003) are the pieces of evidence for the linkage between the social condition of high interdependence and skewed (Pareto) distribution of resources. Dynamics of power resources suggest that they are maintained through high interactivity infused with commitments.

(Boundaries and discontinuities for concentration of power)

It is proposed that *boundaries contribute to the emergence of skewed distributions of power resources*. This heuristic works for a group, organization, or society regardless of the scale. Even linguistically, the language reveals that boundaries serve for accumulation of resources and autonomy. Intra-organisational boundaries that affect power range from formal authorised structures (e.g., teams, networks, units, and divisions) to time-space separation to conceptual closure (e.g., meaning of work is not clear to its performers), to workarounds and temporary arrangements to commitments to the very language of nominalization of processes into "events", "decisions" and "policies". The further examples of important boundaries can be found in the list of the means of discontinuity. Those boundaries form fitness landscapes, through which there are optimal pathways that are named as "crucial contingencies" (Hickson et al. 1971). Some people are particularly effective in exploiting the pathways for gaining power and creating asymmetrical power distributions.

Discontinuity became popular in contemporary literature on innovation. Whilst each boundary presents "small" discontinuity, power is a strong mean of discontinuity, and any large discontinuity in the organisation involves intensive usages of power. Strong means of discontinuity, such as commitment, hiring and firing, project starting and termination are prerogatives of TMTs and perhaps the only both strong and broadly applicable power uses that top managers have. Power is used as a means of discontinuity, then boundaries are used to build power—the circuit is recursive; the power law heuristic often describes the configuration of the network at the time of a crisis, when initial conditions are "re-set", so that organisational systems respond to recent conditions.

An illustration of how boundary management, incrementalism, and discontinuity are joined in one political pattern is the following advice on how unbundling issues into similar sub-issues reduces opposition potential, simply because of the time and energy required to form and hold together a coalition: *the smaller the issue*, the less important the fight and the less the motivation to join a coalition; *smaller issues focused in rapid succession* also make it more difficult to maintain coalition stability (Macmillan and Guth 1985).

Incrementalism-Radicalism Pattern: initial description using the power law heuristic

Proposition 1.6 (Incrementalism-Radicalism) A series of small or weak power-actions is usually met (therefore, increases probability for) with a strong power-action.

This is another restatement of Pareto distribution that can be used in order to represent how a series of weak events precedes a strong response, as occurs in actual organisations. "It is hard in retrospect to recognize roads not taken, but in almost any interaction there are seemingly small steps that can tip a negotiation in one direction of the other" (Wheeler and Morris 2002, p. 9).

A social interdependent relation is subject to balance and 'a flip'. For example, if an agent with less power wants to balance a relation in an unobtrusive way, the agent undertakes a number of small gradual directed steps that will accumulate in a new bargaining position or will be met by powerful agents with a strong response in order to sustain status-quo.

(Illusion of "small" powerful changes that create large effects)

Organisation theory starting from Weick (1979, 1995, 2001) to Morgan (1998) is inspired by the complexity science and portrays the existence of "edge-of-chaos" situations, in which "small but critical changes at critical times can trigger major transforming events" (Morgan 1998, p. 231). As this work looks into the problematic presupposition of causality and utilises the heuristic of power law, it occurs as more feasible, to consider dramatic changes as actually designed and sequenced (even if such design is beyond logical intent of a centralised strategy team). If and only if "a small but strong power-action" fits the right pattern, then noticeable radical change can be triggered and generated in a way that makes it consequentially irreversible that is a necessary condition for change to last.

The strong power-actions seem to create large effects, yet large effects are supported by both accumulation of small power-actions and business needs and responsive (pre-designed) discontinuous shift (Proposition 1.5). The linkage between incremental sequences of small actions and discontinuous shift is nonlinear and not causal. The core

idea of the power law heuristic is, "the same mechanisms are responsible for small and large events... therefore, there is no such thing as a typical scale" (Reed-Thouchas 2005, personal communication).

Pareto dynamics provides a way of description of co-evolution (co-existence but not dialectical duality) of incrementalism and radicalism (discontinuity) in organisational processes. In other words, co-evolutionary change bears both "sides" of incrementalism and discontinuity. A set of crafted commitments (power resources) will require a break-through in the future. Depending upon the organizational process selected (e.g., project management, sensemaking, or culture) there are instances of the incrementalism-radicalism pattern under the names of practicing-versus-strategic drift, learning-versus-forgetting, inertia-versus-radical shift.

Pareto distribution appears as a convenient heuristic that covers a range of the patterns of power at once, specifically, skewed power distribution of the organisation, getting power out of power (e.g., recursivity), quick depletion of power resources in the case of failure, acceptable frequencies of "strong" and "weak" power-actions, and perhaps most importantly, non-causal pattern between incrementalism and discontinuity.

Incrementalism in strategy, decision-making and sensemaking: a modelling review

> *The competing goals of individuals and coalitions ensure that any intended strategy will be disturbed and distorted every step of the way. Mintzberg et al. (1998, p. 236)*

Pareto dynamics is power-driven is best illustrated from strategic management. Power used for both to quake strategy and to commit to strategy, which is an irresolvable duality of non-process power studies (domain II). Any strategy needs to be powerful—effective in terms of its successful ongoing implementation—and any power-action is consequential and strategic (Burgelman and Grove 2004). Power is a reliable indicator distinguishing a strategic action from among the complex noise of structures and institutions. Power appears on each layer of strategy formation from cognition and learning, to commitment and relations, to implementation that needs to be interlocked with formulation. There is a complex equivalence between "power" and "strategy." Similarly to the simple definition of power as "getting things done" (Pfeffer 1992), this work takes the definition of "*strategy as a pattern or consistency in action*" (Mintzberg et al. 1998, p. 189; Quinn 1980). The language of politics, Pareto distribution and incrementalism-radicalism pattern (Proposition 1.6) is in strategy writings by authors as diverse as Henry Mintzberg and Michael Porter.

Porter's (1980) classic account of strategic management defines "position" as "skewed outcome" and describes "strategic manoeuvring" with two classes of political actions, first, soft impressions, quick actions, and intuitions for competitor's actions and second, specific communication of the following ideas to rivals: mutual arrangement is the best alternative, the most effective defence is to prevent the battle, commitment and expectation of retaliation with a high degree of certainty, given the belief that the retaliation will be effective. In IT industry, product pre-announcements and management of uncertainty of expectations about which technology will become standard or widespread in use are effective and accepted moves (Arthur 1996).

Quinn (1980) defined strategic process as "continuous, pulsing dynamic." Mintzberg et al. (1998, p. 178) go for more precision, "strategies could be traced back to a variety of little actions and decisions made by all sorts of different people sometimes accidentally or serendipitously, with no thought of their strategic consequences. Taken together over time, these small changes often produce major shifts in direction." "New strategies, which may be emerging continuously, tend to pervade the organization during periods of change, which punctuate periods of more integrated continuity" (*Ibid.*, p. 197).[11]

Reviewing all areas of strategy research, Mintzberg et al. (1998, p. 367 and table on p. 357) concluded that strategy involves "tradeoffs between the incremental and the revolutionary" at which various strategy schools—design, planning, learning, power, environmental-ecological, and configuration—arrive upon their development. Whilst the language of "trade-offs" is more cruel than the language of "non-causal power laws," Mintzberg et al. (1998) provided further clues of how to research process management implications of Pareto Dynamics with the ideas of incrementalism narrated under the label of "the learning school". Not all strategies are developed as incremental, but each strategy can be decomposed into the elements and kinds of incrementalism explored next.

Kinds of incrementalism

(Incrementalism 1) *Disjointed incrementalism* is a set of concepts describing decision-making as a "serial," "remedial," and "fragmented" *political process*, in which decisions are made at the margin, more to solve problems than to exploit opportunities, with little

[11] Grassroots Model of Strategy Formation, that is a step towards studying power from the viewpoint of followers, as Methodology Note 4 offers.

regard for ultimate goals or even for connections between different decisions. Many actors are involved in the process, but they are hardly coordination any central authority, so that even various aspects of any one problem are analysed at various points in time with "no apparent coordination" (Braybrooke and Lindblom 1963, in: Mintzberg et al. 1998)[12].

(Incrementalism 2) "Policy making is typically a never-ending process of successive steps in which continual nibbling is a substitute for a good bite. ...the piecemealing *remedial incrementalist* or satisfier may not look like a heroic figure. He is, nevertheless, a shrewd, resourceful problem-solver who is wrestling bravely with a universe that he is wise enough to know is too big for him" (Lindblom 1968, pp. 25-27).

(Incrementalism 3) "Successful managers who operate with *logical incrementalism* build the seeds of understanding, identity, and commitment into the very processes that create their strategies. By the time the strategy begins to crystallize in focus, pieces of it are already being implemented. Through their strategic formulation process, they have built a momentum and psychological commitment to the strategy, which causes it to flow toward flexible implementation. Constantly integrating the simultaneous incremental processes of strategy formulation and implementation is the central art of effective strategic management" (Quinn 1980, p. 145). Logical incrementalism is "incrementalism with underlying logic that knit pieces together" (Mintzberg et al. 1998, p. 180).

Incrementalism: logical or processual?

Incrementalism can be explained as the outcome of both consciously intentional actions by managers-agents (logical incrementalism) and less intentional organisational processes (processual incrementalism) (Bailey and Johnson 1988, 1997). Incrementalism as managerial intent and incrementalism as organisational process are two different patterns with different impacts.

(Incrementalism 4) *Processual incrementalism* ends up with *strategic drift*, punctuation and politics, whilst logical incrementalism drives sustained performance and is agent-supported continuity (Bailey and Johnson 1997, based on a large-scale survey). The division between logical and processual incrementalism is associated with where the

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[12] The impression of "no apparent coordination" might be due to emergence. Cynefin framework for assessment of complexity levels links weak central structural linkages to *complexity* (Kurtz and Snowden 2003).

drivers of strategic change are seen, internally or externally, rather than with sense of logic and intention (Bailey and Johnson 1997). Organisational context affects incrementalism by the variables of breadth of participation (i.e., interdependence) formality of decision-making, performance-growth relation, type of industry, and levels of environmental stability (or velocity).

The political decision theory also suggests necessity of clear difference between "the political process of partisan mutual adjustment [logical intentional incrementalism] and disjointed incrementalism or other strategies for coping with humans' limited capacities for analysis [incrementalism for dealing with fragmentation and self-driven processes]" (Woodhouse and Collingridge 1993).

The distinction between logical-intentional and processual incrementalism with separate sources and impacts, invites the interference of purely processual, context-independent, and agent-independent patterns that are parts of Pareto Dynamics, partly because the dynamics demonstrates itself through outcomes (e.g., Pareto distribution of wealth and power laws) regardless of the context.

Natural (cognitive) incrementalism

> *Strategic management involves crafting the subtle relationships between thought and action, control and learning, stability and change. (Mintzberg et al. 1998, pp. 209).*

(Incrementalism 5) Incrementalism is also an immediate cognitive strategy, particularly in the patterns of formation of perspective, for example, "a series of small frames sets up a puzzling or confusing situation [that seems fragmented], and then a larger frame at the end includes something new that resolves the puzzle and makes sense out of it, changing the meaning" (Andreas 2002).

> *The very consistency that promotes success can lead to failure. Icarus Paradox.*

(Incrementalism 6) Even the very logical incrementalism has a potential for intricacy and "irrational incrementalism." A series of rational moves can belie the rationality of the whole activity, thus, leading to strategic drift between actual situation and management belief systems (Hayes and Jaikumar 1988; Johnson 1988).

Cynefin framework for qualitative assessment and dealing with complexity levels: (PROBE)-SENSE-(ACT)-(ANALYZE)-RESPOND

This work adopts Cynefin framework for differentiation in complexity levels (Snowden 2002; Kurtz and Snowden 2003). Cynefin method involves expert assessment and questioning of agents of how their issues can be split in the following domains of different

patterning of cause-effect relations:

- Ordered, where cause-effect relations are either *known or knowable*;
- Un-ordered, where cause-effect relations can not be known usefully because they are either *complex* (for example, information becomes old before knowing is possible or because of lack of information access or lack of information processing tools or capacity) or *chaotic* (e.g., there is no cause-effect, but cause-effect can be imposed).
- Disordered zone of ontological confusion.

The framework was developed by Dave Snowden in business environments, with action research in strategising and self-organisation of decision-makers in the Cynefin domains. It was found that each domain is likely to correspond to certain organisation design and strategy formation patterns, that are most effective under the conditions of respective domain as presented in Figure 1.1 .

Figure 1.1 Cynefin domains of complexity: implications for structure and strategy

Complex	*Knowable*
Structure: Weak central and strong distributed linkages	Structure: Strong central and strong distributed linkages
Strategy Pattern: probe-sense-respond	Strategy Pattern: sense-analyze-respond
Examples: perspective filters and pattern management	Examples: systems thinking, scenario planning, and reductionism (analysis-focused)
Chaos	*Known*
Structure: Weak central and weak distributed linkages	Structure: Strong central and weak distributed linkages
Strategy Pattern: act-sense-respond	Strategy Pattern: sense-categorize-respond
Examples: crisis management and stability-focused intervention	Examples: process reengineering and best practice

Based on: Kurtz and Snowden 2003, p. 470.

The Cynefin framework varies the (PROBE)-SENSE-(ACT)-(ANALYZE)-RESPOND chain for different circumstances of strategy formation. The core unchangeable items of the chain, specifically, SENSE-RESPOND present the basic phenomenon and paradigm of behaviourism, specifically, STIMULUS-RESPONSE known from Pavlovian experiments on classic conditioning and corrected by operant conditioning (Skinner 1968, 1971) as well as other later developments.

(Incrementalism 5) Action research into collective sensemaking describes incremental improvement as the *only* flow of information across the knowable-known boundary of Cynefin framework "where the scientific method is believed to operate" and "the best-accepted sensemaking strategy, engine of technological growth" (Kurtz and Snowden 2003, p. 476). If movement between known and knowable departs from reality observed, such cycle will become a source for inertia, as sensemaking research warns (Weick 1995, 2001).

Deliberate incrementalism but emergent learning

Learning from experience is not a straightforward matter (Woodhouse and Collingridge 1993).

The linkage of *incrementalism—[emergence]—learning* is appreciated in the subjects of political science, organisational learning, strategy management, knowledge management, information systems. The linkage is advocated by empirical research in incrementalism, be it practice of thinking (Bateson 1989), practice of project management for IS implementation (Fichman and Moses 1999), or practice of strategy (Mintzberg et al. 1998).

"All real strategic behaviour has to combine deliberate control with emergent learning" (Mintzberg et al., 1998, p. 195). "Deliberate strategy focuses on control—making sure that managerial intentions are realised in action, while emergent strategy emphasizes learning—coming to understand through the taking of actions what those intentions should be in the first place" (*Ibid.*, p. 189). Whilst it is difficult to operate with emergence on such simple terms, Mintzberg's statements above fit the ideas of stochastic and emergence. As the purposeful rule-governed agency of managers and conditions of the environment vary and constrain each other, their outcome is processual incrementalism and effects of Pareto dynamics, such as skewed distribution of power resources and power laws of emergent forms[13]. In other words, variation generated by managers (deliberately or not) is constrained by environmental variation and somehow incrementally leads to emergence that is nominalised as organisational process. In sync, "emergent order is not based upon random draws, but on path dependence, furthermore, it is co-evolution and there are links between existing competencies and emerging opportunities" (Lichtenstein and McKelvey 2004).

[13] Two great stochastic patterns from inside and outside the organisation.

Management belief systems

First, human decision-makers operate out of their own "models of the world" (Bandler and Grinder 1975). Hence, map is not the territory. Under conditions of stochastic, complex, and emergent, human agents adhere to their belief and value systems. Such systems are inseparable part of any power study, and some power studies use individual value systems as a relative measure to assess whether power was applied or not (i.e., through the presupposition that if what A needs from B does not matter to B, than no power is needed to get it). Second, belief systems work not as utmost continuous truth about the world, but because it is *useful* to have certain beliefs for getting certain jobs done in certain places, even against actual circumstances (Andreas 2002). Hence, territory is the map. For example, good consultants and CEOs are so valuable, because they are carriers of such yet tacit presuppositions and belief systems that add to inimitable core competencies (Prahalad and Hamel 1990; Miles 1982).

Management belief systems are attended in this research empirically by the explication of the crucial several stable decision premises for technochange of a large information systems implementation project (Chapter 4). Such decision premises are few, and managers uphold to them contentiously and operate out of those beliefs systems in making their key decisions, from which many outcomes stem and affect the front-line workers at geographically remote retail workplaces. Their 80-20 rule, the skewed pattern of many "consequences" stemming from few "causes" contributes to Pareto Dynamics.

Incrementalism and interdependence (organisational structure)

Incrementalism has interesting relation to organisational structure the following ideal cases present: if the structure is centralized (i.e., horizontal causality is weak), then adding an agent adds to organisational power 1 unit *incrementally* (i.e., P=N+1), BUT if the structure is highly interdependent, then adding an agent adds to organisational power up to N+1 units *factorially* (i.e., P=1*2*3*...N*N+1=(N+1)!), because the added agent will interact with N agents of the organization and affect the interactions among themselves.

Indeed, continuous, incremental side of change is associated with increase in time-paced semi-structures (Brown and Eisenhardt 1997) that reflect increase in interaction (interdependence) that is necessary in order to grasp power, in its new forms (Proposition 1.8). Yet, the strategies of incrementalism score well regardless of the degree of centralization of decision-making from tightly authoritarian to maximally decentralised systems (Woodhouse and Collingridge 1993).

Modelling incrementalism: presuppositions of agency and successive interlocked sequences

Below is presented a list of the descriptions of incrementalism, gathered from various sources. The list is a result of modelling exercise. As the list was complied, it became possible to identify agency, successive sequences, and interlocked stochastic processes as governing factors of "incrementalism". One way of integration of these findings is presented after the list in a compact meta-strategy of incrementalism.

(*Agency*)

- Decisions are made at the margin.
- Decisions are aimed at solving problems rather than exploiting opportunities.
- Individuals should be "informed" in order to contribute to strategy process.
- "Policy making is typically a never-ending process" (Lindblom 1968). Game theory suggests that "no end of interaction known to agents" is important condition for "emergence of co-operation" and reciprocation (Axelrod 1981, 1984, 1997). Proposition 2.1 defines interdependence as well-formedness of a social relation.
- "The piecemealing remedial incrementalism or satisficer... is wrestling bravely with a universe that he is wise enough to know is too big for him" (Lindblom 1968), so that agents are aware about the scope (e.g., number of agents), the levels complexity of the system (e.g., levels of interdependence and power), and the fact that there is complexity beyond their own comprehension.

(*Successive Sequences*)

- Steps are successive, e.g., in order for incremental process to proceed, the previous steps should be committed, conceptually closed or stabilized-for-now.
- There are sequential attention to goals and time as a separator: "organisations resolve conflict among goals, in part, by attending to different goals at different times" (Cyert and March 1963, p. 118).
- Management of the sequence in which issues are addressed can cause very different coalitions to form (Macmillan and Guth, 1985).
- "...build commitment into the very processes that create their strategies. By the time the strategy begins to crystallize in focus, pieces of it are already being implemented" (Quinn 1980).
- "In well-run organizations managers pro-actively guide these streams of actions and events incrementally towards conscious strategies" (Quinn 1980, p. 15).
- "Multiple, simultaneous, interlocking, and sequential managerial activities" (Noda and Bower 1996, Bower-Burgelman Process Model of Strategy Making).

(Interlocked Stochastic Processes: *Implementing while Formulating*)

- The idea of two great stochastic processes[14] is a model for variation from the inside and outside of the organization (Bateson 1988). The idea of strategy as taking control over probability and related paradoxical interlockage of *opening the future through* making choices and *commitments*.
    - "The real strategy tends to evolve as internal decisions and external events flow together to create a new, widely shared consensus for action" (Quinn 1980).
    - "Through their strategic formulation process, they have built a momentum and psychological *commitment* to the strategy, which causes it to flow toward *flexible* implementation" (Quinn 1980).
- Implementation and formulation
    - By the time the strategy begins to crystallize in focus, pieces of it are already being implemented. "...Constantly integrating the simultaneous incremental processes of strategy formulation and implementation is the central art of effective strategic management" (Quinn 1980).
    - Quinn's work bears interesting ambiguity, it presents incrementalism as a process for developing strategic vision and incrementalism as a process for bringing to life a vision already in the strategist's mind.

Meta-strategy of incrementalism: OPERATE-LEGITIMATE-(TEST)-COMMIT-EVALUATE-(EXIT)

The overall pattern of meta-strategy of incrementalism can be extracted from Quinn (1980, 1982), Weick (1995, 2001), and Mintzberg et al. (1998) as the following statements: *we try things, see the consequences, then explain them, and continue along* OR a single action can be taken, feedback can be received, and the process can continue until the organization converges on the pattern that becomes its strategy. Karl Weick pointed out how sensemaking is retrospective, because there is some set of actions fixed (i.e., conceptually closured, committed or nominalized) before and for the act of sensemaking. Hence, the meta-strategy of incrementalism includes the following steps:

- *OPERATE*: flows and sequences of incremental actions, flexibility and commitment avoidance, generate options, but purposefully avoid irreversible commitments. (Implementation)
- *LEGITIMATE*: build credibility, wait for right timing.
- *COMMIT*: use prestige or power to push or crystallize a particular formulation.

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[14] Non-causal power law relations between 1st and 3rd orders are also interlocked stochastic processes.

- *EVALUATE*: impose sense on past experience, decide to continue or exit[15]. (Formulation)

The practical questions of the application of the meta-strategy application "when to act," "when to commit," and "when to make sense"? Various patterns of incrementalism are out there at work in actual organisations, and the research question for the application of the meta-strategy is detection of the stage which strategic initiative or project has reached.

(Political Layer) However conventional the chain Operate-Legitimate-Commit-Evaluate might sound, if any strategy process is analysed using the chain, some stable trends tend to appear. For example, there is a political layer of creating legitimacy and commitment between operation and evaluation stage (i.e., implementation and formulation). This place of politics is content with functionality of power as a catalyst and discontinuity driver. Another political element is the right timing for each step, and most importantly, for commitment. The right timing prevents conflict.

The best battle won is the battle that did not happen. Adage

Modelling incrementalism with the power-action model: political implementation

(Incrementalism 8) Incrementalism has been the subject of focus from Braybrooke and Lindblom (1963) to Quinn (1980) to Mintzberg et al. (1998) to Woodhouse and Collingridge (1993) who re-defined the subject as the theory of political decision-making and reminded first, *political implementation* with its incremental and intelligent trial-and-error course is a result from natural constraints (boundaries) of cognitive and social nature and second, incrementalism is aimed at learning from experience at acceptable cost. Quinn (1980, 1982) offered "political implementation" as the most effective way of getting things done, and his "prescriptions for logical incrementalism" is a collection of generic political practices that were possible to frame with the power-action model as well as probability-based approach. The political practices modelled in this section are nothing more than parts of the effective belief system of a skilful manager.

(3rd order)

3rd order operations with decision premises include the practices of: "lead the formal information system," "build organisational awareness," "building credibility," and "legitimize new view points."

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[15] The continue-exit decision is similar "fight or flight" choice proposed by behavioural sciences.

"Building credibility change symbols" is an interesting form of power communication that unfolds at multiple orders at once. Executives know "they cannot communicate directly with thousands who must carry out a strategy, they purposefully take few highly visible symbolic actions which wordlessly convey complex messages they could never communicate as well, or as credibly, in verbal terms" Quinn (1982). This is a case of one "small but strong" 1st order power-action with intense 3rd order content that contributes to reputation considerably more than an ordinary 1st order power-action[16].

"Building awareness" and "broadening support" are the kinds of actions that are recommended to perform frequently.

(2nd order)
Quinn's 2nd order operations are primarily about coalition management and "overcoming opposition" in subtle and foreclosing ways (e.g., in advance of the battle).

(Probability Management)
Probability management practices include "consciously, structure flexibility," "engage in continuous change," "to capture the initiative, to deal with unknowable events."

Purposeful design of flexibility includes "having resources ready to deploy incrementally as events demand. This requires...creating sufficient resource buffers, or slacks, to respond as events actually do unfurl... developing and positioning "champions" who will be motivated to take advantage of specific opportunities as they occur, and shortening decision lines between such persons and the top for rapid system response."

"Even as the organization arrives at its new consensus, guiding executives must move to ensure that this too does not become inflexible. Effective strategic managers therefore immediately introduce new foci and stimuli at the top to begin mutating the very strategic thrusts they have just solidified—a most difficult but essential psychological state." The psychological-level operations with power are likely to fall in the class of strong but volatile 1st order power-actions[17].

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[16] See Relations between the orders of power-action: non-causal "power laws".

[17] See Paradox of "the strength of power:" immediacy versus durability for the power-action.

Further means of probability management are exceptionally incremental, specifically, "systematic waiting," "pursue tactical shifts and partial solutions," "develop trial balloons and pockets of commitments," "use prestige or power to crystallize focus and formalize commitment."

Modelling incrementalism: contribution of divisibility of technology (modern software)

Information technology itself is a convenient vehicle for driving intentional and unintentional politics and drift equally well (Methodology Note 1), which contributes to the presupposition of designed discontinuity (Proposition 1.5). Information technology is both particularly suitable for enabling incrementalism AND notorious for discontinuous change.

Incrementalism utilizes *divisibility of technology* (Leonard-Barton 1988): each stage of incremental implementation delivers a functional module or layer of functionality, even if no further increments are completed. The property of divisibility is true for most software, but commonly overlooked. Large information systems are normally designed in modular ways and in order to support modularity of organisation design. Divisibility also depends upon how software is perceived and configured, so that divisibility can be created, even if it was not built into technology from the start.

Software affected the nature of innovation, Quinn et al. postulated (1997). Design and properties of information technology are suspiciously convenient for incremental and political action; examples of such properties include:

- Information search and exploration of large-scale and new-level quality.
- Tracing and organising sequences of activities in an orderly fashion.
- It is easy and instant to stabilise rules for now in a computer information system (therefore, to commit) and unfreeze them at any next step of incrementalism.

Ultimately, computer information systems are just symbolic media, in which coding and configuration are performed physically and immediately (1^{st} order) but correspond to 3^{rd} order of social. Given that symbolic power resources are built upon one another, information systems are the means of management of embeddedness and recursiveness of symbols, rules, formal hierarchies and schedules into actionable sequences that guide behaviour. Such appears as the dynamics of $3\text{-}3^{rd}$ order (i.e., 3^{rd} order in power of 3^{rd} order): software is symbolic means to perform interpretative 3^{rd} order operations in increasingly cohesive way. With information systems, 3^{rd} order power-actions gain

immediacy, so that "policy realises itself" across entire organisation regardless of structural, physical, or geographical boundaries.

(iii) Pareto Dynamics for Technology Management: political delivery of information systems

The review of empirical research about yielding firm-level capability from the use of information technology shows that successful cases vividly demonstrate the patterns of Pareto-shaped strategic adaptation.[18] One condition for Pareto dynamics is the skewed Pareto distribution of power resources, which is how IT expertise, human resources, and IT money are distributed scarcely.

With its IT infrastructure and information systems, any organisation should keep an eye on the level of adaptability that can be represented with the trade-off between mobilisation-commitment of resources and flexibility. Mobilisation of the IT human resources for serving all requests coming from the business functions is not a viable strategy. But a too well-built IT infrastructure, that is easy to maintain for IT people, will be expensive to change; thereby, building IT resources above the levels of scarcity will eat up the firm's flexibility for the future in terms of both their systems locked-in and resources spent (see management of stochastic processes).

Yet another feature was noticed from empirical cases, specifically, without a considerable political component, large IS projects fail or become abandoned. The political component (or indeed power-actions) include upholding to several key decision premises by the top management, counted timing of actions, the layer of commitments, sign-offs, user acceptance tests, and other legitimisations (between operation and evaluation), purposefully designed sequences of the units of delivery, and other features of incremental strategies modelled in this work.

Pareto Dynamics appears as a way of capturing certain relation between patterns of technology management and patterns of power, as presented with Table 1.4 next.[19]

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[18] A review of case studies reported by Applegate et al. 2003, Ciborra et al. 2000, and Davenport et al. 2000.

[19] The patterns of Pareto Dynamics are akin to kaleidoscope: patterns appear emergently, but once learned they cannot go unnoticed. Kaleidoscope provides emergent combinations of recognisable components. The similar structure is reported by complexity studies for fractals of snow stars and ocean shores. In strategy processes it is always possible to recognize the powerful patterns of Pareto Dynamics presented.

Table 1.4 Patterns of power in delivery of information technology (Pareto Dynamics)

	Pattern in technology implementation, usage, and management	*Pattern of power*
Incrementalism-radicalism pattern	A typical corporate IT infrastructure is built incrementally by practicing and learning-by-doing. But IT infrastructure is subject to radical software innovation from the outside and drift from the inside of the organisation. IT expertise and skills are gained gradually and at considerable costs.	Basic proportion of the power, specifically, many "small" actions "lead to" one "large" action of other kind (Proposition 1.6). Power as discontinuity. Pareto distribution of power.
High interdependence	Project management of information systems development suffers from high interdependence and following over-engineered solutions (Vlasic and Yetton 2003; Fichman and Moses 1999).	A condition for Pareto-shaped process and distribution of resources (Proposition 1.9).
Several powerful management decision premises	Several decision premises of project and technology management are purposefully owned by top corporate and IT management, adhered to by them in their daily decision-making, and kept stable even against the logics and functionality of systems implemented and at considerable costs. Empirical finding.	The 80-20 rule. The paradox of the strength of power: immediacy versus durability: grassroots operations with technology do not provide durable power resources (Proposition 1.4).
Risk intensification	"Flexibility of modern software... enables fundamentally new ways of working that amplify the potential benefits of IT investments, but at the cost of making almost any implementation project a potentially risky program of organizational innovation and change" (Fichman and Moses 1999, p. 2)	Drives risk-balanced politics rather than resource-balanced (i.e., strategic decisions and resource allocation are more affected by possible ramifications rather than previous resource allocation) (Proposition 1.10).

Increasing returns	The more users employ technology in more applications, the more value and lock-in technology develops (Arthur 1996).	Increasing returns is the economic name for the pattern of getting power out of power (March 1988), when the appropriate treatment of power resources creates power seemingly out of nothing[20].

Nonlinearities for eventual shift from incremental practice to discontinuous innovation

The critical question behind Table 1.4 is "(why), how and when do routine incremental practices and managerial logical intentions being accumulated together emerge into strategic drift that is managed by discontinuous shift?"

Addressing the question, it is important distinguish different kinds of nonlinearity. *Few causes lead to many consequences* is a replica of power law and a sign of deterministic chaos, against which living systems self-organise in complex ways. *Logical and purposeful movements of agents produce discontinuous movement of the system as a whole of which the agents are a part*—very consistency that promotes success can lead to failure, irrational incrementalism. A small collection of nonlinearities, found empirically in cases of information systems implementation, ensues.

Small differences in organisational context generate significant variation in attitudes, competencies, and use patterns of software, for instance, with "an hour difference". *Small facilities of software* may spur a shift in strategic practice, for instance, software-assisted negotiation in a management team provides "small" features of raising opinions under the condition of semi-anonymity, and disturbances that would be never raised in voice appear in textual comments on the screen (Eden 2004).

IT-productivity paradox: the case remains valid as providing a worker with software to fulfil job functions does not guarantee increases in productivity, and increases in productivity might not cover the cost of technology delivery. However, most cases of IS implementation demonstrate the assumption of nearly automatic productivity gains. The

[20] For example, out of one's own agency of continuous asking the questions such as, "what am I going to achieve," "for what purpose am I doing this," and "how exactly, by which steps, I am going to achieve this."

IT-productivity paradox will remain a paradox until IS research can define the trade-off between contribution of technology delivery to productivity AND increase in workload, learning requirements, and disruption to business-as-usual.

The paradox of the strength of power appears in the immediacy of technological action versus distorted-but-durable impact of IT policies and standards. So that, few key decisions, such as a purchase of large software package, create long-standing impact upon thousands of technological actions. The grassroots operations with technology are very dependent upon decision premises and easily reversible (Proposition 1.4).

IT capabilities are difficult to imitate "core competencies," since they reside not just software, but in the organisation-specific arrangements of technologies-in-practice developed inside the organisation over time. Yet, "strategies can arise in all kinds of strange places and unusual ways" (Mintzberg et al. 1998, p. 208) and "it was not unusual for late availability of a small component to cause hundreds of thousands of dollars worth of production to sit in inventory" (Fichman and Moses 1999, p. 9). This research confirms *unexpected localisation of strategic capability* with a case of issues of market readiness resting in the stockpile of routine IT task requests (p. 248).

Nonlinearities of Pareto Dynamics in practice: generic examples

> *The days of... technologies that can be physically installed, turned on, and used as-is by most organizations are over, if indeed they ever truly existed to begin with. Fichman and Moses (1998, p. 2).*

Yet another way to concern with the question of discontinuity in technology deliver (Table 1.4) is to trace how a business requirement emerges out of the accumulation of various small needs in nonlinear way. Initially, small needs are oriented to different purposes, therefore, a need emerged might is resolved discontinuously (Proposition 1.6).

Many 1st order actions with information technology do accumulate into 3rd order decision on IT policy, but the sequence is hardly causal. For instance, it is often difficult to find out which particular action provoked policy, and the policy response itself is likely to be discontinuous in serving many purposes different from the initial. (a) Such pattern is common to purchase of any large software package: the needs that initially led to purchase do not necessarily affect the outcome of purchase (which software), how software will be used in practice, and what will constitute competitive advantage from usage of that software. (b) Further generic instance of the pattern is incremental increase in end-user

computing that increases demand of IT services as well as diversity and instability of IT infrastructure. Under scarcities, the IT function has choices to meet the case with policies (3rd order), differentiation in quality of service and structural arrangements (i.e., routing support of non-profitable customers to intermediate-level professionals, 2nd order), or immediate technological actions-configuration of systems (1st order). The empirical discussion will show that contrary to the "technological mindset" attributed, IT managers prefer to maintain strong policies rather than exploit nuances of technology in order to achieve its stability (Proposition 6.3), which might be a function of intra-firm economics of information systems.

Stability of technology is a basic necessity for effective operations of any kind, and particularly to customer services in retail banking studied in this work. Maintaining stability creates loss of flexibility that will be necessary for the next stage of technochange, and here *discontinuity* starts: a next technology, such as new banking systems or new computer platform, might be implemented on discontinuous basis. The IT infrastructure is a heavily network built gradually—high and far-reaching interconnectivity is the purpose and value of the IT infrastructure. Yet, it is bound to be quaked by the waves of new technology, such as a release of new version of operational systems. IT professionals are aware about such pattern and eventual discontinuity, and utilize it (Proposition 1.5).

Scarcities of IT (human) resources affect these nonlinearities and are products of them. Both IT expertise and IS project management knowledge are built very gradually and tacitly because of considerable expense and learning-by-doing in developing professional IT human resources. Here, incrementalism is learning through experience at acceptable cost, because building IT resources above the levels of scarcity will eat up the firm's flexibility. Again, IT professionals are aware about scarcities (that are 2nd order buffers and pockets for power) and even utilize them in order to manage themselves, e.g., by defining who will receive how much of expensive training. These underlined cases are considered empirically in Chapter 6 The Political Delivery of Information Technology.

Delusions of conventional distinctions and no strategy

'Technological determinism' and 'social construction,' 'organisational imperative' and 'technological imperative' (Saunders et al. 2000), 'IS projects' and 'organisational change projects' – such conventional distinctions of IS research were useful as scaffolding for starting thinking and can still serve as reference, yet they are of disservice and danger to epistemology, because they are taken dialectically real. As it is shown in this work,

process-based methodology (incrementalism), political implementation, complexity-based approach, and *technochange* approach (Markus 2004) are possible to convey without reference to conventional distinctions.

Review of incrementalism, patterns of Pareto dynamics, and nonlinearities *question the possibility of any long-lasting and satisfactory formulated information strategy*, thereby acknowledging the controversy of the field. Partial 'IT strategy', 'IS strategy' or 'IM strategy' are more effective than large comprehensive ones. The very complexity of strategy content and project management schedules leads to failure, irrational incrementalism (Fichman and Moses 1999; Vlasic and Yetton 2003).

Information technology and its industry are experiencing radical drifts in different directions with trends aligned infrequently. The alignment and alliances in IT industry come from purposeful intervention (Proposition 1.5). Arthur (1996) points to the *IT industry as an exemplar* of product pre-advertisements, user lock-in, manipulation of user-bases, and other *political games* pursued in order to capture increasing returns and secure monopoly, which "*make it difficult to converge on a clear strategy at all.* In this case, the structure tends to take the form of adhocracy, or project organisation, and the learning approach becomes almost mandatory" (Mintzberg et al. 1998, p. 229). Exactly the adhocracy and project organisation of large IS implementation are described through the empirical Chapters, and the managers studied demonstrated incremental political approaches.

If naturally remedial incremental decision-making (known as 'garbage can') is countered with purposefully incremental strategies, the requisite change comes in less radical forms. Such was precisely the story of the business case of purchase new banking software described empirically. The divergence between intentional-logical and organisational-processual incrementalisms is also resolved much easier, if natural incrementalism and fragmentation of business processes are met by purposefully designed incrementalism. That increases chances of formation of a viable strategy as pattern, because interlockage of successive stochastic processes is managed with the third ingredient of incrementalism: the skill of agency.

Managers deal with "no strategy", nonlinearities, and complexities using their own belief systems, the collectively shared part of which comprise *several stable decision premises* that are exercised across the organisation. The system of several stable decision premises

is usually simple, and the overt simplicity of cognitive maps of top managers is a surprise to many researchers (Clarke and Mackiness 1998; Ackermann and Eden 2004).

> *I want to clarify that the results have been driven by major process and policy changes as well as by the software implementation. (Project manager)*[21]

Managers use their beliefs for guiding their decisions on frequent basis. The 80-20 rule is an exemplar of such beliefs. Several stable decision premises pay off by the benefits of simplicity, sense of purpose, and efficiency of technology management. Managers uphold to such decision premises even against the actual circumstances. For example, the decision premise "change in practices is cheaper than change in IT solutions" was used in order to ensure that the comprehensive software is transformed in technology-in-practice in a way that minimises costs over long-term. Chapter 4 Alpha Case. Complex Organisation of Simple Means: Decision Premises, Software, Structures, and Institutions starts with the summary of those several stable decision premises.

Shift from function to process management due to cognitive biases of IS delivery

> *Software implementation has now taken on more of the character of technological process innovation... Technological process innovation can rarely be implemented as-is, so to achieve desired results adopters must engage in cycles of adaptation where the technology and organization are fit to one another. Leonard-Barton (1988)*

Transformations of organisations in the velocity of co-evolutional incremental-discontinuous change requires shift *from functional* taxonomies, tools for information strategising and "the right mind-set for managing information technology" (Bensaou and Earl 1998; Earl 1989, 1995, 2001) *to process-based* methods, incrementalism and the cognitive biases of IS delivery that might need continuous attention (Markus 2000). In process management, decisions are based not on the technological content of functionality or architecture, but on how the process of implementation goes. In large-scale projects, the decisions are based upon generic decision premises (e.g., the 80-20 rule, step-by-step movement, or no key-man dependence) and applied *ahead of the game*, before implementation outcomes are known. Practitioners appreciate that IS delivery is dramatically effectively managed by process-based project methodologies, such as Results Driven Incrementalism and Win-Win Spiral Model[22].

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[21] Re-quoted from Fichman and Moses (1999) from the case of results-driven supply chain IS implementation in Herman Miller, the second largest office furniture manufacturer in the U.S.

[22] The WinWin Spiral Model for development of software, system requirements and architectural solutions as "win conditions negotiated among a project's stakeholders (user, customer, developer, maintainer,

Staffs feel uncomfortable thinking in terms of business goals rather than software capabilities... they feel safer thinking in terms of activities rather than in terms of achieving business results. ... the goal is defined by some sort of functionality, and when you are talking about functionality it is so easy for people to twist the scope. (Project managers, see footnote 21)

Functional implementation encourages implementers to focus on technology instead of practice changes required in order to derive business value from functionality (Fichman and Moses 1999). *In information systems implementation, the following biases occur rather naturally: accent on technology, desire of getting all at once, and thinking in terms of the visible at first sight (e.g., activities, software functionality, and resources).* The first bias leads to overloaded software, over-engineered solutions, and complexity explosion. The second bias leads to unproductive increase in task interdependence and interactivity. The third bias shows how goals are lost between technology (the first) and technology-in-practice (the second).

Whilst these biases occur in people's best attempts to deliver, they actually delay software implementation to the workplace: end-users do not comprehend advanced software, until they have experience with it in their actual work. An example of such biases at work is an institutional practice of elaborated evaluation of software functionality with checklists, which in most cases is over-treated comparing to its practical impact. The biases of functional orientation overlap with the biases of activity-based thinking and resource-based view – thinking in terms of the visible is an overall frame for such biases. These biases are presupposed by this work based upon its review of IS implementation cases. The issue "why these biases occur" is largely beyond the scope. By their systematic occurrence it is possible to say, they are cognitive. Naturally, those biases are called "biases" in relation to the rational purposes of getting things done – in some other contexts those "biases" are normal means of sensemaking. Their omnipresence requires awareness and *(conscious) modification*, and incrementalism is one approach for it.

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interfacer, etc.)" is not specifically considered in this thesis. However, it features interesting tools for *quantitative trade-off analysis*, which this thesis pursues in certain way. As accessed http://sunset.usc.edu/research/WINWIN/winwinspiral.html on 07.01.05, the latest available version of the model is dated by May 1998; given its applications in the domain of Satellite Ground Stations, further development of the model was probably transferred to proprietary sector.

Process management is of interest to top management by the virtue of their position of oversight over many functional aspects. However, the shift from "functional" and "visible" is yet to be operationalised in management methods and fads in order to meet the cognitive biases and fragmentation of business processes. Chapter 3 Research Methodology starts with Big-O approach that is a simple heuristic that reminds of the existence of the organisation, project, or production system as a whole. Neither it is a co-incidence that strategic IT steering committee is countered by strategic product development committee.

Results-driven incrementalism for (political) IS implementation

(Incrementalism 9) A results-driven incremental (RDI) approach is practitioners' methodology for implementing advanced software. RDI methodology is a concise and well-developed example of incrementalism. It utilises divisibility of technology in order to develop *discrete* units of technochange delivery, so that each stage of implementation delivers results in a non-overlapping manner, even if no further increments are completed. Before each next step starts, new policies and structures should make some measurable impact upon work practices. Discreteness is naturally utilized in order to gauge business benefits by milestones and commitments (political layer of the meta-strategy of incrementalism). RDI methodology can be presented with the following set of heuristics:

- Each unit of delivery should be fulfilled before the next unit is initiated.
- For that, each unit should have defined scope that is implementable over the short time.
- All following units are reviewed on the basis of each increment. The impact of the sequence should be traced in regard to change content and the whole process sequence.

Advantages of RDI methodology stem from purposefully designed sequences, discreteness, and readiness for discontinuity that is equal to designed discontinuity (Proposition 1.5). RDI methodology shows that *incrementalism is a tool for promoting multiple objectives simultaneously*. Carefully designed sequencing of supports the following altogether:

- Productive balance between ongoing implementation and formulation.
- Productive levels of interdependence, as certain interdependences increase for different stages of information systems development lifecycle.
- Productive "bit rate" – work becomes planned for smaller intervals (weeks for years).

Results-driven incrementalism promotes organisational learning, sustains implementation momentum, avoids the delay and over-engineered solutions, and acts as focusing device (Fichman and Moses 1999). As expected by this modelling of Natural (cognitive) incrementalism, contribution to learning is a particularly strong side of incremental

approaches. RDI methodology (a) makes learning of new software to start earlier and happen more frequently, (b) carries out the presuppositions of effective learning (e.g., being itself by-doing, frequent, immediate, hands-on, and action-oriented), (c) avoiding situation of impossible hands-on learning for a short period right after one massive delivery, and (d) provides short horizons for expectable of learning and planning. A special effectiveness of RDI approach comes from its inclusion of *psychology of project management as well as timing and sequencing effects* due to operant conditioning (Appendix 3). At the bottom line, there is ample evidence that RDI approach makes business benefits arrive sooner, and makes highest payoff arrive earlier rather than later[23]. RDI is found to facilitate the prioritisation of close-to-earth features, such as tracing of customer identity, account, and individual order, that appear simple and necessary but require intensive coordination between different business functions.

Cognitive politics with RDI approach: core and periphery distinction

Incrementalism methodologies do raise resistance, which is a sign of politics intensification lacking well-developed interdependence (Proposition 1.8 – Proposition 1.9). The obstacles to purposeful incrementalism are function of previous learning and biases towards functionality of technology, all-at-once solutions and activity-based thinking. RDI methodology accents key indicators and clear prioritisation, constraints in scheduling, red flags and deadlines, alternative options in case of a problem, and frequency of review, which are the features of "political implementation" (Quinn 1982). Incremental handling multiple purposes simultaneously increases the number of commitments and reviews, thereby sharpening the political component.

Application of RDI methodology in IS implementation separates managerial intent and logical incrementalism. *Core* logical incrementalism for project management and operations management deals with well-defined logical constraints and task coordination – exercised by small teams overseen by top management. Core logical incrementalism is a zone of legitimate use of power that however might have high stakes. *Peripheral* logical incrementalism for stakeholder management deals with various political arenas and

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[23] The following sort of measures were reported by Fichman and Moses (1998):

IS project measures: time to initial benefits of use, time to project completion, time to use software in production mode, percentage of goals achieved per time. No implementation failure.

Business measures (for supply chain and inventory software): reduction in planning cycle time, decrease in lead times, increase in inventory turns, and decrease in missed deadlines (the latter was extraordinary, from 30% to 1%).

agendas (e.g., persuasion of CEO, communication to end-users, and negotiation with vendors) – exercised by the members of federalised IT function, including many temporary project workers and consultants. Peripheral logical incrementalism strengthens as actions on distributed arenas affect one another increasingly, yet unexpectedly. Peripheral logical incrementalism is a zone of intensified politics with low risk outcomes.

RDI approach empowers the agency of an implementation team to keep control over the scope of work and offers early and recurrent visible achievements to promote a project. Yet, RDI approach appeals to executives, because it is process-based and allows discovering implementation problems much sooner. Thus, practical usage of incrementalism involves special governance arrangements, workarounds, temporary business processes, and intensified work with stakeholders.

These details of the modelling review of Results Driven Incrementalism methodology found that it is in tact with generic features of incrementalism and the power-action model. To complete, application of RDI methodology also confirmed that, *whilst incrementalism is conventionally associated with gradual and deliberate pace of change, the incremental strategies are effective for rapid and discontinuous change* because of well-structured and frequent feedback, discreteness, and readiness for discontinuity (Incrementalism-Radicalism Pattern Proposition 1.6).

> *Life is a journey of a ten thousand leaps, but the wise person understands that it is complete at each step. Chinese adage.*

(iv) Human face of Pareto Dynamics: power labour of middle management

(Emotional) balancing between continuity and radical change for innovation

> *Perhaps the most difficult role in innovation is that of middle managers. They are the key implementers of strategy... Middle managers often find themselves in conflict with both top managers and technological innovators as they try to maintain the strategic focus and fulfil the operational performance goals... overcome the inevitable resisters to change, and live with the chaos that effective innovation always involves. Quinn et al. (1997)*

"Innovation Explosion: Using Intellect and Software to Revolutionize Growth Strategies" title of the book by Quinn et al. (1997) invites considerations of Pareto dynamics and complexity-based approach. Quinn et al. (1997) carried the assumptions of discontinuity, remedial incrementalism, uncertainty of formation of increasing resources, zone of high volatility of the outcome of strategic action, and other nonlinearities of complex innovation. However, they wrote in common sense language without precision.

Middle managers are in the position to reconcile basic sources of variation from inside and outside the organization, the variation of core competencies nurtured by top managers and the variation of end products delivered by front-line staff. One example of such reconciliation is another Pareto thinking inviting title, "Emotional Balancing of Organizational Continuity and Radical Change: The Contribution of Middle Managers" by Huy (2002, p. 31): in tackling the pattern of incrementalism-discontinuity, middle managers demonstrated "two seemingly opposing [primary] emotion management patterns that facilitated beneficial adaptation for their work groups: emotionally committing to personally championed change projects and attending to recipients' [of change] emotions."[24] Low commitment to "objective" change led to inertia (core logical incrementalism), whilst low attention to intra-firm customers of power-actions led to chaos (peripheral logical incrementalism), and only high stretch on both sides led to adaptation (careful complete incrementalism). Balancing between these two patterns also reduced the likelihood of extreme responses such as union strikes (designed discontinuity prevents radical change).

Innovation and knowledge conversion as power-intensive labour

In implementing software and managing IT infrastructure, middle managers handle the most of interdependence, assuming firm size more than 1,000 employees. Top management is distant from IT issues over long term by their background (e.g., through finance or law) and by their oversight over many functional and cross-functional aspects—the duration and overrun of IS projects themselves make it difficult to keep executive attention on them. On the other side, the end-users are deliberately buffered from participation in IT governance (p. 251). Hence, *flatter structures* that ICTs help to build might turn against innovation, because of create voids and buffers: access to the authorising top is not eased, but decision-making powers are overcentralised. Downsizing layers of middle management reduces organisational flexibility and innovation because of the removal of base for ideas fostering and emotional balancing (Huy 2002).

Middle managers play a key role in the conversion of tacit knowledge into explicit knowledge, they "synthesize the tacit knowledge of both front-line employees and senior

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[24] Core competencies are roots, whereas end products are leaves; for the metaphors of "grassroots model of strategy" and "competency tree" see Mintzberg et al. (1998, p. 217) and Prahalad and Hamel (1990) respectively.

executives, make it explicit, and incorporate it into new products and technologies" (Nonaka and Takeuchi 1995, p. 16). The statement indicates the kinds of power labour performed by middle managers, for example, 2nd order mild commitments of conceptual closure and stabilisation-for-now.

"Strategic initiatives often develop deep in the hierarchy and are... given impetus, by middle level managers who seek the authorization of senior executives" (Noda and Bower 1996). "...a cognitive process in which technological and market forces, initially ill defined, are communicated to the organization, and strategic initiatives are developed primarily by front-line managers who usually have specific knowledge on technology...", "impetus is a... socio-political process by which these strategic initiatives are continually... adopted and brokered by middle managers who, in doing so, put their reputations... at stake" WHILST "the role of top managers is limited in that they do not necessarily have the appropriate knowledge... to evaluate technical and economical aspects [of the initiatives what will become strategic, but are not recognised as such at the moment of their promotion by middle managers]". These quotes reveal specialisation of power labour, which the power-action model reinterprets into a pattern: innovation is driven by upstream power law dynamics of those 1st order power-actions which make their way through the webs of 3rd order decision premises.

Generation of innovative variation requires *agency*. Only starting from initial managerial level employees (a) possess enough agency in order to be self-activated, (b) participate in information exchange throughout the organisation legitimately, because they are charged with some coordination duty, and (c) possess enough specialization and resources in order to gain noticeable power. *Complexity agency*: only starting from initial management level agents have enough agency for making their emergent networks developing groupings and coalitions (horizontal causality), and then hierarchies (vertical causality) as the unified framework of the four stages of emergence offers (Lichtenstein and McKelvey 2004). *Psychological agency*: Huy (2002, p. 35) arranges emotions of the middle managers on the scale from high activation to low activation, and "those experiencing power are immune to influence or persuasion by others, but are ironically more susceptible to self-influence" (Galinsky et al. 2004). These are psychological hints at the fact that power labour requires knowing how and when to self-activate. Here, the modelling review closes the loop of the reconciliation of objective force and subjective will in power definition with restating that agency is a political skill that is necessary for generative social activity. Agency can be a

source of one's power, yet one needs skill and conditions in order to mine power from his or her purposeful agency.

7 Domain II of operation with power sources

Power resources and their images, such as reputation and identity, have been studied more than power processes. Domain II power studies formulated few "eternal" questions that can guide any domain II analysis over and over, but are not resolvable within that domain. How power is a reusable resource? To what degree could power be based upon and gained from previous power (i.e., power of power)? How types of previous power sources affect types of power gained from them (i.e., what is convertible into what)? What happens with power resources, when politics penetrates the extent of maximally gained power and the threshold of minimum power necessary in order to remain in the position? How to study volatile power resources that are produced and consumed in one unit of activity (i.e., issue of latency of power)? As certain answer, the section integrates the findings by the model of power developed in the previous sections (e.g., probability-based approach, the power-action model, implications of Pareto Distribution of power resources) with some conventional theorising about power resources, specifically, the resource-based perspective, consumption analysis, and symbolic dynamics.

Presuppositions of power studies introduced the phenomena of structuration, embeddedness, and emergence in building complex power resources and offered a distinction between allocative and authoritative resources.

Domains of power studies contributed with more differences that makes the difference: not all political activity contributes to production of power resources and definitional distinctions between domain I of power processes and domain II of power resources. Specific description of operation with power resources will address the issue of "absence of any neat, constant, and direct relationship between power as a potential for determinative action, and power as determinative action itself" (March 1988, p. 136).

The power-action model offers specificity necessary by describing relations between the orders of power that translate to the rules of formation and use of power resources (Table 1.2). Particularly, production and consumption of power resources are performed with 1st and 3rd order actions, while routine reference and maintenance of power resources are performed with 2nd order actions. Often, the difference between 2nd and 3rd order is simply in the amount of resources engaged and levels of risk for resource exploitation; for

example, authority is demonstrated with title (2nd order) and signified with a signature (3rd order), and a signed document has predictable consequences but might amend the original authority resource unpredictably.

Patterns of power in practice ("Pareto Dynamics") provide further heuristics about operations with power resources, specifically, skewed power distributions, getting power out of power (e.g., recursivity), quick depletion of power resources in the case of failure and acceptable frequencies of "strong" and "weak" power-actions to name a main few. Processual understanding should deliver more insight into the role of structures, boundaries and commitments in gaining power out of various sources.

Power is re-usable resource, and it becomes better with continuous re-use. However, the excessive use of a power resource increases volatility of outcomes of its use that is linked with dramatic increase in embeddedness of power actions upon each other. Simply, power resources over-used risk to become unusable because of their own complexity. The theory of *increasing returns*, that concerns with knowledge-intensive goods that are better with re-use (Arthur 1996), is of help with studying the complexity of power resources.

The ideas of production and consumption are particularly applicable to operations with power resources. Both verbs emphasise agency with their non-transitive requirement of specification, specifically, "power produced by whom" and "consumed by whom"? Whilst the consumption analysis and Foucault's (1983) ideas on power labour remain at their broad stages, Methodology Note 4 on the study of power from the viewpoint of the followers provides initial guidance.

(i) Positional difference as power resource: context-dependency of power

Anything of the organisation could be a source for power, but power resources do not appear randomly. Political interaction of organisational agents is stochastic, but power resources are constructed purposefully with high degree power specialisation and resource immobility (March 1988). Contextualisation of power occurs in the boundaries of positions and relations among specific people, but authority and legitimisation (2nd and 3rd orders) make power more mobile and transferable. Most of power resources come from various positional differences in social networks, hierarchical and structural arrangements, and organisational coalitions. Conventional view upon power resources is presented with the following list of "the most important sources of power" compiled by Gareth Morgan (1998, p. 163):

- Formal authority
- Control of scarce resources
- Use of organizational structure, rules, and regulations
- Control of decision processes
- Control of knowledge and information
- Control of boundaries
- Ability to cope with uncertainty
- Control of technology
- Interpersonal alliances, networks and control of informal organisation,
- Control of counter-organisations
- Symbolism and the management of meaning
- Gender and the management of gender relations
- Structural factors that defined the stage of action

An inquisit look at the sequencing of the list reveals uniformed hierarchies behind Morgan's thinking, specifically, "strength" and "applicability" were his criteria about how much power is possible to gain for these varied sources. With the power theories of this work it is possible to notice how some of the power sources are just taxation from the widespread theories (e.g., ability to cope with uncertainty), some of the power sources can be aggregated (e.g., control of boundaries and control of counter-organisations), and some of the power sources are more specifiable than others (e.g., control of technology and the management of meaning are tackled in this study).

(ii) Construction of power resources from knowledge: Expertise is NOT Reputation

Reputation is a representation and reference to actual resource, such as expertise. Whilst reputation is not expertise, reputation management (2^{nd} and 3^{rd} orders) is aimed exactly at managing gaining actual expertise (1^{st} order).

Proposition 1.7 Reputation is a function of at least both actual expertise or experience AND routine political process of building a re-usable power resource with confirmation and authorisation actions of 2^{nd} and 3^{rd} order.

The examples for the proposition come from frequent situations when users of software have more knowledge and ability than they are formally authorised to apply. Politics appears, when such knowledge is not acknowledged, so that users are prevented from gaining reputations, which in future, might help them to take stronger bargaining position on IT issues (e.g., when selecting new systems). This story is empirically supported with descriptions of limiting end-user reputation for IT expertise as intentional political practice of IT support.

Reputation is guarded, because it brings dividends: reputation for knowledge of business processes will bring its holder closer to strategy formation, and reputation for IT expertise brings salary benefits to its holder. Inside the IT function, there is a considerable competition of who will receive formal training from the vendor, even the skill of systems configuration comes largely from long-term gradual learning-by-doing.

(iii) Economic language of power resources: credit of power and scarcity

There is certain economics to use of power, which this work starts to formalise: (a) in a human collective, the cost of power execution is reduced over time, because people learn; (b) over long term, reputation building is a cheap way acquiring power; (c) the more power is used, the more power is gained (subject to its successful use).

The very language of power is capitalist. "Symbolic power is a credit; it is the power granted to those who have obtained sufficient recognition to be in a position to impose recognition" (Bourdieu 2002, p. 242). It is possible for A to credit B with the amount of power P2 that is more than the amount of power P1 that A has. B can gain even more power, because of his or her skills, specialization or other opportunity to employ (positional) power with more output. The reverse dynamic is nonlinear: if A granted B with power, and B failed, B's failure might deplete A's power resources but not proportionally.

Behind those speculations is comparison of the issue of power to issue of credit by a financial institution or issue of money by a central bank. Today's highly interdependent financial systems allow the emitter to issue more than it has, yet at the earlier stages of social development, there was the idea of the fixed amount of wealth (e.g., money should be guaranteed by the amount of gold reserves for the purpose of trust in the financial system), and at some point of growth the belief of fixed guaranteed wealth became unsatisfactory. Similarly, some even postmodern and supposedly liberating works on power bear the presupposition of scarcity when they encounter skewed power distributions as a matter of fact, not as than an outcome of particular specifiable processes.

8 Power and Interdependence

(i) Interdependence: latent power?

Dependence can be seen as the obverse of power. James Thompson (1967)

Organisational studies intertwine power distribution and interdependence continuously;

interdependence is presented as latent, unrealised or lost power as well as a resource and cause for power. Complexity science offers the model of NK Fitness Landscape that aligns with the framework of interdependence patterns as follows: it simulates a co-evolutionary process in which both the N individual agents and the K level of interdependence are changed over time in cellular automata simulations. The model equates the degree of system-wide interdependence with complexity (Kauffman 1993). There is analytical confusion of inseparability of "power" and "interdependence" to address:

Proposition 1.8 Interdependence is a formative condition for power. First, interdependence defines which frequency-strength of power is most effective (i.e., order of power-action). Second, high interdependence allows advanced forms and uses of power.

Without interdependence there is "more power—more resistance" dynamics, with interdependence there are advanced forms of power possible on the range from slavery to tele-working. The related important question is *whether interdependence is a case of zero power or intense power* becomes answered, yet relativised. Any positional difference can be either a power source (domain II) or a condition or obstacle for power exercise (domain I), depending upon the purpose of analysis (i.e., certain interdependence is a source of power for ones and obstacle for power exercise by others). Juxtaposition of the framework of interdependence patterns (Thompson 1967) and expected power (Hatch 1997) suggests,

Table 1.5 Interdependence patterns and use of power

Interdependence pattern	*Implications for power*
Pooled	Pooled task interdependence involves few if any power considerations.
Sequential	Sequential task interdependence involves asymmetrical power relationships and, therefore, is associated with considerable latent conflict.
Reciprocal	Reciprocal task interdependence is a case of balanced power relationships as neither side can perform without the support of the other.

Further ideas that open the black box of interdependence and can be breakthrough to the issues of interdependence-power linkage and why interdependence stabilises power rest in the distinctions of symmetry and complementarity of the relation:

> *It is possible that no healthy equilibrated relationship between groups is either purely symmetrical or purely complementary, but that every such relationship contains elements of the other type. It is true that it is easy to classify relationships into one or the other category according to their predominant emphases, but it is possible that a very small admixture of*

complementary behaviour in a symmetrical relationship, or a very small admixture of symmetrical behaviour in a complementary relationship, may go a long way towards stabilizing the position. Gregory Bateson in "Culture Contact and Schismogenesis" (1972, p. 70)[25]

(ii) Political consequences of high but disjointed interdependence

Next epistemological distinction shall be made between interdependence in power relation among the finite number of parties and interdependence in power distribution of the social system of group, business unit, or the organisation. *For a reciprocal power relation between two parties*, Thompson's (1967) framework is constructed in such a way that interdependence patterns are embedded, so that the dynamic of reciprocal interdependence includes the dynamics of sequential and pooled interdependencies (see Table 2.1). Given multiplicity of options for structuring in order to achieve one goal, reciprocal interdependence can be represented with two interlocked sequential interdependencies (schedules) when one party cannot move without output from another; in such a construction the possibility for intense power is evident even if the relation is balanced. *For a condition of high interdependence within the organization*, it is even more difficult to distinguish whether power is diminished or intensified. There are indications for politics intensification (Proposition 1.9). This case is treated in the empirical analysis and discussion part of the thesis, particularly in Chapter 5 High but Disjointed Interdependence: Technology and Practice of Its Coordination yet without a final answer.

Politics of fragmentation and disjoint: difficulty of gaining power at the bottom

Fragmentation of social structure (e.g., federalisation of the IT function), fragmentation of business processes, fragmentation of activity and attention at work, and observable fragmentation of software (e.g., contributes to divisibility to use in incremental delivery) – all make power sources disparate for getting things done at lower organisational levels. Those fragmentations are compensated with information systems' capability to enhance remote presence with robust, immediate and far-reaching controls, which has a reverse side of strong logics built in the software that gave it behaviour of its own. Highly interlinked complexes of human workers, organisational arrangements, and technological facilities (actants) emerge for coordination purposes and have their own behaviour. Because it is difficult "to disagree" with a computer system, the actants of large software packages and

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[25] Bateson continues with an example of such stabilisation: the squire is in a predominantly complementary and not always comfortable relationship with his villagers, but if he participate in village cricket (a symmetrical rivalry) but once a year, this may have a curiously disproportionate effect upon his relationship with them.

IT infrastructures pose difficulties for effective power-action by individuals AND even generate their own politics, as illustrated in the section Independent politics of information systems (actants): ally or enemy in Chapter 2. The forms of disjoint, behaviour of highly interdependent socio-technical systems, and similarities between actants and complex power resources are considered further with Interdependence-Contingency Perspective on Technology and Organisation and its empirical application.

Intensified risk-balanced exhausted politics on disparate power resources: a pattern

First, conventional reorganisation, interdepartmental coordination, promotions and transfers involve the most intense power uses (Pfeffer 1992, pp. 35-37). People selection and coalition management are the ultimate controls top executives have in guiding and coordinating their companies' strategies (Quinn 1982). Organisational restructuring includes change of design and positions (e.g., creation and termination of projects, teams, and liaisons), change in policy, job definition and incentives, and routine day-to-day change in opinions and options. Second, disembodiment and actants fulfil coordination purposes but do not ease the institutional tension between centralised operational core and professional periphery. The tension increases as new multiple "operational cores" are encouraged to become profit centres (i.e., semi-autonomous economic agents) and knowledge-intensive operations (Child and McGrath 2001). Third, as restructuring with new units and federalization of the IT function is utilised for politics intentionally (e.g., putting a new initiative into a separate unit is a political key to success, and cross-project appointments are means of negotiation), politics intensifies.

Proposition 1.9 (Intensified Politics) Contemporary organizational forms based upon modularity and heavy ambidextrous networks contribute to intensified politics.

If intensified politics do not necessarily contribute to power outcomes and resources, then

Proposition 1.10 (Risk-balanced politics) High but disjointed interdependence produces unexpected linkages and ramifications through technology and contributes to risk-balanced rather than resource-balanced politics.

Proposition 1.9 and Proposition 1.10 should be interpreted with the most detail possible in terms of the routine politics of life that is embedded in rational action but not necessarily in one purposive way, for example, designing data structures, views and triggers in the databases has consequences but performed without reflexivity of such consequences. Risk-balanced politics creates zones of high volatility of power use with quicker than usual depletion of power resources in the case of unsuccessful use.

Proposition 1.11 (Intensified Exhausted Politics) As new cores and peripheries compete for the attention of top managers and interdependence disjoint makes power sources disparate to individuals, the coalition and political activity might intensify but not affect tangible power outcomes (e.g., resources, reputations or strategy).

Top managers' logics and (organisational) interests that are present remotely with rigidifying effectiveness, pooled interdependence, technological interfaces instead of human relations, actants with their own politics, and modularity of organisational design in general – all make power sources disparate and risky to individual agents. As the landscape of power sources becomes rugged and agents fall into local optima, strategic issues become trapped in local solutions – semi-efficient practices of software use. Simply, it becomes difficult to mobilise power resources from the lower organisational levels but not from the top. But even the simple power specialization, activation and conditioning model shows that power concentrated at the top is less applicable. Information systems make "top power" more reaching out and effective, but IT-controlling and information management contribute to further skew of power.

9 An Overview

> *I continue to think that the components of the broader concept of power are researchable and that there are better reasons for seeing power in an all-embracing way than for not doing so. Steven Lukes (2005, p. 111)*

This Chapter 1 conceptualises power in an all-embracing way, yet it makes precise definitional decisions and uses ideas of incrementalism and interdependence in order to make power theory practical. The section on Power and Interdependence is not a closure to Precision for Power, it is a transition onto the next part of the research model, Interdependence-Contingency Perspective on Technology and Organisation developed in Chapter 2.

The sequencing of Chapter 1 Precision for Power is intentional. First, in order to show how power is defined in terms of its outcomes and consequences, domain III of "the properties of the effective power process" was described first (starting p. 51). Second, domain I of power processes with *the power-action model* specifies different kinds of power exercise and frequency relations among them (p. 54). The power-action model was developed as a micro-level, process-based and practical tool. The application of the power-action model immediately encountered the skewed distribution of various power resources, and turned out to the discussion of Pareto Dynamics in organisational change, strategy formation, sensemaking and cognition, technology management, information systems delivery,

implications of software for innovation, and emotional labour (p. 65). Third and only then, the patterns of domains I and III were re-iterated in order to describe domain II of power resources of reputation, positional differences and interdependence imbalances (p. 101). This way of studying power in resource allocation is reverse to institutional and reputation approaches.

This Chapter explicated several presuppositions and epistemological distinctions which the authors of diverse traditions used in order to grasp power, and adopted a simple definition of power for getting things done. This Chapter achieved satisfactory mapping of the domains of power studies that it proposed. Most importantly, this chapter developed two promising models of 'the power-action' and 'incrementalism' beyond conceptual. These models were supported by the Results Driven Incrementalism method for software implementation devised by practitioners. The constructs of incrementalism were summarised by the modelling review of strategic management research and include presuppositions of agency and successive interlocked sequences and necessary political layer in the meta-strategy of incrementalism. The modelling has started to enquire what is deeper than incrementalism that makes it a powerful tool: psychology of project management, human cognitive biases, and ways of how modern software is designed. Making sense of practitioners' usage of the 80-20 rule, a simplistic form of Pareto Distribution, is the core of this Chapter that took the central place and main space.

Chapter 2 Interdependence-Contingency Perspective on Technology and Organisation

Interdependence in modern society has grown to such an extent that organizations have become fused into collective units whose very nature does not permit independent action. Astley (1984, p. 533)

Interdependence is a concrete pattern distinguishable by looped mutual causality, counter-balancing, and self-referential inclusion of the context. This Chapter, first, aims to re-specify interdependence further using advances of complexity studies, cybernetic thinking and epistemology, yet in simple terms; and second, develops a simple map of what constitutes qualitative interdependence studies in terms of key themes and distinctions.

Highly interdependent socio-technical systems, IT infrastructures, and actants acting on their own question feasibility of contingency theory. Given that social structures of the complex organisation are embedded and cyclic, is the structural contingency theory with its linear contingency-structure linkage helpful for studying ICTs, IT infrastructures or interdependencies encoded at the level of software architecture? These questions are explored by the end of this chapter and translated to the choices made in Research Methodology, yet the answers have to be sought empirically.

1 Interdependence

The literature on organisational design is abundant. Therefore, work focuses on identification of interdependence as a distinguishable pattern. For the purpose, the model selects the propositions of James Thompson (1967) about "action by complex organisation", the Big-O approach of considering organisation as a whole (Child and McGrath 2001, Heath and Sitkin 2001, p. 56) including "organisational superstructure" and embedded clustering demonstrated in the works on organisational design by Henry Mintzberg (1979, 1983).

Since the early 1980es the ideas about prominence of the interdependence and loops in the social structure of the organisation are noticeable. The notions of loops and mutual causality for social structure came from cybernetics (Maruyama, in Morgan 1998, pp. 234-235). A whole field of social network analysis both qualitatively and quantitatively was developed (see Wasserman and Faust 1994 for review). In operational research, the systems dynamics and soft systems are sub-fields that model the circuitry of systems. Today in 2005, the paradigm of network with its presupposition of horizontal causality

appears dominant in management[26], organisational design, information systems design as well as methodology (e.g., actor-network theory). The related paradigm of infrastructure (IT infrastructure) is based upon network but includes the presupposition of vertical causality. Both "network" and "infrastructure" are often used metaphorically and do not go beyond the image of some carcass and joints of interfaces.

The earliest attempts of making interdependence instrumental were reviewed by Kiggundu who distinguished initiated and received interdependence (1981, p. 502). Then, Bart and Blackburn decomposed task interdependence into one's own action, action of other, and joint action; they offered to assign a weight to each side of the relation and calculate various dependency indexes (1987)[27]. On a qualitative side, Tillquist et al. came with dependency network diagram as a qualitative modelling tool for IS design (2002, MIS Quarterly); they referred to resource-based view and offered a step-by-step algorithm for diagram composition that joins goals, activities, dependencies and governance controls in acceptable interdependence configurations.

(i) Interdependence as a subject of study: rationales

Such interdependence-based analyses and consulting practices including conventional business process improvement are limited tools for working with either organisational processes and circuitry. They are focused on task, workflow, and resource distributions without regard to what interdependence is useful for, specifically, looped mutual causality, counter-balancing, and self-referential inclusion of the context – the patterns that social relations demonstrate. Their *presupposition of "grasping only what is relevant to business" and quantification manipulations leave out political, psychological and cultural factors that actually make social relations a well-formed and healthy interdependence.*

Interdependence is viewed as an obstacle by the theories of economic organisation, because interdependence patterns and distributed work supported with information systems make it difficult to assign responsibility for success or failure for a product (Barney and Hesterly 1996, p. 127). Interdependence creates ambiguity about how much each agent contributed to the final output (Eisenhardt 1989). As a result of being out of economic and

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[26] For example, innovation management presents a networked organisation with holographic features (Morgan 1998; Quinn et al. 1997, 1998).

[27] Bart and Blackburn (1987) drew upon the works by Fry and McCann, and Galbraith that conceptualized interdependence through transactions or exchanges between units.

quantitative paradigm, the interdependence concept is not central to organisational analysis. The research tradition left it contained by triviality, simplicity, and measurement problems.

> *The distinction between social interaction and required task interdependence has not been made. ...And researchers do not include task interdependence as one of the core job characteristics. Kiggundu (1981, pp. 500-506).*

Interdependence analysis will advance information systems design for socio-technically complex organisations by means of "accommodating for the variance and uncertainty found in actual organizational life" (Tillquist et al. 2002).

(ii) Specifying interdependence pattern: definition and presuppositions

> *We need to know something about the occurrence of reciprocal behaviour in relationships. Gregory Bateson (1972, p. 70)*

Interdependence is about relationships rather than causality. "Any social system exhibits interdependence" (Forrester 1971). "Pure, one-sided, and one-dimensional dependence is rare in social systems" (Wasserman and Faust 1994). "It is often impossible or infeasible to separate a complex pattern, and a meaning is not possible to obtain without studying such patterns as a whole. However, patterns of interactivity can be identified and influenced: recognised, disrupted or reinforced as such" (Snowden 2002).

Proposition 2.1 (Interdependence Definition) The pattern of interdependence is continuous and self-referential balancing that offers advanced forms of relating. However asymmetrical, any social relation aims to develop itself to interdependence or breaks.

(Presupposition of Interdependence) No social relation can be completely asymmetrical, even if it is a self-referential relation. All parties participate in the relation with their own representation of purposes and circumstances and within the frames of social order (or social choice).[28] Because a developed interdependent relation can be affected in both ways, it is manageable. Hence, interdependence is a well-formedness condition for a social relation.

(Presupposition of Interdependence) Whilst circumstances affect a relation "from the outside", they only affect interdependence as a pattern through re-balancing its internal

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[28] Even the extreme cases of slavery and builders of Egyptian Pyramids were not asymmetrical social relations in practice, because "slaves" had guaranteed living and even medical attention (Martin 1977 and Child 2003).

dynamics, partly because the representation of "the outside" is a part of a developed social relation.

> *There may be countless interactions within and between systems... but there is no independent pattern of causation (Morgan 1998, p. 216).*

Self-reference and advanced forms of stabilising interdependence make it non-causal circuitry. The following quotation about impact of conscious cognition upon human epistemology propose why interdependence of human relations is grasped partially:

> *The conscious view of network is a... denial of the integration of that whole. From the cutting of consciousness [1+-7 chunks of conscious attention], what appears above the surface is arcs of circuits instead of... the complete circuits... interlocking circuits of contingency, while consciousness can see only such short arcs of such circuits as human purpose may direct. Gregory Bateson in "Effects of Conscious Purpose on Human Adaptation" (1972, pp. 142-143)*

Big-O approach of considering the organisation or production system as a whole is, in essence, one way of correcting the epistemological issues presented.

(iii) Pooled, sequential, and reciprocal interdependence patterns

The framework of *pooled, sequential and reciprocal* patterns of task interdependence is utilized from Thompson (1967) and explained in Table 2.1. The framework is operable with the following "short" presuppositions. (a) Organisational design can be represented with these patterns, for example, two units may have pooled interdependence for authority and sequential for production. (b) Certain configuration of patterns requires certain coordination means as empirically explored in Chapter 5 High but Disjointed Interdependence: Technology and Practice of Its Coordination. (c) Yet there is path dependence to the same goal, because it might be achieved with various organisation designs (i.e., multiple interdependence configurations and representations are possible), for example, sequentially positioned units may create an intermediary and operate in a pooled way, and the intermediary may be solely technical, for example, a well-tuned database with a report-generation instrument.

Table 2.1 Interdependence patterns

Interdependence pattern	*Cases and implications*
Pooled – units are interdependent with common core (individual work, pooled effort)	Each unit renders a discreet contribution to a whole and each is supported by the whole. Pooled units might have no communication among each other, but their joint effort is coordinated.

Sequential – units are dependent upon each other in task-performing sequence (cooperation, coordination)	Output of one unit normally serves as input for another—direct interdependence can be pinpointed between them. Units contribute to and are sustained by a whole, so there is a pooled aspect to their interdependence. Sequential interdependence is not symmetrical.
Reciprocal – units are mutually interdependent (mutual work, collaboration)	Output of each unit becomes input for others and vice versa (in other words units require input and provide output to each other within implementation of certain tasks). Units are penetrated by and pose contingency upon each other, so there are pooled and sequential aspects to their interdependence.

Interdependence patterns: implications for hierarchy and coordination

The framework of pooled-sequential-reciprocal is a conceptual tool that offers a set of trade-offs which may be used in order to simplify the relation between contingencies and organisational structure and coordinate (see also Methodology Note 6). For example, pooled-reduced interdependence in one place/level will require integration-increase in interaction in other place/lever – high task specialization is reconciled through complication of contemporary business process software. The framework presupposes the constant of the levels of interdependence around which the trade-offs are adjusted.

Thompson proposed organisation design occurs *according to interdependence patterns' complexity and similarity*. Complexity increases from pooled to sequential to reciprocal interdependence patterns. And interdependencies with similar patterns are grouped in clusters in order to facilitate coordination and decrease its costs. *The presupposition that organisations structure in order to minimise their coordination costs is central to most research organisational design and agent-based modelling.* Even if the research does not come from the field of institutional economics, that presupposition is mainstream thinking.

In Table 2.2, complexity of task interdependence is represented horizontally from top to bottom and similarity is represented vertically from left to right, which in this case is different from horizontal and vertical causality of organisational structure. *The principle of incorporation of interdependence circuits within a unit or cluster of units is not overt in Thompson's work but traceable in the concepts of localisation and conditional autonomy.*

Table 2.2 Interdependence patterns and hierarchy-specialisation

	Specialisation and positions	*Hierarchy and groups*
Reciprocal	Organisations seek to place reciprocally interdependent positions tangent to one another, in a common group which is local and conditionally autonomous (Thompson 5.1a)	When reciprocal interdependence cannot be confined to intra-group activities, organisations seek to link the groups involved into a second-order group, as localized and conditionally autonomous as possible (Thompson 5.2)
Sequential	In the absence of reciprocal interdependence, organisations seek to place sequentially interdependent positions tangent to one another, in a common group which is localized and conditionally autonomous (Thompson 5.1b)	After grouping units to minimize coordination by mutual adjustment, organisations seek to place sequentially interdependent groups tangent to one another, in a cluster which is localized and conditionally autonomous (Thompson 5.3)
Pooled	In the absence of reciprocal and sequential interdependence, organisations seek to group positions homogeneously to facilitate coordination by standardisation (Thompson 5.1c)	After grouping units to solve problems of reciprocal and sequential interdependence, organisations seek to cluster groups into homogeneous units to facilitate coordination by standardisation (Thompson 5.4)

Upon grouping horizontally by specialisation and vertically by hierarchy of nested clusters, the uncovered interdependence is coordinated by standardisation (e.g., rules and technological interfacing) and human interfacing (e.g., liaisons and committees) in somewhat interventional manner to interdependence circuitry (described in Table 2.3).

Table 2.3 Rules, liaisons and committees for coordination of interdependence

Coordination	*Case*
Rule	When higher-priority coordination requirements prevent the clustering of similar positions or groups, organisations seek to blanket homogeneous positions under rules which cut across group boundaries and to blanket similar groups under rules which cross divisional lines (Thompson 5.4a)
Liaison position	When organisations employ standardisation which cuts across multiple groupings, they also develop liaison positions linking the several groupings and the rule-making agency (Thompson 5.4b) (With the advent of IT, such rule-making agency specifies human interfacing into technological one.)

Committee *Task force*	Organisations with sequential interdependence not contained by departmentalisation rely on committees to accomplish the remaining coordination (Thompson 5.4c) Organisations with reciprocal interdependence not contained by departmentalisation rely on task force or project groupings to accomplish the remaining coordination (Thompson 5.4d)

Further Thompson's propositions concern with *organisational form.* When technical core and boundary-spanning activities can be isolated from one another except for scheduling, organisations will be centralized with an overarching layer composed of functional divisions (Thompson 6.3). Organisations designed to handle unique or custom tasks (which are most of today's service, professional, and financial organisations) base specialists in homogeneous groups for housekeeping purposes, but deploy them into task forces for operational purposes (Thompson 6.5). Being published in 1967, these propositions are in line with the matrix organisational form of the late 1980es as well as the recent advent of knowledge-intensive operational cores (Child and McGrath 2001).

Coordination in institutionalised task environments and the issue of causality

Thompson (1967) conceptualised task complexity via the organisational environment, which is an interesting epistemological move that negates open-closed distinction for organisational boundaries and suggests institutionalised isomorphic task environment. This occurs to be applicable to today's lower level of uniformed operations information technology-software packages across organisations. Thompson used two categories of homogeneity and dynamism (also conceptualised as change frequency, velocity, volatility of environment) of cause-effect relations that are true for certain task environment.

The ideas about homogeneity parallel the ideas about stable domains of known and knowable offered by Snowden (2002). In most human systems cause-effect relations may be complex and inexplicable, they are nevertheless manageable as patterns, yet in *chaotic* systems no such patterns are possible and "unless we intervene to impose them, they will not emerge throughout the interaction of agents" (Snowden 2002).

Table 2.4 'Old' task complexity by James Thompson and 'new' knowledge complexity by David Snowden: a resilient common sense

Snowden's domains of complexity	*Thompson's categories*	Under norms of rationality, organisations facing heterogeneous task environments seek to identify homogeneous segments and establish structural units to deal with each. (Thompson 6.1)
Stable (known and knowable)	*Heterogeneous*	
	Homogeneous	Under norms of rationality, boundary-spanning components facing homogeneous segments of the task environment are further subdivided to match surveillance capacity with environmental action. (Thompson 6.2) The organisation component facing a stable task environment will rely on rules to achieve its adaptation to that environment. (Thompson 6.2a) When the range of variation presented by the task environment is known, the organisation component will treat this as a constraint and adapt by standardizing sets of rules. (Thompson 6.2b)
Unstable (complex, chaotic)	When the range of task environment variations is large or unpredictable, the responsible organisation component must achieve the necessary adaptation by monitoring that environment and planning responses and this calls for localized units. (Thompson 6.2c)	

Task environments make sense because their homogeneity is encouraged and sustained by culture and institutions well beyond the organisational boundaries. The ideas of skilled labour by DiMaggio and Powell (1983) remain applicable to the task environments of IS implementation, in which agents are "likely to be homogenised, irrespective of whether management was planning or strategy-oriented, or inclined to react to contingencies" (Ciborra et al. 2000, p. 2).

(iv) Interdependence-based organisational analysis: initial operationalisation

Interdependence analysis is distinguished from other forms of formal and ethnographic network analysis by understanding that *interdependence is not trivial*, as well as any description of organisational structure that goes beyond formal authority hierarchy is not.

Methodology Note 6. (Non-triviality of Organisation Design) A study and representation of the social structure of the organisation is not trivial, even if the social structure is limited to one-sided task and information dependencies.

Separation of interdependence patterns into pooled, sequential, or reciprocal activities is an arbitrary choice made for best representation of social structure. Depending upon how researchers use the term, pooled interdependence might imply "sharing" with high interactivity and mutual adjustment, or "boundaries" with formal separation of teams and integration of their work by means of some information systems, which is supposed to foreclose political processes and contribute to efficiency. Interdependence patterns are not always possible or feasible to split by definition (see Proposition 2.1). Most of the patterns work across organisational levels and coordinate multiple goals simultaneously. Therefore, detachment of interdependence from its context bears the risk of unacceptable levels of abstraction (Snowden 2002).

Quantification of interdependence through its properties of centrality or criticality is also problematic. The assignment of "importance weights" or costs to the arcs of the interdependence circuitry has low validity (Bart and Blackburn 1987, p. 489). "One cannot use multiple regression, t-tests, canonical correlations, structural equation models, and so forth, to study social network data or to test network theories" (Wasserman and Faust 1994, p. 21)

Studying interdependence qualitatively: trade-offs and parameters

Focusing on one side of formal coordination, such as task interdependence or workflow of products, is self-referential, because it leads to deletion or distortion of other sides under the black box of nominalization of "task". The relation of authority consists of at least four sides, specifically, chain of command, reporting, evaluation and incentives, and responsibility – each might be distributed differently and have its own control systems.

A scope for interdependence-based organizational analysis is outlined in Figure 2.1 that is a map for studying interdependence. Some parameters of interdependence have already been operationalised into conventional measurements of social network analysis (Hickson et al. 1971; Wasserman and Faust 1994). *Centrality* or *pervasiveness* – the more linkages a network node has, the more central it is, and the more pervasive its actions are. *Criticality* – some importance of a linkage, for example, in terms of timely critical or otherwise scarce resource; criticality is frequently treated through the presuppositions of value. *Alternativity* or *substitutability* – are parameters of path dependency, the more alternative linkages are available in order to achieve the outcome desired, the more substitutable the relation is.

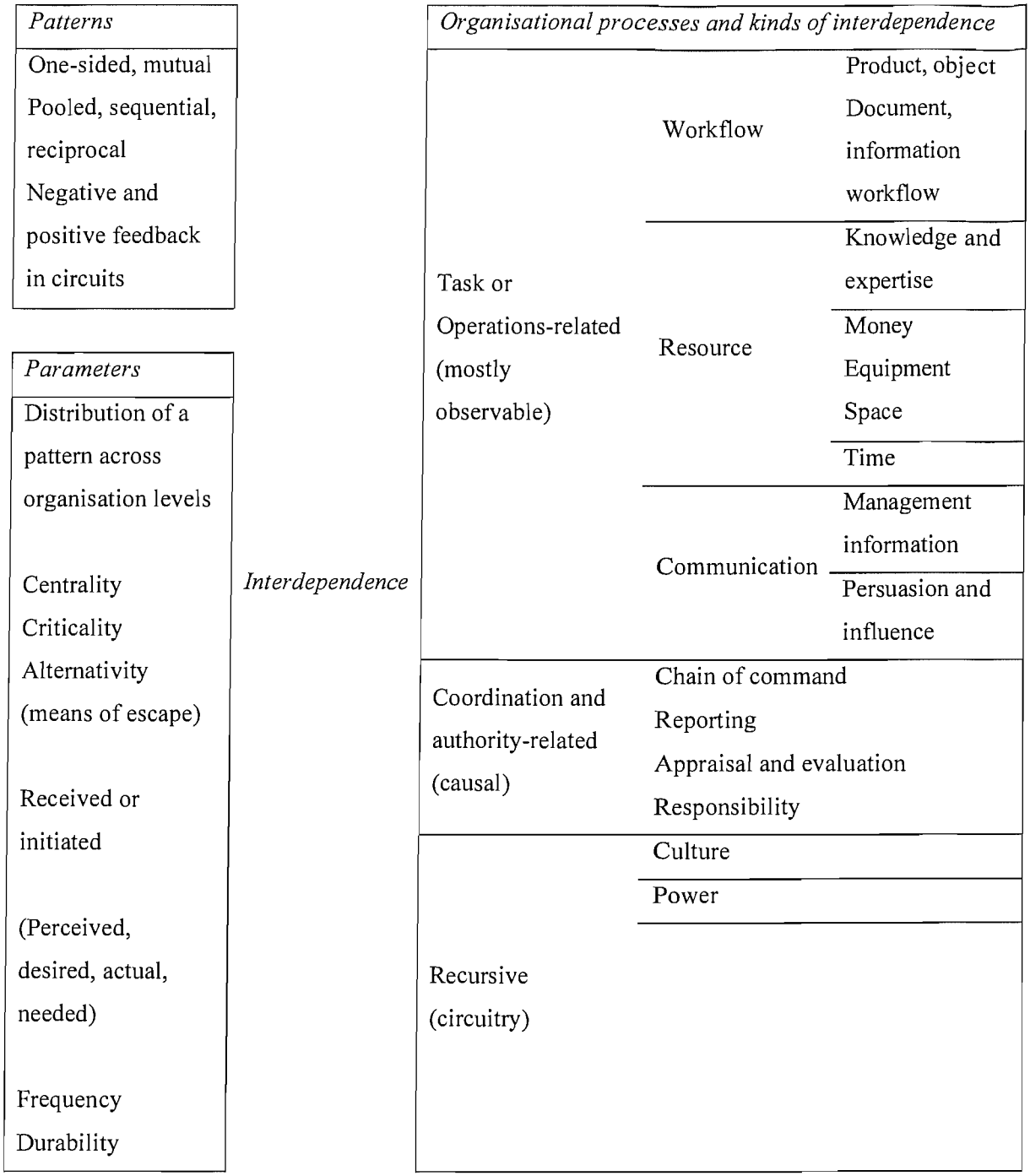
These parameters are translatable into crucial tests for power, such as mobilising for

getting things done (presupposition of an outcome) and irreversibility (presupposition of no means of escape). In political processes, fewer alternatives indicate riskier options, under such condition relationships enter the zone of drifting out of interdependence into intensified risk-balanced politics (Proposition 1.11) that contributes to ramifications upon seemingly non-linked or remote parts of heavy network. Also, there are "weak ties" and other IT-supported linkages, which were difficult to make before as quickly and easily created and which can remain surprisingly resilient or re-activated. Such interdependence is *dynamic interdependence* with short longevity, high frequency, and high activation.

Interdependence can be received or initiated. The initiator exhibits agency that contributes to emergence that might be desirable or not from the viewpoint of the organisation. Initiated interdependence is positively related to a person's responsibility for work outcomes, motivation and job satisfaction, whereas received interdependence results in dissatisfaction and lessening participation (Kiggundu 1981, pp. 503-506).

Cybernetic constructs for working with interdependence include positive feedback (the more-the more pattern) that typically increases variation in the system and might drive vicious circles and no-win situations and negative feedback that balances the system (the more-the less, or the more-the opposite/other pattern).

Figure 2.1 A map for studying interdependence



These distinctions are used conceptually and empirically through the thesis, several of them (e.g., negative/positive feedback and interdependence patterns) are applied in Chapter 5 High but Disjointed Interdependence: Technology and Practice of Its Coordination and considerable share of them is used in power analysis of Chapter 6 The Political Delivery of Information Technology. However, the distinctions are used selectively as appropriate, for example, responsibility is discussed in relation to end-users, whilst culture and resource dependence are applied to the solid grouping of IT

professionals and their function.

Chapter 3 Research Methodology describes how interdependence analysis and this map affected all techniques of data collection and basic analysis, particularly interviews and document search (p. 164). Actionable implementation of interdependence was done with Protégé software that allows building ontology, a specific data set, that served Advanced Qualitative Data Analysis (p. 182) as illustrated in Appendix 4 featuring dynamic browsing through different perspectives upon data that, for example, allow to look on interdependence including business processes from different organisational levels or different functional positions.

2 Contingency

(i) Presuppositions of contingency theorising: around rationality

Linking organisational characteristics, such as interdependence, to outcomes has always resulted in conflicting research findings because of the existence of contingency factors such as the environment, strategy, or technology that may affect the nature of the relationship (Child 1972; Fry 1982). Classic contingency theory defines contingencies as conditions under which we can expect to find certain organisational relations. Typical contingencies are size, technology and environment.

Contingency theory is useful economically, "*the costs of organisational operation at the end are much higher than they would have been, if uncertainties have been taken into account*" (Arrow 1974). *Uncertainty matters when there is a risk* and "*risks can be insured but uncertainties make risk allocation difficult*" (Arrow 1974). Absorption of crucial uncertainties is a strategic activity with far-reaching implications for integration, social structure and power in organisations (March 1988; Simon 1982).

The development of modern perspective upon complex but actionable organisations (Perrow 1979; Thompson 1967) with contingency and complexity theories (Donaldson 1996; Anderson et al. 1999) as well as economic modelling, that has much in common with modelling of physical science, turned out to presuppose the following:

- organisations and their participants act rationally;
- stable operation is the most productive (or stabilisation is the best way to seek productivity);
- inputs and outputs are stabilised and operational core is protected from contingencies

(where operational core is distinguished physically, for example, with product lines);
- coordination costs are minimised, particularly with stabilisation (i.e., presupposition of economising on coordination).

Organisational rationality is defined broadly, as selection of means that are appropriate in order to achieve goals selected; technical rationality is defined in terms of capabilities for such means (Thompson 1967). Contingency theories depend upon presuppositions of *cause-effect relations* and *decision premises* (Thompson 1967). Conditions that make a rational action possible are achieved by *removing as much external uncertainty as possible from operational and technological core*, particularly by reducing the number of variables handled and improving reliability (Shafritz and Ott 1991). Such kind of *rationality appears bounded*, because it can survive in presupposed conditions only. Yet the first problem appears when acknowledging rational environment for stable operations, "an organisation must remain flexible and adaptive to satisfy environmental requirements" (Thompson 1967).

These ideas shape "common sense" language in which we talk about organisations. Management of crucial contingencies is regarded as strategic management. Yet, contingency itself is a theoretical artifact and a problem-solving conceptual-technology-in-use (Jarzabkowski 2004), which only difference from consultancy frameworks (e.g., Five Forces) is that contingency-structure linkage is supported statistically for long-term and large samples of companies, which presents only one and high-level kind of cause-effect.

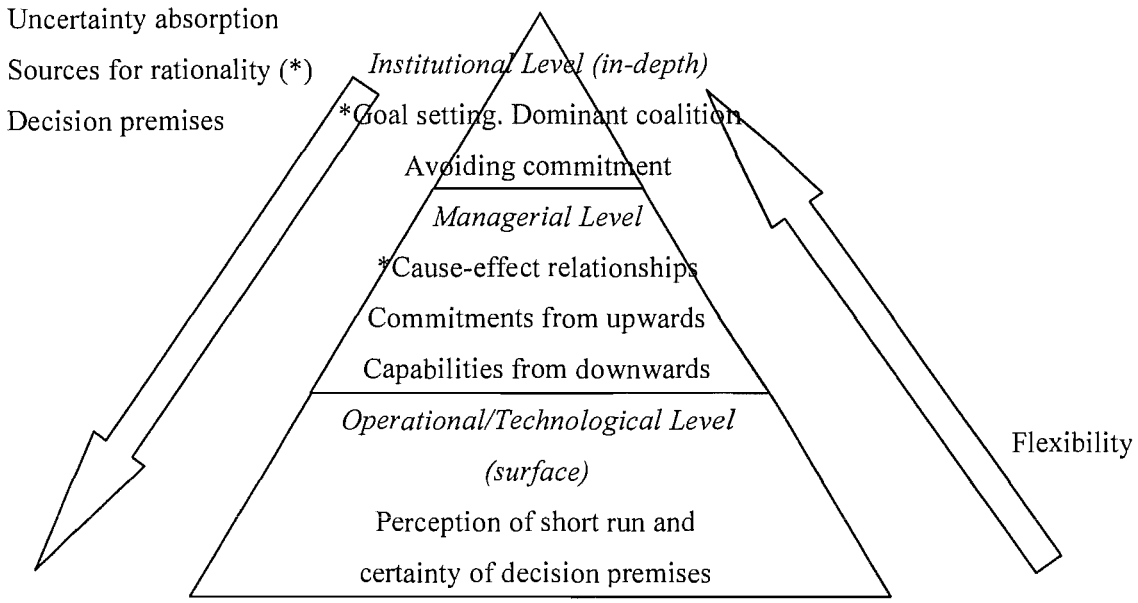
Rationality: integration of stability and adaptability through (organisational) levels

To resolve both demands for stable operations and adaptability to the environment simultaneously[29], Thompson (1967) offered the three-layered model of *institutional, managerial and operational-technological* (see Figure 2.2). Institutional activities are strategising, programme planning, vision and mission setting, or cultural change are commonly focused on environmental issues and are prerogative of top managers. Operational and technological activities are production, back-office, and information processing. Managerial level activities "iron out" irregularities stemming from institutional

[29] Stabilisation of operation inside the organisation and adaptation to environmental requirements from outside the organisation are processes that respond to two great stochastic processes discussed as a part of Pareto Dynamics of Strategic Adaptation.

level and unmet external contingencies as well as "press" the technological core for modifications (Scott 1992; Thompson 1967).

Figure 2.2 Levels of a complex organisation by James Thompson



Implication is that the same organisational characteristics (or variables) follow different rules at each of those levels, for example, authority is a chain of command on the operational level, a responsibility and reporting on the managerial level, and just a means at the institutional level on which incentives and pay structures set.

Figure 2.2 is an illustration of *how the contingency theory models how the organisation faces and internalises its issues*. Organisational environment (e.g., market, regulatory, or institutional) poses issues, which are handled with a set of "internal" structures including functional separation and task definition and prioritisation, business processes, and technologies-in-use. Internalisation of environmental contingencies is subject to the distortion of goal displacement.

(ii) Contingency theory for (information) technology research

Structural contingency theory offers several ideas on technology. First, technology has greater significance for the structure-performance relationship when organisations are small or technology is a "core technology". Second, impact of IT on organisational structure and performance is mediated with changes in communication (Galbraith 1995). Third, technological complexity and uncertainty increase communication load and information processing demands; therefore, adaptation of organisational structure and coordination practices is needed (Hatch 1997). In this work the "increase in communication" is worked through the observations of high interdependence, simply,

people need to support more work relations in order to do their jobs effectively.

Since the works by Woodward (1965), the contingency theory conceptualises technology in terms of technical complexity. Because information technologies vary in their complexity considerably (Dewett and Jones 2001), the usefulness of contingency theory in IS research is tentative. The study took some small specific probes of complexity of banking technologies in Alpha case, which contributes to commensurability with contingency analysis. Recent contingency theory attempts to correct itself by seeing technology as "a mediating factor" (to statistical correlations between structures and outcomes) but not an infrastructural carrier. But, communications, tele-working, and change in employment relations make *the organisation technology*, because all work and significant share of coordination are performed in the medium of their computer information systems (Malone and Laubacher 2000).

Does it make sense to study IT on terms of contingency-based organisation theory?

Today, when operations are embodied in computer-based information systems and human work relations are disembodied, revolutionary and unanticipated impact of information and communication technology is yet to happen upon operations (Drucker 2000). The work medium of IT systems and infrastructures incorporates old operational core. Under these conditions, does contingency theory apparatus remain useful? Could it be usefully adapted for contemporary conditions of pervasive use of malleable information technology? These large questions can be narrowed down to a few following practical questions:

- What does it mean for IT to be the organisational technology?
- Do operational core, organisational rationality and their protection remain valid as conceptual tools?
- What sense does the division into institutional, managerial and operational levels make (Figure 2.2), as employees deal with contingencies beyond their levels?

Core technology versus organisational technology

The concept of core technology (operational core, technical core or technological core) was introduced to distinguish the operational technology for producing goods and services from other technologies that support major production processes or help to adapt to the environment (Hatch 1997). The literature does not separate the core technology across organisational levels and specialisations and puts knowledge, procedures and routines in that one concept, so that "core technology" is itself a socially constructed concept that does not match a set of concrete physically or electronically interdependence technologies, such as communication networks and software.

The concept of organisational technology seems to be different from core technology. Organisational technology reflects technologies that intertwine most operations in such a way that (a) technology serves cross-functional coordination and (b) technology becomes inseparable from organisational design, value chain, strategic plans and the like. It becomes difficult to assign responsibility for getting capability and value from technology, and conventional distinctions and "no strategy" condition do not help to sensible categorising of information technology in practice (p. 92). Technology of Coordination case of the on-line live business process material in Alpha organisation approximates what organisational technology is. Organisation technology includes IT infrastructure(s), technology of coordination, and technologies-in-use.

Protection for operational core? Knowledge-intensive operational core. Multiple cores

"Operational cores" were production processes that required protection from crucial contingencies (Thompson 1967). With the advent of knowledge economy, traditional operations operate with diminishing returns, such as physical goods, whilst knowledge-intensive operations operate with increasing returns, such as knowledge (Arthur 1996). It is estimated that not less than 80 per cent of the price of a good is the cost of knowledge or information processing (Quah 2003). Child and McGrath (2001, p. 1144) pointed out that operational cores become increasingly populated with knowledge workers and professionals and coined the term of knowledge-intensive operational core. As new kinds of expertise crystallise at the edge of business operations and information systems, the cores multiply and disjoin. Even the IT function becomes disjoined into (1) IT infrastructure support and (2) software development and topped by (3) some mini-function in charge of technology-in-practice and routine business operations support—the three cores were observed in the case of Alpha in addition to conventional split of banking operations into (4) branch sales and customer service and (5) centralised transaction servicing and call centres, with the total of five "operational cores" with their own management.

Operational and knowledge-intensive distinctions in "organisational cores" contribute to ambidexterity of organisational design and core-periphery separation. First, Child and McGrath wrote that under such multiple cores, outstanding organisational members in terms of power, creativity or expertise are the periphery because they possesses less actual reach towards operations and grassroots business issues (2001, p. 1145). Second, multiple organizational cores lead to multiple sources of crucial uncertainty from inside the

organisation and increase in coalition activity, contributing to politics (Proposition 1.9). Third, continuous and consistent argument is devoted to insufficiency of the information processing capability of authority hierarchy (Child 2003, Child and McGrath 2001; Dodds et al. 2003).

Protective function of the organisational form and the subject of protection

> *As buffering becomes less feasible, scholars need to offer theories that can help organizations cope with, even embrace uncertainty. John Child and Rita McGrath (2001, p. 1144).*

Thompson's theory of complex organisations postulates that organisations seek to seal off their core technologies from environmental influences by surrounding with components of organisation structure that provide inputs and resources and remove outputs in order for the core to function efficiently (1967). However, traditional function of the organizational form, specifically, to protect from external uncertainties, seems to be no longer primary.

If a complex of information technologies including software and communications adopted for particular use in particular organisation is to be imagined as "technology of operational core", then such core might need protection in two ways: first, stability of systems running including reliability and security, for which IT people are held responsible and second, continuity of use to business advantage including integrity and timely provision of management information, for which business functions are held responsible. The mass of end-users participates in both activities, and sometimes either responsibility is shifted to them (as Alpha case will show) – the move of policy-based assignment of responsibility is an effective 3rd order power-action in order to manage amorphous networks. Responsibility shift might be effective preventive and indirect measure but it does not guarantee the stability of technology. Operations with IT are vulnerable to individual agency and subject to unexpected ramifications, when the action by one may affect the entire core information system and work of many employees (Baskerville and Smithson 1995).

The most common way of new protection for the new operational core of IT infrastructure is the crystallisation of some core out of a federalised IT structure, which was Systems Operations Support in Alpha case. Needing boundaries and protection, an IT infrastructure is stabilised through interconnection and interfaces. Furthermore, the purpose and value of any IT infrastructure lies in the provision of stable high interconnectivity among a variety of subsystems, databases and so on across internal and external organisational boundaries. Here is a paradox, *needing protective custody by expensive IT staff, the IT infrastructure is stabilised through high levels of interdependence both technical and social, and the high*

levels of interdependence being mediated by technology, first, are not obvious, and second, bear ramifications. Such paradox breeds "new contingencies."

3 "New contingencies"

(i) A source of new contingencies (and a beast on its own): IT infrastructure

The concept of IT infrastructure refers to the configuration of some physical communications, hardware, and software, also defined as a computer platform (Greenstein 1998) that is standardised and professionalized enough to be perceived to operate in "production mode"[30] and analysed as a single unit. "IT infrastructure" is a term that is used to represent (a) high socio-technical interconnectivity (where all social interdependence is portrayed as technical) and (b) capability and advantages of integration and manageability of the whole organisation, which any IT infrastructure is supposed to bring. In a recent report on "10 Capability Clusters of IT infrastructure" from MIT (Weill et al. 2002), the capabilities of IT infrastructure are presented with the following clusters: IT Infrastructure Services—Applications Infrastructure, Communications, Data Management, IT Management, Security and Risk, Architecture and Standards, Channel Management (industry interfaces, IT channels to customers), IT R&D, IT Education, and IT Infrastructure Facilities Management.

Michael Earl extended the metaphor of architecture in order to describe and manage IT infrastructure (1989) with the following advice: the frameworks (of IT infrastructure) guide the organisation in satisfying business and management information needs, but the infrastructure is unlikely to be set in concrete, detailed way, when all of its elements are planned for a long time. IT infrastructure or architecture are *to be used but not achieved*, in other words, these are communication concepts rather than things in reality. *IT infrastructure itself is a framework or interpretative scheme* for major technological decisions and conflict resolution, *a set of decision premises that is used in order to maintain requisite stability, tackle complexities, and manage trade-off among achievable short-term benefits and long-term core and competitive advantages that risk never be achieved.*

---

[30] Notice the continuous use of the language of "old" factory production systems and contingency theory that was born in the study of such systems.

Information systems are often analysed and designed as highly *modular*, just as organisations are often analysed as bureaucracies that are decomposable along hierarchical lines. In fact, "information infrastructures are always deployed within ramified webs of externalities and interdependencies. ...It is too simplistic to cut through such interdependencies with the old, industrial-age models shaped by the principle of functional, hierarchical decomposition, and the six [empirical] cases seem to confirm that" (Ciborra et al. 2000, p. 2). IT infrastructures are build in *embedded* fashion, which makes a purposeful design difficult if not impossible over the long term. "An infrastructure is designed just as much through side effects... as through any efforts aimed deliberately at designing the infrastructure. The dynamics created by unintended side effects turns infrastructures into independent actors... which again are 'designing' other actors" (Hanseth and Braa 2000, p. 126).

Methodology Note 7. Despite modularity, production logics specified, and explicit design documented, IT infrastructures have their own behaviour, as the following review shows:

(The power of initial conditions for deterministic chaos)

- Never built from scratch

(Hierarchical embeddedness and its path dependency)

- Larger components are built upon smaller ones.
- Layered upon each other.
- If one component is changed, others need to be changed or redefined.
- Same logical functions might be implemented in different ways.

(Networks of users-installed bases. Self-sustainable ecology)

- Develop through extending and improving installed bases (e.g., groups of users that have interests in different aspects ranging from operational systems to CRM applications).
- "An infrastructure is an evolving shared, open, and heterogeneous installed base" (Hanseth 2000, p. 60).
- Connected and interrelated, constituting ecologies of infrastructures.
- Socio-technical actor-networks.

The list is sorted from small to larger chunks and was modelled from a volume of empirical studies of IT infrastructures of large and diverse companies (Ciborra et al. 2000). Given these characterisations of the IT infrastructure and its specificity to organisational context, it is possible to understand the major implication: IT infrastructure is impossible to test in advance. "The diffusion of information and IT infrastructures has its own accelerations or slowdowns, in ways that are only indirectly correlated to the decisions

made by the resource-owners: delays, unintended consequences, sudden oppositions and always imperfect attempt to align all the stakeholders [peripheral incrementalism]. The interplay between intervening factors is too complex and no model can capture the dynamics and their final outcome, which remains open and highly dependent upon local circumstances" (Ciborra et al. 2000, p. 7).

> *Technology not only helps us to build enhanced or more flexible control systems, it also creates risks and unpredictable side effects that transfer faster and wider. Hanseth and Braa (2000, p. 54).*

Larger in the scope of functions and in the amount of interconnectivity, *IT infrastructures are built with the presupposition of getting more control* over the organisation and its cross-boundary production systems, supply chains, and value chains. Yet, more interconnected networks are harder to change, and the probability of side effects increases. That leads to less actual control over both controlling technology itself and the organisation (Hanseth and Braa 2000, p. 126). High interconnectivity also drives isomorphism and same institutional practices across various organisations, which might be good for the firms of one size but not the other. However, the presupposition of controlling with technology is sucked by positive feedback whirlpools of high interdependence, so that the effectiveness of strategic IT controlling becomes a function of good relations with the IT function. The conclusion here concurs with Ciborra et al. (2000), specifically, IT infrastructures tend to drift rather than to be controlled and to help to coordinate.

Institutional features that information technologies and the infrastructures of them bring are well beyond the scope of the work. Whilst information systems researchers argue for organisation-specific approach towards IT management depending upon the degree on sophistication of IT services required, specific business strategies, structure, culture, size, and industry (Earl 1989; Markus, in: Davenport et al. 2000), literature on strategy, innovation and IT diffusion describes or implies usefulness of institutionalisation (Butler and Gibbons 1997a, 1997b; Munir and Jones 2004; Orlikowski 2000, 2001; Whittington 2002; Zollo and Winter 2002).

Independent politics of information systems (actants): ally or enemy?

One illuminative example of how far IT infrastructure can drift, is an illustration that it can be a political actor, member of coalition, ally or enemy. The actant of IT infrastructure is an obstacle for gathering power resources and mobilising actions by other agents, which need to create additional linkages in order to deal with new contingency. The following example is also a case of how independent politics of technology at 1st order of power-

action is not reachable with 3rd order premises, which creates nonlinearity.

Secondary data case of SAP installation in Hydro Agri Europe, which became a large infrastructure (Hanseth and Braa 2000, p. 143) showed how SAP first served the top management by playing the role of a powerful change agent. Later on, SAP was an ally of local managers and end-users by helping them to bring the change process under their influence and to their preferred speed. But as SAP installation and configuration was integrated into a larger corporate infrastructure, it became everybody's enemy by resisting organisational trans-formation.

(ii) Evidence for new contingencies: high but disjointed interdependence

The interdependence of IT infrastructure (emergent and driven by IT infrastructure design presuppositions) is well beyond the technical. First, the main design principle of IT infrastructure is to provide as many linkages as possible—through interfaces among business software applications, databases, the Internet, and infrastructures of other organisations and industry. Second consequentially, the more reach infrastructure provides the more valuable it is, for example, integration of investment, credit scoring, mortgage illustration, insurance, post office address database, and alike services to the edge of one customer service application available at bank branch. Third consequentially, stability of IT infrastructure depends upon strong interconnection of its elements within routinisation of technology-in-use; by positive feedback, the more opportunities infrastructure offers the more there are durable typical technology uses (p. 179) – this cycle eats up flexibility, so that next technological change (e.g., new computer platform or large software package) typically come on discontinuous basis to the adopting organisation (e.g., structure and practices change).

For organisational form, IT contributes to increasing interdependence by virtue of abundant functionality, connectivity, and new opportunities for different forms of co-working and coordination, particularly across boundaries. Such *interdependence increase* is empirically characterised by *frequent restructuring* and the following patterns. First, new linkages are established easily and without regard to transaction costs (Williamson 1996), because the most of such costs become insignificant, yet new linkages are usually "weak ties" that have limited durability and reliability and are not controllable by the main authority hierarchy; thus, they are difficult to trace for both managers and researchers. Second, *the pattern of integration is shifted from specialisation and buffering, to invading micro-level routine operational activities and pooling the outputs with technology*; which

relies upon technological mediation and modularity that are presupposed to be flexible (see the review of generic means of coordination and integration). Third, cross-functional and professional conflicts, that are frequently deep institutional conflicts, are brought into overt consideration, particularly through the crystallisation of multiple cores and organisational periphery.

The difference between "high" and "not high" interdependence? The power law!

A proper modelling requires at least a heuristic that separates highly interdependent systems from others. Having reviewed the literatures about IT infrastructure, social networks and actor-networks as well as organisational design and form, it became evident to the author that the threshold high interdependence has been passed, so that we deal with some new phenomena that can be formalised with the following initial proposition:

Proposition 2.2 There are constant of requisite interdependence and threshold of high interdependence.

Whilst, it might not be feasible to seek the numerical value of these constants for social systems, it is useful to presuppose their existence, and use them as leverages for thinking about organisational form and understanding nonlinearity patterns of high interdependence. Some constant level of interdependence is requisite for productivity of a given organisation. Such requisite interdependence can be shifted to horizontal relations that become heavy networks, vertical relations that become elaborate hierarchies, specialisations, IT infrastructure, but it remains constant for a given system. If the constant of requisite interdependence changes, the nature of the system changes, which becomes evident in the "system's behaviour" whether empirically or by agent-based modelling.

Proposition 2.3 (High Interdependence Formalisation) High interdependence is defined using the power law heuristic in relative way, specifically, if there are more than 1,000 relations in a system of 100 agents, then there is high interdependence.

For example from Alpha context, dealing with 10 non-weak regular work relations on a daily basis is a considerable task. On a continuous basis, an ordinary employee (for example, in a call centre or bank branch) interacts with his or her supervisor, a local team of few colleagues, and maybe rarely a person or two from professional functions (e.g., for CRM or mortgage purposes), which constitutes less then 10 regular work relations.

Initial consideration of highly interdependent socio-technical systems: nonlinearities

Having certain definition of high interdependence that echoes the condition of high interactivity for appearance of Pareto distribution, it is possible to put together further heuristics about how a highly interdependent socio-technical system behaves.

(Nonlinearity of High Interdependence: (Technological) Disjoint). Technological mediation and forms of interdependence disjoint are called by various names, for example, disembodiment (Child and McGrath 2001), remote presence (Giddens 1984), collective distributed action (Orlikowski 1992), technical intermediaries and liaisons (Malone and Crowston 1994) and fragmentation. There are common means of discontinuity behind those forms of disjointed interdependence. The main implication of disjoint is that, "if people do not realize their interdependence, they are not likely to undertake mutual adjustment or collaborate" (Morgan 1998, p. 185).

(Nonlinearity of High Interdependence: Disjointed Specialization). Disjoint with technology of coordination offers an opportunity to reinforce task specialization. "The greater the task specialization [pooled with IT], the more likely there will be disagreements" (Pfeffer 1992, p. 42). As the organization becomes more complex, division of labour increases and each focal person increasingly depends on others for overall role fulfilment (Kiggundu 1981, p. 501). It is logically obvious that specialisation increases levels of interdependence of the organisation as a whole; what is not obvious is that information systems tend to fail the expectations of dealing with both new levels of specialisation and interdependence.

(Nonlinearity of High Interdependence: Unexpected Ramifications) Social and technical disjoint directly leads to the situation, when ramifications are hard to predict, which is especially the case with IT infrastructures (Ciborra et al. 2000). Actions taken by one player in a highly interdependent system can have unforeseen and far-reaching consequences for other actors (Child and McGrath 2001, p. 1139). A change in one component of a far-interdependent system produces unpredictable changes in others, thus leading to coordination problems (Majumdar and Venkataraman 1998).

(Nonlinearity of High Interdependence: Unexpected but Bounded Organisational Design). It is no surprise that nonlinearity of high interdependence "provokes increasingly complex and differentiated internal structures, which tend to be unique to each organisation" as 15-year study of two large pharmaceutical MNCs by Malnight (2001) reports. A proprietary organisational design is a result of the following tension: whilst complexity of the task environment pushes for elaborated structures, uncertainty and volatility urge for flatter structures that are supposed to react quicker and have more efficient dependencies (Hatch 1997). The tension, however, does not rebuff requisite high interdependence that is

shifted to horizontal level at the cost to front-line workers who then need to support more work relations in order to maintain their productivity. Buffering and disjoint of the organisation have their limits in both the constant of interdependence (Proposition 2.2) and the extent of effective practice – this study starts to explore how much formal controls can be built into behavioural practices and coordination.

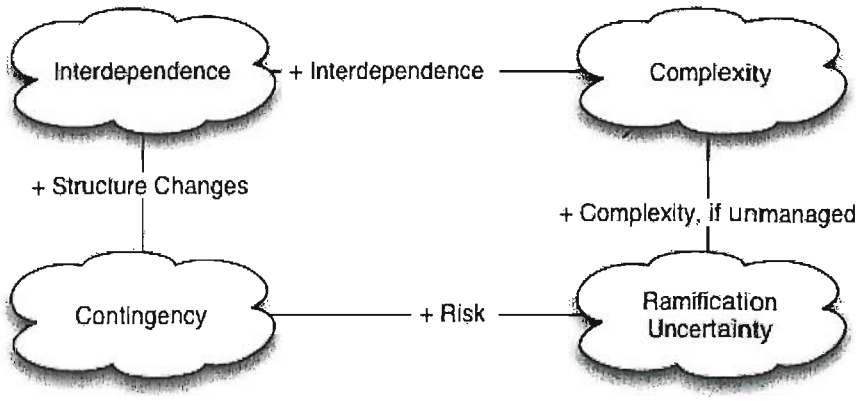
(Nonlinearity of High Interdependence: Heavy Network) High interdependence is also known as heavy network with increased inertia and decreased capability for change. "Heavily networked organisations might find their dense connections an unexpected liability, particularly if this density encourages the fallacy of centrality" (Weick 1995, p. 3)[31]. Fallacy of centrality is easy to appear, as interdependence is disjointed, pooled, and mediated by technology, and as disjointed interdependence is less noticeable to its participants and those who are supposed to manage strategically. Fallacy of centrality is also over-protection of its own position by an organisational unit to the degree that the firm-level integration of capability becomes overlooked, which is the case for the IT function in Alpha and elsewhere. Blurred boundaries and high interdependence undermine the construct of operational core, which is hard to find in a heavy network with many horizontal relations occurring because of the choices of technological disjoint.

4 An Overview: points for interdependence management

If complexity rises, people increase their interactivity in order to share expertise and co-ordinate, as immediate natural response. If the increase in requisite interdependence is not managed, it leads to proliferation of problematic contingences (Salancik et al. 1980; Thompson 1967), risky uncertainty and stochastic ramifications that are not amenable to conventional forms of planning (e.g., non-incremental project management and tools of strategic analysis, such as Five Forces or BCG grid). Modelling with scenario building and probability-based approaches can help, but they themselves require considerable commitment and resources.

[31] "Because I do not know about it, it does not exist."

Figure 2.3 Abstract circuitry of highly interdependent socio-technical systems



This high-level dynamics of high interdependence are illustrated with Figure 2.3. The danger of the dynamics is in its positive feedback linkages, each of which can drive the system to the condition of vicious circle. Complexity management, the most feasible intervention point, received much appreciation from academics as well as from practitioners. In Alpha case, management pursued quasi-management of operational complexity, i.e., without regard to the complexity science but as they naturally perceived the situation. Other points of intervention do not seem as effective: if interdependence increases, then it is too late to intervene, and if risk and ramification are at stake, then risk-balanced politics intensifies and (discontinuous) restructuring becomes inevitable (Proposition 1.10 and Proposition 1.9)[32] and shifts the whole system into a new state. Risk management do not appear as a preventive approach.

The presupposition that technology itself might give more control in highly interdependent socio-technical systems fail (Ciborra et al. 2000), for example, in Alpha, effectiveness of strategic IT controlling became a function of good relations with the IT function, a function of politics. This is an illustration to the problem of cause-effect thinking about authority hierarchy, a rational tool with its limitations: even if cause-effect relations are continuously imposed by managers by means of their stable decision premises and serve for certain local optimum efficiency, the causality of human organisations is "distorted" by the circuitry of mutual causality loops with positive and negative feedback, advanced forms of reciprocal relations, and other patterns of interdependence. As a result, representation of only arcs of organisational circuitry with mathematical (but not probablistic) functions is flawed, because highly interdependent socio-technical systems

[32] As in the case of power definition, a careful treatment of high interdependence is of a catalyst. Such treatment does not presuppose cause-effect.

accept no linear independent variables: a free variable will eat resources and flexibility and the system fail. This is showed by the findings that work tends to expand to fill all the time available (Appendix 3) and that dynamics of IT infrastructures and IT human resources is continuously (or discontinuously) balancing on the edge of scarcity (Appendix 8 and scarcities that drive political delivery of information systems p. 88).

This Chapter discussed the shift from contingency to nonlinearity of highly interdependent yet disjointed socio-technical systems with infusion of complexity thinking. First, the contingency-structure model was developed for explanation of statistical correlations in unified data sets collected by means of survey, across many organisations, and over considerable time. Therefore, the contingency-structure model can serve only to register consequences of interdependence. Second, the main conceptual tools of contingency theory, specifically, the observation that the organisation develops multiple levels, the presupposition that that levels are based on authority hierarchy and rationality, the presupposition that there are cores needing protection, and the contingency-structure linkage are of small value to studying information technology in use and meet the "new contingencies" of highly interdependent socio-technical systems. The nonlinearities of high but disjointed interdependence fit each other in a patterned way that indicates new phenomena of the stage four emergence, specifically, self-purposive coordination actants with their own behaviour and role in organisational politics. Third, the contingency theory offers no model of how organisational levels emerge and work altogether. Forth, the presuppositions of contingency theorising explicated are useful for making medium-range theories commensurable among rather than guiding empirical studies.

New contingencies require new models that actually can be build from old well-known constructs, such as the stabilising role of negative feedback, the proposition that hypotheses are only arcs of context, and the formal heuristic of the power law between size and embeddedness found for highly interactive systems. Re-mapping of interdependence studies was necessary and its initial results were presented by Figure 2.1. The power of inertia of the contingency theory in mainstream thinking about organisations and the problem of grounding organisational levels in cause-effect authority made the next Chapter 3 Research Methodology sophisticated.

Chapter 3 Research Methodology

It is unlikely that we will understand the topics of organisational change or interdependence without understanding how these processes take place among individuals, groups, and the organisation as a whole; such topics are less likely to lend themselves to simple studies that correlate a laundry list of behavioural valuables. Heath and Sitkin (2001, p. 56).

1 Organisation Analysis: basic choices for research strategy

(i) Big-O approach: definition and tests

Why should an (information systems) researcher notice "the organisation"? The reviews of organisation studies and information systems research call for *studying the organization as a whole*. Self-referential political and strategic processes as well as the problematic status of causality in the circuits and loops of interdependence indicate that the organisation cannot be represented as a chain of relations or a network of separate parts, because the organisation is a self-determining pattern possessing a logic of its own and representing the environment within its logics, such as the logics of business processes and decision premises (Morgan 1998, p. 216). The entire functional or production systems should be analysed in order to generate sensible propositions (Child and McGrath 2001). Yet, not much empirical research implemented the Big-O call thus far. Organisation studies suffer from the problem of the lack of integration and the problem of extreme treatment of the context with most of the studies being either maximally context-free statistics or too contextual interpretative cases (Heath and Sitkin 2001). In information systems research, it is known that technology requires cross-functional arrangements in order to contribute to productivity (Ciborra et al. 2000; Markus 2004; Zuboff 1998). The fields of information systems and computer science consider a range of behavioural or information management issues (e.g., technology acceptance, HCI or groupware), whilst much less empirical research is done about how technology is relevant to what coordinates people together in the organisation, makes them specialise and prioritise tasks, create hierarchies, and share resources and issues.

Core competencies test of Big-O approach is met as this research draws from multiple organisation theories and research methods in its own unique combination of Lenses (see Figure 1.1). This work employs variance and process research strategies, develops specific properties of organisational process, and applies meta-triangulation or less formal juxtaposition (Lewis and Grimes 1999; Hatch 1997) to the concepts, theories and frameworks of different paradigms, perspectives, and subjects of organisation studies.

Organisation centrality test of Big-O approach is met by this research by continuously relating IT issues (e.g., software use, infrastructure, technology management) to coordination, interdependence, top management's decision premises, strategy process, performance and other central organisational issues. Both research model Chapter 1 Precision for Power and Chapter 2 Interdependence-Contingency Perspective on Technology and Organisation focus on same issues of organisational design for getting things done.

(ii) Conventional research strategy? A preview of multi-method

If one would look for a conventional research strategy and part of methodology that responds to the research questions specifically, it has started here with Big-O approach as a main heuristic and continues in (Basic Data Analysis) Making a case: data collection and generation (p. 164), where, first, research setting and case samples are justified and described, and second, generic techniques of data collection, specifically, documentary analysis, interviews, and elements of ethnography are explained in appropriate detail. Techniques for alignment of choices (p. 142) section introduces the special techniques applied by this research and provides the direct relation between research the questions and techniques actually carried out in Table 3.2.

The work presents one full in-depth case study done (Alpha Case) and another empirically started and mostly document-based case study with few live and e-mail interviews, one report by fellow colleagues who were kind to answer questions, and access to the company's electronic discussion forum (Scandia case). In order to improve research quality the work used secondary data for control and comparison including industry reports and the detailed cases of similar financial organisations as well as IT infrastructures.

Case study method was applied in order to prepare focused subject cases out of two large exploratory cases of a financial organisation (e.g., the cases of increase in interdependence, examples of technology of coordination and incremental political delivery of IT services) (Eisenhardt 1989; Orlikowski 1992, 2000; Yin 1989)[33]. Participatory *ethnography* was done in order to grasp the work and practices of software use at the banking branch workplace and to a lesser degree in the headquarters (Zuboff 1988). *Engagement with live banking information systems* was applied in order to develop understandings how

[33] The referent textbooks and studies are given in parentheses.

employees could interact with those systems, learn them, and build their routine work arrangements using them (Huxham and Vangen 2002; Eden and Huxham 1996).

Technological detail? The study is a commonly limited information systems research. First, the work does not offer architectural diagrams of the IT infrastructures or banking software studied because of their commercial confidentiality, relation to security of real IT infrastructures and the lack of space. That, however, is insignificant to the quality of Big-O research because of doubtful analysability and representational value of such information (Ciborra et al. 2000), for example, attention to the thousands of facilities of Microsoft Office would not contribute to a specific organisational research, because users apply only some facilities for concrete purposes of non-technical origin. Second, the work operates with systems' logics as a whole unit of analysis with only some features described as necessary. These limitations do not prevent linking systems' logics with its behavioural implications upon end-users in the formal context of their workplace, such as activity fragmentation. The necessary degree of technological detail is preserved, and computer-literate reader will easily recognise software and functionality.

Sophisticated methodology? The fair share of sophistication of Research Methodology is a due regard to well-specified epistemology, updates to the structural contingency theory, and improving methodology for studying practices: whether behavioural practices of using software and interacting with co-workers, generic practices of institutions, or thinking practices of organisation theorising. This line of argument develops from Organisation Analysis: advanced choices as Presuppositions (p. 149) to Configuration of organisation theories for the purposes of the research: Lenses (p. 156) to (Advanced Qualitative Data Analysis) Practice Lens (p. 174) and (Advanced Qualitative Data Analysis) Interdependence analysis (p. 182) as mature methods.

(iii) Configuration of paradigms for the multi-method research

Use of multiple methods is possible with an explicitly designed modular approach, basically, each research theme is developed within its own paradigm and appropriate methods and techniques. Cross-paradigm steps require clarity in epistemology and sophisticated methodology like this one, which basically happened because this research uses both structural variance and process approaches as well as both positivistic and interpretative techniques—as it appears in the language of the current philosophical paradigms of social theory (Morgan 1980) that are also applied in information systems research. Table 3.1 provides the overall framework for which methods from which

philosophical paradigm are used. The modularity is possible in the following general ways:

(1) Selective application of the constructs and theories from various paradigms. For example, the constructs of postmodern perspective are applied to the research question of activity fragmentation and work organisation in bank branches but not to complexity.

(2) Some theories and method are applied with due regard to their home paradigm. For example, structuration theory and ethnography are located within the interpretative and inter-subjective perspective, whilst contingency theory and regressions for the study of organisational design are located in the positivistic paradigm—the results of interpretative methods are discussed separately from the results of company's own survey.

(3) Some methods were developed in versions that vary from paradigm to paradigm or left undefined. The in-depth case study appears more as interpretative and critical method, whereas comparison of multiple case studies along defined lines appear more as positivistic comparative analysis.

(4) Basic techniques of data collection and analysis can be architecturally separated from the ideas about the paradigms with their assumptions. There are generic techniques, such as interviews and documentary analysis, output of which can be analysed interpretatively, linguistically, or built into a formalised data set (see Table 3.2 for techniques).

Table 3.1 Research assumptions and methods from the paradigms of social science

	Symbolic-Interpretative perspective	*Positivistic (Modern) perspective*	*Critical perspective (with elements of Postmodern)*
Ontology	Socially constructed (through communication and language) multiple shared realities	Objective generalised reality determines social construction by constraints	Contradictions and conflicts are indicative
Epistemology	The position of observer as a part of what is observed (first, associated). Organisations are as much constructed by theories as represented by them. Practice.	The position of observer as independent or meta (third, dissociated or forth, associated) Routines.	Multiple positions that might have physical meaning

Methodology	Inductive (critical literature review with easy juxtapositions, theory generation). Qualitative methods. Phenomenology	Deductive (theory analysis and verification of hypotheses). Quantitative methods (if data allows)	Metaphor Reflexivity Deconstruction Fragmentation
Data collection and basic data analysis	Semi-structured interviews Observation, participation and other ethnography elements	Documentary analysis Questionnaire survey Descriptive statistics, multiple regression, stochastic models	Attention to conflict Engagement with actual systems

Epistemological shortcuts: preserving concurrent description from multiple positions

Dealing with the large scope of literature, theories, and business issues preserving knowledge of descriptions from multiple positions would not have been possible without *epistemological shortcuts*, which the paradigms of social theory do not grasp.

First shortcut is classic *epistemology rooted in cybernetics and the works by Gregory Bateson*, which offers the tools of logical levels, natural hierarchies of communication and learning (e.g., single and double loop learning), questions of "how do you know" kind, biases of purpose and selective partial representation of consciousness (e.g., only arcs of patterned circuitry), positive and negative feedback loops, distinctions between map and territory, as well as thinking in terms of restrictive conditions and inverse variables that bound randomness and deterministic chaos to stochastic (Bandler and Grinder 1975; DeLozier and Grinder 1987; Bateson 1972, 1979). Second shortcut is Transformational Grammar with the developments of Meta-Model and Syntactic Environments for Identifying Natural Language Presuppositions in English, old tools of *psycholinguistic analysis*, that were applied in the search of presuppositions behind organisation theorists' thinking as presented in their writing (Chomsky 1965; Grinder and Elgin 1973; Bandler and Grinder 1975). Third shortcut is insights of *complexity studies*, specifically, the power law heuristic, concept of scale-free networks, and distinctions among kinds of nonlinearity, such as, deterministic chaos (i.e., ultimate impact of initial conditions) and irrational incrementalism (i.e., consistency that promotes success eventually leads to failure). The danger of dragging physical world's presuppositions of complexity studies is met by previous two shortcuts, and alternative and better ways of borrowing from physics and science are demonstrated by this work, for example, with the model of spectrum.

These three epistemologies provide shortcuts among what is important, what constitutes a pattern through the complexity of highly interactive socio-technical systems, and the complexity of studies of such systems (specificity). These shortcuts as well as behaviourism have a tool of "black box" in common, which application is perhaps best illustrated by the field of linguistics that studies rule-governed human behaviour of language with through simple input (surface language structure)—complex processing (transformational derivation)—simple output (surface language structure). A generic chain of the "black box" tool looks like *Simple(Surface)—Complex(Deep)[Multi-level, Nested]—Simple(Surface)*. Researchers have simple same-level inputs and outputs, for which they develop transformational models. For example, such sequence is similar to a research that observe practices and infers models of strategising in organisations.

The idea of knowledge that comes from preserving the differences of *descriptions from multiple positions* structures this thesis. Both research model Chapter 1 Precision for Power and Chapter 2 Interdependence-Contingency Perspective on Technology and Organisation focus on the same issues of organisational design for getting things done. Research Methodology starts with the meta-position of organisation analysis: Big-O approach on focusing on the organisation as a whole and juxtaposes several organisational theories as Lenses of configuration analysis (Figure 1.1). The section Circumstances of research on power, technology and information systems as well as Chapter 6 The Political Delivery of Information Technology use at least the viewpoints of the IT function as a group of professionals, end-users as unorganised abstract groupings, top management teams, and the organisation. This satisfies the epistemological well-formedness condition of minimum double description (Bateson 1988; DeLozier and Grinder 1987).

Inductive-Deductive Recycle

In terms of induction and deduction, the research was transformed through the following sequence: theoretical induction with the reviews – theoretical deduction with the research model – empirical induction with the interviews and data collection – and empirical deduction with drawing conclusions that can be useful for daily management practice: the model of incrementalism as process management methodology applied in IS implementation projects and the advice on overloaded software is offered by this research.

Karl Weick (1989) offers two choices of theory construction: either concurrent development of concepts, propositions that state a relationship between at least two

variables OR contingent propositions whose truth or falsity can be determined by experience (a non-contingent proposition is a straightforward mathematical deduction). But both choices are in double bind: researchers cannot make deductions from concepts and definitions alone AND sensible theory must be designed to highlight relationships, connections and interdependencies in the phenomenon of interest (Homans 1964, in: Weick 1989).

Middle range theories are solutions to problems that contain a limited number of assumptions and considerable accuracy and detail in the problem specification. To look for middle range theories is to prefigure problems in such a way that the number of opportunities to discover solutions is increased without becoming infinite (Weick 1979, 1989). The following steps of building middle range theories were advised by Weick (1989): partitioning of the topic under investigation, review of literature, construction of theory-induction from empirical base, extension of theory-deduction into propositions, elaboration and conclusion. Any theory is a simplified generalization about how and why the world works (Lichtenstein and McKelvey 2004, p. 22). Semantic Conception of Theories, a post-positivist epistemological approach, proposes that rather then explaining actual real-world behaviour, theory is meant to explicate "idealized behaviour" found in models, just as the power-action model or interdependence patterns does, and they shall be treated as such as proposed by consideration of usefulness of micro-macro connections for power-actions and interdependence (p. 155).

At this stage, this theorizing uses the advice presented in the Special Issues on Organization Theorising of the Academy of Management Review, Volumes 14 and 24: develops middle range integrations and "contingent propositions" that are stable findings verifiable by experience. Most deductions are done primarily after empirical analysis-some propositions were re-formulated after the advanced data analysis. This theorising accepts continuous and discontinuous moves back and forth between intuition (induction) and data based theorizing (deduction).

2 Techniques for alignment of choices

(i) Techniques: reviews and the elements of linguistic analysis

Meta-triangulation of knowledge and data from research literature—also known in its loose forms as juxtaposition, meta-analysis, and critical literature review—is significant component of this research (Lewis and Grimes 1999; Hatch 1997). The following samples of organisation studies were reviewed specifically using electronic reading notes

organised by authors and categories (in Microsoft Outlook), electronic databases and citation indexes (e.g., ISWorld eLibrary, GetCited, ICI, JStor, Ebsco, and Ingenta) and linguistic analysis:

- literature about power and the articles of information systems field by "politics" and "power" keywords;
- incrementalism in strategic and project management;
- organisation design and form (related to interdependence);
- applications of structuration and socio-technical analyses;
- coordination practices that are generic to business organisations

The review of generic coordination practices borrows from common sense professional expertise of the author and is a continuation of the review of computer-based coordination means by Malone and Crowston (1994). Case studies (Argyres 1999) and textbooks by Applegate et al. (2003) and Davenport et al. (2000) were used for that review.

The reviews of power studies, incrementalism, and technology-in-practices (mostly by Orlikowski from 1992 to 2000) were performed using psycholinguistic features of Transformational Grammar and Meta-Model of twelve language patterns good for specifying questioning and noting deletions, generalisations, and distortions in the Surface Structure of natural language (Chomsky 1965; Grinder and Elgin 1973; Bandler and Grinder 1975, Chapter 4). The analysis focused on referential indexes missed as well as uncovering presuppositions and nominalizations defined formally as follows.

Referential index (e.g., singular and multiple pronouns) indicates position from which the description is made[34]. Interview preparation and e-mail follow-ups were used for recovering the referentiality that is crucial to investigation of interdependence and power (Methodology Note 4), for example, an interviewee might give a position of his or her own, or their current team, hidden coalition, professional group or business function, or the entire company, the latest is a fairly rare case of wisdom.

[34] "Position" is a nominalization as well as each pronoun is. Impact nominalizations upon epistemology and thinking of organisation theorists (e.g., impact of nominalizing process via event) is beyond the scope but not awareness of this work.

Presupposition is an underlying assumption that is necessary for a well-formed sentence to make sense; the formal definition postulates that presupposition is true regardless of how positively or negatively representation is stated[35]. Syntactic Environments for Identifying Natural Language Presuppositions in English was used a tool (Bandler and Grinder 1975, Appendix B).

Nominalization is representation of a process by an event; there are true nouns with which we know how to operate physically (e.g., apple, paper document, or e-mail letter) and nominalizations (e.g., communication, decision, strategy, power); also there is a special class of nominalizations that does not have literal verbs describing process nominalized (e.g., event or perspective). For example, Wanda Orlikowski used terms "conceptual closure" of meaning and "stabilized-for-now", which are loose names for a formal pattern of nominalization. Furthermnore, the event-based conceptualisation of the process that is standard to contemporary organisational analysis is a classic case of linguistic nominalization.

(ii) Techniques: configuration of Basic and Advanced data collection and analysis

Given the *configuration* approach this research took in regard to both the philosophical paradigms of social science (e.g., positivist, interpretative, and critical-postmodern) and the families of organisational theories (e.g., contingency, institutional, structuration, complexity), *the basic data collection was separated from further analysis*. The input from the common data collection techniques was utilised by various methods, specifically, interviews-based interpretative account, a dataset in Microsoft Excel spreadsheet analysed statistically, a sample of 100 IT task requests for content analysis, and interview-based input for advanced qualitative data analysis (e.g., technology-in-practice, actor-network, and interdependence ontology). Consequentially, data analysis of this work has basic and advanced layers.[36] *The basic data collection* was largely ethnographic and included documentary analysis, interviews and social encounters, observations and site visits with,

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[35] Both sentences "the ideas of Pareto Dynamics are true" and "the ideas of Pareto Dynamics are not true" have presupposition that there are ideas of Pareto Dynamics exist.

[36] Creation of architectural layers is common in complex systems, including information technologies (e.g., network communications, the Internet, and IT infrastructure). Multiple layers allow satisfying multiple and even contradictory purposes and requirements. In this study multiple paradigms of social sciences and multiple organisation theories are configured through layers of data analysis and sequencing of Lens.

and use of data from company's own questionnaire surveys. *The advanced qualitative data analysis was intertwined with data generation* and features the following:

- Usage of necessary distinctions for researching organisation change, specifically, variance and process research, self-reference, core and periphery, micro-macro connections, and elements of critical analysis such as paradox and metaphor.
- Development of frameworks to use as techniques, specifically the technology-in-practice framework was elaborated into a table data set to fill out from the interviews.
- Cognitive mapping was used for drawing Appendices with reference to Rosenhead (1989).
- Semantic ontology-based representation of interdependencies was developed with Protégé software.

The lenses of organisational analysis presented on Figure 1.1 IT and the organisation: configuration analysis lens are calibrated with methods and techniques as presented in Table 3.2.

Table 3.2 Calibration of lenses: techniques and data analysis

Research area (purpose)	*Lens and constructs*	*Techniques and measurements*
Calibration of organisation theory for the purposes of this work: critical and integrative literature review and modelling reviews	Meta-triangulation Context-content, process and outcome Process, structure and boundary Necessary distinctions for researching organisation change (e.g., variance and process research, self-reference, core and periphery, micro-macro connections, and elements of critical analysis) Purposeful metaphors	Selected literature, specifically, Hatch (1997), March (1988) and Thompson (1967) were annotated with quotations, researcher's comments, and hierarchically organised summaries of their hypotheses and presuppositions. Use of Batesonian epistemology and Meta-Model (language patterns) for detecting presuppositions and nominalizations in the reviews of power studies, strategic management literature and incremental approaches, as well as technology-in-practice studies.
	(Purposeful break)	Use of hyperlink connections in the text.

Organisational design as a result of high but disjointed socio-technical interdependence (IT infrastructure)	Interdependence-Contingency Lens	Network traversal and cross-check of relations using interviews and the data set constructed using Protégé ontology (an object-based and hierarchically-organized data set) to represent the IT function of 60-70 people that produced above 900 distinctive work relations. Multiple regression with a co-variation check on project management data for the proposition that interdependence is main determinant for actual task priority in IS implementation (from among risk, high user interaction, and amount of stakeholders).
Coordination of IT function. Political delivery of information systems	Political Lens: the power-action model, power tests starting with Methodology Note 4	Further analysis of interviews. Content analysis of a sample of 100 IT task requests. Use of company-provided "performance statistics" of the central processing centre for banking operations (e.g., amount of tasks in progress sorted by their type). Limited analysis of financial documentation (e.g., IT budgets and budget procedure). Stochastic analysis for power-actions. Application of the power law heuristic.

Technology (software) use and activity fragmentation	Practice Lens: the technology-in-practice framework	Ethnography of customer services (e.g., branch workplace) Observer-as-participant in banking branches Engagement with systems Technology-in-practice framework as a technique. Use of results of two Alpha's own surveys about attitude-confidence and competence in systems.

(iii) Techniques: writing up this research

The format of the work as well as the configuration of theories and methodologies was affected by the "recommendations for theory manuscripts in information systems" by Zmud (1998) that offered the following chapters structure: research model development, implications, and connections to other theories. Also, for writing this text, the configuration of philosophical paradigms and organisation theories made impact upon the format of this work, that is made explicit in the following comparison between this work and a typical positivistic text as guided by the submission instructions of the Academy of Management Journal, the comparison is made in Table 3.3.

Table 3.3 Pinning down philosophical paradigms: differences and similarities to a typical positivistic text

A typical positivistic study	This study
Literature survey with focus upon one central theory or body of knowledge in linear manner (e.g., a line of argument).	Several reviews of literature survey juxtapose theories of complex organisation, contingency, institutions, structuration, "information systems" as well as approaches towards organisational design and power. Several tools are employed in text: Propositions, Methodology Notes, graphical frameworks, and various tables.
Hypotheses are formulated in self-sufficient and objectified language (and it is impossible to prove or disprove the hypothesis stated recursively).	The propositions of this work are formulated as means of guidance; some propositions include key definitions, relations (cause-effect or complex equivalence), or even patterns. Therefore, some propositions are supported with empirical data rather than logical proof and some propositions are extended with purposeful and designed metaphors (see also Micro-macro connections).

Surveys or other formalised data collection followed by statistical analysis.	Methodology includes "presupposition component" that lists the choices of organisational analysis that are outcomes of the selective configuration for the purposes of the work. Paradigms and common means of data collection are separated architecturally. Some ways of interpretative analysis are structured into Advanced Qualitative Data Analysis, in which frameworks were applied to data generation and analysis directly (i.e., used during the interviews or later in order to categorise data). Interdependence analysis was supported by Protégé software that contributes to robustness and validity of the analysis, because the structure of the dataset (ontology) was reference point for quality of data gathered (e.g., all linkages of an interdependence pattern), non-random exploration through the structured dataset (e.g., all linkages in accord to certain criteria were pulled up for writing up the empirical part), and dynamic browsing.

Methodology Notes

Methodology Notes are techniques of this research. They were designed to provide specific instructions on "how to know" in the context of research model. Methodology Notes reflect the research design choice of how much a theory ought to be contextualised usefully. Therefore, methodology notes contribute to understanding of the data and validity. Methodology Note 2 describes how to understand power as stochastic phenomena, Methodology Note 3 offers a set of questions about consequentiality and irreversibility which a researcher can ask in order to test for the presence of power, Methodology Note 4 provides that studying power from the viewpoint of the followers is more operational, and Methodology Note 5 reminds that use of power always leaves certain traces. The methodology notes were borne in mind while asking questions during the interviews and while analysing the data. The list of Methodology Notes ensues:

Methodology Note 1. IT is not only 'a source for power': the impact of IT upon power is neither completely random nor completely subject to how people use technology. It is best to reflect nonlinearities by the following statement: information systems create and constrain choices, structure the difference between 'actual' and 'possible', and provide actionable 'institutional memory' for power, for example, by information access privileges and system profiles for different job roles.....32

Methodology Note 2. Because the power of an action is defined by its outcome, strength (or impact) of the power-action can be equated to expectation of such strength (or probability). This opens a way of analysing power with probability distributions.....45

3 Organisation Analysis: advanced choices as Presuppositions

The map is not the territory. Gregory Bateson (1988)

This section offers the choices that are necessary for any organisation theorist to keep in mind. The reader might think of the section as a "notes of general guidance" or extract from organisation theory. Yes and yet, the extract is special in it provides a class of distinctions (e.g., process-structure, individual-context, contingency-institution) that are a safety net for theorizing. Another class of distinctions that those choices help to make is about "chunking of information" (i.e., what is larger and what is smaller piece of information) and about what is central, what is peripheral, and what is background of the analysis. In most of the cases of constructing a proposition or cause-effect linkage, an organisational theorist makes those choices implicitly. The sections ensuing present rules

that guided development of the thesis; they might appear poor in direct connections to the empirical material, which is a consequence of the presupposition way of presentation.

(i) Constructs, levels, and units of organisation analysis: epistemological glossary

The conventional *levels* of organisation analysis are *individual, group and organisation.* The focus upon practices directs this research towards individual and meso levels. As discussion of micro-macro distinctions for power and interdependence and practice lens point, focusing upon details and physical practices extensively some works still return to macro and use institutions as an explanation (e.g., Orlikowski 2000), which is recursion.

Structure refers to organisational structure (e.g., group, team, committee, liaison, director or other unit), which is the first meaning. In many instances term "structure" is used to refer to conceptually closed, stabilised-for-now, or nominalized meaning of anything taken out of "the organisation" (see means of discontinuity). Because of the duality of structure, anything can be structure, including but not limited to rules and controls, boundaries, governing rules of process, outcomes, relations, practices, tasks, events, and even language patterns can be solid durable organisation structures. Therefore, a representation of social structure, even in terms of one-to-one task and information exchange dependencies, is not a trivial task (Methodology Note 6). One implication is that considerable empirical discussion of interdependence analysis is spread through the thesis.

Boundary is structural concept that represents differences as well as transitions. Boundaries delineate and connect at the same time, more precisely, boundaries are interfaces that allow stable stabilised communication. "Depending how you look at it, any gradient [way of sensemaking, perspective] can be a boundary and any boundary can be a gradient" (Kurtz and Snowden 2003, p. 474). Boundaries are particularly important for accumulation of power in skewed Pareto-shaped distributions. After debate about "the organisation" and its relations with "the environment," development of institutional ecology, co-evolutionary change approaches, and simply the assumption of blurred boundary, the concept of "organisational boundary" appears tentative and artificial.

Action, activity, task, decision, and event (e.g., organisational structures and boundaries) are nominalizations of a piece of dynamics that has context, content and conceals patterns.

Process is "the fact of going on or being carried on, as an action, or a series of actions or events; progress, course (time-referenced). Philosophically used to designate the course of

becoming rather than being" (Oxford English Dictionary, OED). Organisation analysis methodology conceptualises process as either an explanation for variance models or a category of concepts or a developmental sequence of events (Van de Ven 1992), the first two are considered quasi-process, whilst the third is based on time (Sambamurthy and Kirsch 2000).

> *One of the most common examples of distortion in modelling is the representation of a process by an event. Within language systems, this is called nominalization. Richard Bandler and John Grinder (1975, p. 216).*

Outcome is "that which comes out of or results from something; visible or practical result, effect, or product" (OED). Outcome implies time by its definition, it is a result of something happened, where "happened" is measured by mapping it onto the timeline.

The frameworks of *context-(content)-process-outcome* (Pettigrew 1985; Walsham and Waema 1994; Orlikowski 2000) and with accent on boundaries *structure-process-boundary* (Pettigrew et al. 2000) are the ways of integration for a Big-O approach.

Practice is used by this work in phenomenological meaning first, for example, the observable practice of software use or institutional practice of IT support formulated in documents. Advanced treatment of practice is offered in Practice Lens (p. 160).

Pattern is a root concept, the highest-level linkage, or the most precise conceptual linkage available. Pattern can be a set of cause-effect linkages, a set of specific relations among humans that form interdependence pattern that work, a set of power-actions and their sequences that form a recurrent power pattern. The definition difference (and a presupposition) between pattern and statistic is that a practice-based pattern works at all times and a frequent issue is the configuration-representation of data that let rendering a pattern, whilst statistic (and hypotheses that it supports) means no pattern in the data responding to a statistical distribution or there are several patterns hidden.

Context or content?

Context and content are frequently and interchangeably used in organisation studies, whilst they are not interchangeable in this domain. Oxford English Dictionary provides the following definitions: *content* is that which is contained in anything, whilst *context* is a whole structure of a connected passage [phrase] regarded in its bearing upon any of the parts which constitute it; the parts which immediately precede or follow any particular

passage or *text* and determine its meaning. One distinction that useful for organisation studies is between what is in focus (content of change) and what is in important background (organisational, institutional, cultural or social context). Context is used to refer to central, determining or relevant circumstances that are subtle. Pettigrew (1985) defined content through an action (e.g., what, why and how to start), whilst context through circumstances for that action. In order to proceed with precision, Table 3.4 considers overlapped and frequent meanings of context and content in organisation studies.

Table 3.4 Context or Content?

Context and Content	*Meanings*
Context of organisational structures and processes	*Overlapped meaning*: organisational structures and processes are context for entity or situation. *Frequent meaning*: Circumstances that are contextual to organisational structures and processes themselves.
Content of organisational structures and processes	*Overlapped and frequent meaning*: elements and all that contained within organisational structures and processes. *Special meaning*: a sample purposive or intended part of organisational structures and processes.

(ii) Patterned research of organisational change: necessary distinctions

This work uses exploratory case studies and operates with patterns more than with variables. The propositions of this work are often pieces of empirically verifiable experience rather than linkages among variables (or variables are too complex and mutually causal to be considered so). Patterns are identified from relations among observable phenomena (e.g., patterns of task or resource interdependence, patterns of technology use, and each generic coordination practice is a pattern). Patterns are carved out from the circuitry. Patterns are generalisations; therefore, at some stage they are abstracted from practice and human relations and enriched with relations offered by organisation studies and models, for example, the power-action model and incrementalism propose Patterns of Power in Practice. To patterns definition in organisation studies, cognition and presuppositions, qualitative trade-offs of organising, and distinctions of organisational process are particularly guiding.

Distinctions for methodological process and variance (contingency) research

Process could be an explanation for variance models, a category of concepts, or a

developmental sequence of events (Van de Ven 1992), the first two are considered quasi-process, whilst the third is based on time (Sambamurthy and Kirsch 2000). Mapping sequences of events over time is logically different from mapping sequences of events over some tautology of cause-effect relations (Bateson 1988); in this regard the power-action model is only at initial stages of its process development, whist incrementalism is a developed process-based approach. Theorising that avoids strong assumptions about temporal sequences of events or provides indirect inferences about time is called "quasi-process" (Sabherwal and Robey 1995).

The research implemented its own instance of joint application of variance and process approaches following the guidance by Langley (1999) and Sabherwal and Robey (1995) who suggested the following ways of reconciliation: first, contingency variables could determine the appropriateness of alternative processes; second, casual ordering of relationships among a number of variables could represent a sequence within a process dynamics, and third, joint application, when the same data is analysed separately and the results are reconciled.

The data from the same Alpha case study was analysed using several approaches independently, specifically, interviews and observations were used for both, variance formulation of interdependence ontology and time-oriented formulation of certain practices of IT support, for which the factors of right timing, frequency of review, and sequence of actions (e.g., for software selection) was especially attended in order to test for power use and search elements of incrementalism. The impact of several stable decision premises and formation of technologies-in-practice were presented by their outcomes in patterned ways, which was different from "process via events" approach (see definition of *pattern*, p. 150).

Distinctions for organisational process: self-reference and periphery

Recursion of social processes was implied by Giddens in his definition of the duality of structure (1984), extended by Luhmann with the notion of autopoiesis for social systems that create models of their environment and interact with those models (1984). There is a step from recurrent institutional reproduction to recursion. The technologies-in-practice as described by Orlikowski (2000) are of the first kind, the political and cultural processes are of the second (Hatch 1997). What is different for political processes is their *self-reference:* they are directed towards themselves in addition to (or sometimes rather than) their outcomes and purposes. Power and influence are aimed at persuasion and at exclusion of the other influences in order to increase the strength of consequences. In the self-referential

closure, the context external to the process is represented within the content logics of that process, so that the process interacts with its own representations modifying them in the light of actual experience (Morgan 1998, pp. 216-217). In other words, the process *self-validates*, as a thermostat self-validates by the means of internal circuitry and negative feedback provided from within the system (Bateson 1988, p. 150).

Yet another useful distinction in working with organisational processes is between "core" and "periphery". The distinction is presupposed by the structural contingency theory with its operational cores and in this work, it is explicitly applied to incremental political processes of information systems implementation.

Useful steps for researching organisational change

Van de Ven and Poole (1995) offer the following basic taxonomy for organisational change: evolution, lifecycle, dialectic and teleology. In this thesis, the lifecycle model is used for structuring the material on waves of dynamic interdependence through the project lifecycle of IS implementation, and the teleology model was useful in linking "micro" practices of technology use to cycles of adaptation between technology and the organisation that follow the stages of (political) goal search, implementation, and update through dissatisfaction in practice – this is a useful interpretation of implementation of AlphaCoreIS technochange. Both the lifecycle and teleology represent sequences among events rather than causality. The book on ICI by Andrew Pettigrew (1985) was used as another template for researching organisational change with results presented in Table 3.5.

Table 3.5 Researching organisational change: useful steps

Andrew Pettigrew's advice	*Implementation examples with regard to the study of power*
Describe the process or processes under investigation	Specification of power processes with presuppositions of power studies from in-depth review and distinctions among epistemological domains of power studies
Expose in the above descriptions any variability or constancy between the processes	Formulation of the probability-based approach to power, consequentiality tests, and power-as-catalyst
Begin the analysis of the above processes by using existing, or developing novel, theories of processes	Development of the power-action research model, that particularly specifies relations between different ways of power application

Begin the task of pinpointing the levels of analysis in the context along with categories and variables	Modelling power resources with the heuristic of Pareto distribution. Modelling strategic management theories with the concepts of incrementalism Modelling IT delivery with both the power-action model and incrementalism
Begin the task of describing and analysing any variability across the contexts through which the process unfolding. Describe and analyse trends and developments in the various contexts through time	Studying technologies-in-practice and political practices of IT support empirically
Begin to consider the alternative criteria which can be used to judge the outcome of the process under study. Good sources to assist reflection in this problem are contained in the literature seeking to assess the success and failure	Domain III characteristics of the successful power process as power tests. Development of the ways of application of the "power law" heuristic in IT management

(iii) Useless micro-macro distinctions for power and interdependence?

1st, 2nd, and 3rd orders of power-action and pooled, sequential, and reciprocal patterns of interdependence could be considered as micro as well as macro. *Instances of ideal case* or *quanta* (micro): an ideal kind of power-action or interdependence does not exist in practice but is a useful explanatory construct. *Ideal cases* or *patterns themselves* (macro): pattern approximates a recurrent set of relations or "a piece of dynamics", for example, not all actions in a relation are reciprocated but the overall character is reciprocal.

The power-action model as a method: issues with causality and inaccessibility section (p. 60) proposed the purposeful metaphor of quanta that helps by showing implications of "ideal case" upon selection of unit of analysis. First, quanta are ideal cases, nobody observed or directly measured those quanta, yet a presupposition that such quanta with certain properties exist is helpful for explanation of the phenomena registered. Second, quanta are micro and macro at the same time: they are micro because each entity (atom that is a unit of analysis once considered the smallest possible) consists of quanta and they are macro because there is one same set of N quanta, out of which each atom is constructed. In similar troductive sense, an institution is a macro force, but micro phenomenon because institutional impact appears in each micro case, even it is only feasible to trace an institution over long term and a set of cases. Third, because quanta are transient, those two ways of treatment are interchangeable with but render the same unit of analysis differently

(e.g., as abstract or practical). Recursively, a small unit of analysis becomes an ideal case, if it is treated as final or the smallest possible.

Inductive-Deductive Recycle is a pattern to break out of theories as representations of idealised behaviour (p. 141). It is common to contemporary organisation studies and information systems research that *analysis goes in-depth of micro detail but at the end turns out to macro explanations*, such as referring to institutions. For example, most of the work by Wanda Orlikowski (2000) on technology-in-practice studied micro-factors of groupware technology use (e.g., software facilities and impressions of users) but ended up describing how institutional factors and interpretative schemes, to which mangers uphold as ideal, explain practice formation. This is not a confirmation to reality of institutions, but an illustration that most of the time and over long-term, it is profitable to act out of the powerful belief systems, as managers in Alpha did. Hence, the territory of the organisation is the map for agents with the skills of power.

(iv) Configuration of organisation theories for the purposes of the research: Lenses

The research selected concepts and presuppositions from various organisation theories and implemented *configuration analysis* (Child and McGrath 2001; Mintzberg et al. 1998). The *difference* from *contingency analysis* is rooted in method and techniques: whilst contingency analysis is based upon comparing variance of structure and context one at a time, configuration analysis is about (a) patterns of organisational change that occur in adaptive response to the environment, (b) the organisation as a whole because different aspects of the organisation make sense in relation to the whole (irreducible complexity), and (c) strategic action and learning that aim at integration of the co-evolution of internal and external stochastic that always has the risk of radical drift.

This section explains in which way the following extract of choices from organisation theories forms a system of organisation theorising, a belief system in which a social science researcher is likely to be indoctrinated without awareness. Those choices are joined as *Lenses*. Each lens has strong presupposition effect upon any phenomena: any strategy or IT issue being analysed through political lens will appear very much political. The purpose of lens is to focus and magnify. This section presents lenses in a designed sequence that shapes certain perspective of thought upon the organisation. Therefore, in configuration analysis, the subject of study is a function of specifity, a different kind of complexity.

Complexity: epistemological shortcut linking all Lens

The conscious and non-metaphorical approach towards complexity this work takes beyond

general reference to "task complexity" or "organisational complexity". This is necessary because of issues with multiple cause-effect linkages beyond authority hierarchy. The work applies heuristics of complexity science to a degree possible with organisation studies, specifically, the power-law, distinctions among kinds of nonlinearity and paradoxes. The work also relies upon the conventional presuppositions about organisational complexity made by Lawrence and (Lorsch 1968) in the form of the law of requisite variety—the more complex, uncertain and high velocity the environment is, the higher degree of internal differentiation is needed. That implies, first, the internal regulatory mechanisms of a system must match the diversity its environment (i.e., effective self-reference), and second, the internal element with the maximum variety will control the system.

An epistemological distinction to make is between *complexity and specificity*. Specificity is "complexity of description" that is function of a given natural, professional, or formal language (Edmonds 2000). The language of complexity studies one kind of specificity, the language of power theories is another kind of specificity, the language of incrementalism and process-based methodology is yet another kind of specificity, the language of contingency and institutional theories is lack of specificity. The research models and theories of this work are specified to such degree, that any but very small organisations will surrender enough evidence for studying the research issues formulated highly specifically.

Interdependence—Contingency Lens: to go beyond

The research design started with the structural contingency theory that sets the relation of contingency—structure (Donaldson 1996) hoping that the contingency theory would help to explain the landscape of interdependencies for a large IS implementation project. Methodological problem occurred as the contingency—structure model was developed for explanation of statistical correlations in data unified by a survey measurement instrument, collected across many organisations and over a long-term. Organisation theory proposes only limited resolve to the contingency—structure problem with introducing mediating variables into the linkage: communication impact of IT (Galbraith 1995; Hatch 1997) and institutions (Tolbert and Zucker 1996).

Whilst the variance approach is more popular in IS research rather than process approach (Sabherwal and Robey 1995), the contingency—structure model is less applicable in this enquiry into the cycles of adaptation between "technology" and "the organisation" that are patterned within and across various levels. This enquiry is mainly grounded in social

theory of power studies and socio-technical approach, including actor-network and structuration theories (Latour 1996, 1997; Giddens 1988), implementing which ethnographic, content analysis, and critical methods were applied. Whilst this enquiry uses the outcomes of surveys of end-users attitude and competence in systems and multiple linear regression for investigating how priority is "a function" of task interdependence in a small dataset on project management of business process implementation (Appendix 5), these techniques are complementary to practice-oriented research design.

An Overview: points for interdependence management (p. 133), conclusions to Chapter 2 Interdependence-Contingency Perspective on Technology and Organisation stated problems with the conceptual tools of the structural contingency theory, specifically, the constructs of multiple levels based on authority hierarchy only, and the contingency-structure linkage that fail in front of "new contingencies" of the nonlinearities of highly interdependent socio-technical systems. Therefore, as research strategy outlined, the fair share Research Methodology specifies questions and updates to Interdependence—Contingency Lens as well as goes beyond with improving methodology for studying practices (p. 136). These specifics are presented here, as this research concerns with advanced issues of at least:

- Identifying interdependences and their consequences for behavioural practices of technology use and power relations, using the framework of pooled, sequential, and reciprocal patterns of interdependence.
- Studying actual practices and technology of coordination "as is" and identifying complex agency of socio-technical coordination actants with their own behaviour.
- Tracing outcomes of liaising, interfacing, and disjoint and disembodiment.
- Considering implications of various process-based approaches in theory and in practice, such as streamlining of business processes across functions, working with cross-organisational value chains and production systems, and implementing information systems using incrementalism, such as results-driven incrementalism.

Further questions to contingency theory

How does the contingency theory relate to the constructs of *time*, *process*, *practice, pattern,* and *the organization as a whole*? How is an appropriate degree of abstraction (objectivity) combined with subjective interpretation and intersubjectivity?

What happens with contingencies as they are viewed through organisational levels? How do "environmental contingencies" transform into "operational contingencies"? How is the

resultant operational complexity handled with the patterns unfolding from practice to business processes to strategy? There is blatant difference between abstract contingencies as formulated by researchers and problems posed by practitioners due to displacement of goals, refraction of contingencies through interdependence, and conscious agency.

Is contingency theory ready for a study of the "new contingencies" of highly interdependent socio-technical systems, IT infrastructure, coordination actants, intra-firm markets, multiple operational cores, intensified risk-balanced politics and other features of contemporary organisational form?

Institutional perspective: isomorphism for the contingency—structure linkage

Imitation, normative influences, and other features of institutionalisation interfere with the contingency-structure research models that attempt to connect variations in structures and establish determinants of structure (DiMaggio and Powell 1983). First, external influences and internal organisation change may have no effect upon actual production processes, as in cases of legislation changes or development of strong social norms within an organizational network (Tolbert and Zucker 1996, p. 178). Second, adoption of formal structure can occur regardless of the existence of specific, immediate problems of coordination and control (Tolbert and Zucker 1996, p. 178). Third, "organizations are driven to incorporate the practices and procedures defined by prevailing rationalized concepts of organizational work and institutionalized in society. Organizations that do so increase their legitimacy and their survival prospects, independent of the immediate efficacy of the acquired practices and procedures" (Meyer and Rowan 1977, p. 340) with similar ideas in Martin (1993). As a solution, in the 1960es, organisation theorists already had retreated to the ideas of complexity and conceptualised it through descriptions of isomorphic task environments carried by skilled labour. Today in 2005, there is more than ever skilled labour of knowledge economy, yet alone with uniformed and market-like operations of standardised information technology.

Organisational Context over Individual Agent

The investigation review of the delusional distinction between technological determinism versus social construction concluded that *it is likely that organisational context shapes people. Interdependence-contingency studies* converge that factors of the organization and its context prevail at least in their direct outcomes over individual characteristics or capacities (Salancik et al. 1980; Kiggundu 1981). *Power studies* converge that "...whether the most critical source of power is individual characteristics or location in the organization? Although individual attributes are important, my view is that being in the

right place is more essential" (Pfeffer 1992, p.69). Resistance to MIS implementation occurs "because of the interaction of specific system design features with aspects of the organizational context of system use" (Markus 1983, p. 430). *Sensemaking and information strategy studies* converge that human agency and decisions are significantly mediated with organisation context (Choo 1998; Weick 1995).

Practice Lens

Attention to practices either behavioural and observable or practices of thinking or institutional implements a shift from "contingency" to "malleable IT" and patterning of organisational processes and releases bounded rationality presuppositions of the structural contingency theory and positivism of social theory. *The key presupposition of the practice lens is simple distinction between espoused technologies (as described in standards, packaged in a box, or just installed on a computer) and technologies-in-use* – the presupposition has useful applications and related presuppositions described in Practice Lens as a method for Advanced Qualitative Data Analysis (p. 174) that help to reconcile "context" and "individual agent" as well as "social construction" and "technological determinism" and move away from these delusional distinctions and associated cognitive biases of IS delivery (p. 94) that occur in people's best attempts to deliver, but actually delay delivery of somehow workable software to the workplace.

Practice and any action by an individual is (the) only observable edge, behind which deep complex transformations of "organisational", "social" and "institutional" reside in human mind. Depending upon conventional epistemology (e.g., positivist or interpretative), *practice* is defined as *observable and behavioural*, *generic and institutional*, or *conceptual and cognitive* (thinking habit) – the first pair takes practice as ontology (what do we know from observation), whilst the second and third take practice as epistemology (how do we know through practice).

High socio-technical interdependence and institutionalism of contemporary organisations created yet another new phenomenon registered as *institutional praxis* (Whittington 2002): a pool of practices accepted as standard (so deeply entrenched and readily used) that makes them "generic" and automatically applicable to most of organisations. Jarzabkowski (2004) describes content and time-paced dimensions of strategising praxis from which most decision-makers borrow standard procedures for making strategy, such as strategic planning, Five Forces, Balanced Scorecard, scenario planning, away-days and so on. Richard Whittington operaitonalises the concept of praxis as "an understanding of

institutionalised strategy practices is important to approaching any episode of strategy activity, and an exclusive focus on 'micro' is liable to neglect this larger dimension" (2005 personal communication).

Dualities and discontinuities

"Structural properties of social systems are both medium and outcome of the practices they recursively organize" (Giddens 1984, p. 25). Structures are enacted by agents recurrently (i.e., with certain frequency), and agents always have a choice of changing the structures that they enact (i.e., technology stability is provisional) (Giddens 1984). These ideas are known as *duality of structure*.

Duality of technology follows the duality of structure and can be presented with following examples from (Orlikowski 1992, p. 406): "technology is the product of human action, while it also assumes structural properties, ...technology is constructed physically and socially by actors in a given context and through the different meanings, ...however, once developed technology becomes *reified and institutionalised* (i.e., ongoing action of routine drawing on technology objectifies it), losing its connection with the human agents that constructed it or gave it meaning, thus, technology appears to be part of the objective, structural properties of the organisation".

Duality presupposes and invites discontinuity. Goal is different from its implementation, technology use is different from its design purposes, activity-as-observable-practice is different from its meaning and outcomes. *Time-space separation* transcends information technology. Other means of discontinuity include, first, conceptual closure, stabilized-for-now, and nominalization applied to meaning; second, remote relations when present are some interests of agent but not the agent itself, where agent could be human individual, institutional, or socio-technical entity (e.g., actant); and third, phenomena of weak ties, planning divide, interlocked formulation-implementation, or process-outcome. These conceptual tools assist in analysing patterns across organisational levels, uses of power for discontinuity, and collective distributed use of technology.

Critical management and postmodern perspective: stimulating reflexive thinking

The work's attention to power and paradoxes is an apparent tribute to critical management. The work selectively utilises the ideas of high reflexivity, deconstruction, and fragmentation, the framework is a result of refinement of the postmodern perspective of organisation theory literature, particularly Alvesson and Deetz (1996), Calas and Smircich (1999), Hatch (1997) as well as Jackson and Carter (2000).

High reflexivity is carried out with the attention to researchers and subjects operate in their contexts of the organisation, culture, and institutions; the organization or system as a whole; and high degree of specificity and associated attention to detail and self-reference.

Deconstruction is identification and reframing of assumptions and presuppositions, for example, reducing an argument to its basic assumptions, denying those assumptions by asserting their negation and considering what this implies about the original argument. Appreciation for multiple meanings achieved through different interpretative schemes. Contrary to deconstructive sounding of "deconstruction", deconstruction can be generative and transformational.

Fragmentation is the fuzziest concept of both organisation studies and information management. The notion of fragmentation came from studies of organizational culture, where, contrary to the *image* of integration, researchers were surprised with actual organisational inconsistency and instability as well as acknowledgement of multiplicity, lack of sense of purpose, and wide variation in symbolic interpretation.

After observing activity fragmentation of practices of technology use, the work concluded that fragmentation is a fundamental social phenomenon that can appear in the practice of an agent, in technology design, in organisational structure, and in organisational processes. Different appearances of fragmentation patterns have different sources, detection methods, and outcomes, specifically, (a) activity fragmentation is self-reinforcing psychological process, (b) business process fragmentation is purposeful task specialization, (c) organisational fragmentation, for instance strategy process fragmentation, is analytical construct that allows reconciliation of the paradoxes of wide variation of local practices for mobilization of firm-level capability and of standardisation for flexibility, within the broader pattern of opening future possibilities through commitments.

Beyond multiplicity, management theory values metaphor and *paradox* as tools to work with diversity:

> *Paradox is likely to be a core theme of postmodern organizational design. As scholars, we must learn to allow contradictions to remain, stepping away from the modernist principles of alignment and congruence. This implies some bad news for theories that are attempts to explain the diversity of organizational form in terms of local optimization, for instance, organizing to limit transaction costs. ...Theories may themselves need to become more textured and*

dialectical. Child and McGrath (2001, p. 1144).

Metaphor as tool of organisational analysis

Metaphor is a primal force through which humans create meaning by using one element of experience to understand another. Gareth Morgan (1998)

Organization theory is metaphorical, and metaphoric re-interpretation of organisation theory allows yielding new insights, connections, and commensurability (Morgan, 1980, 1998). Main reason for use of metaphor is complexity levels the organisation; basic reason is language is metaphorical.

Organisations are complex, dynamic, and difficult to observe, which means that whenever we think about them, the thinking will be guided by indirect evidence and visualizations of what they may be like, often captured in metaphors. Karl Weick (1989)

Theorists have no choice but to be more deliberate in the formation of these images and more respectful of representations and efforts to improve them. *Metaphors are one of the few tools to crate compact descriptions of complex phenomena.* The fact that theory construction makes full use of representations is its strength (Weick 1989).

Hypotheses and models generated within positivist paradigm can be treated metaphorically in order to find the powers of their applicability. However logical the idea is, the idea-in-use in actual context is difficult to predict and control (Hatch 1997). In fact, positivistic contingency theory was created with metaphors, for instance, Thompson compared, "an organisation is not simply machine or natural system that regulates itself..." (1967, p. 144).

In this work, metaphor is purposefully utilised as tool of compact explanation, sensitivity for the difference between a phenomenon and its representation, and other insightful distinctions (Morgan 1998; Bateson 1989). The big metaphors of the work include, but are not limited to: the power-action model is introduced with the metaphor of "wave", then viewed from the "atomary perspective", then the orders of power-actions are equated to "quanta" that are both micro and macro, then the "spectrum" of power-actions is considered as a unifying complex equivalence and the pooled, sequential, and reciprocal interdependence that are equated to "quanta" as well.

Creation of a metaphor for the organization involves, at least, the following "design principles" that were extracted from (Morgan 1980, 1998) and applied in the volume of this work: first, the metaphor is focused on one or several sides or viewpoints among all possible ones; hence, diversity of theoretical perspectives is possible and non-

contradictory, and some issues become vivid whilst others shadowed; second, the effective metaphor is neither too close nor too far from subject; and third, literalism and specifically designed ambiguity of language are tools to convey multiple messages at once.

4 (Basic Data Analysis) Making a case: data collection and generation

(i) Cases sampling, lines of comparison, and initial information requirements

Given the research subjects of power, incrementalism, implications of fragmented practices of technology use, high interdependence and centrality of the theme of "Meeting Fragmentation and Interdependence by The Incremental Political Delivery of Information Systems," the industry of financial services provides the requisite complexity of operations and mid to large size organisations in order for research subjects to occur noticeably. The financial services industry attracts considerable research attention, but it still hinders the productivity of the UK economy[37]. Financial services firms bear high levels cross-functional and individual task interdependence along with blurred organisational boundaries that to a large extent are enabled by the IT infrastructures of the financial industry (e.g., for cheques clearing, mutual provision of insurance, mortgage, and investment, all sorts of individual and liquidity financial transactions, and even for reporting to regulators electronically).

The financial industry is also a vivid case of increasing dependence upon IT industry and co-evolutionary innovation with information systems. Considerable amount of regulation and institutionalisation make the financial industry particularly suitable to illustrate risk-balanced politics and outcomes of high institutionalisation. The strategic role of IT and high institutionalisation make the financial industry a special case for studying power in the context of the IT professions and IT function.

Finally, the financial industry is services industry that offers multiple cases on different matters, particularly, on the frontline workplace of retail operations in banking branches and customer service operations in call centres, both of which have different technologies-in-use, activity fragmentation, and IT support. To the extent, the findings of this research are transferable to organisations of professional and service sector, particularly ones that have complex customer service or retail operations performed with intense use of software.

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[37] Report by Professor Michael Porter to the UK Government, 2003.

Further description of the research setting is presented in Chapter 4 Alpha Case. Complex Organisation of Simple Means: Decision Premises, Software, Structures, and Institutions.

In terms of research access and the course of the fieldwork the following steps are worthy to note. First, information was collected about Top 100 businesses headquartered in the proximity of Southampton, England. Second, IT directors were approached in writing and then by telephone follow up. Third, the fieldwork was a continuous negotiation with each entry point to the organisation (e.g., interview with a member of different department), where the researcher was not of priority to subjects. Therefore, a continuous clarification of the researcher's identity and intentions was important in approaching each interviewee as well as in reporting results to different stakeholders.

Alpha case

This complete in-depth empirical case study was based upon a mortgage, saving, and private investment oriented bank, here referred to as *Alpha*. As a financial institution, Alpha was one of the top UK building societies in terms of assets owned and customers served. In 2002, Alpha acquired a regional bank in central England, and in 2003 it acquired another building society with the Alpha's branch network resulted in about two hundred branches. With its developed brand, Alpha pursued "branch-led blended distribution strategy," attempted to change its culture from service to sales. The firm suffered from branch/operational staff turnover of 25% with the average of 30% reported for the U.S. and UK financial retail (Lund et al. 2003).

For the last four years Alpha has been implementing a major replacement of its banking information systems using the platform of International Comprehensive Banking Systems (ICBS) software package with its own API and IBM AS/400 computer platform that includes operation system environment, DB/2 database engine, and Websphere software development tools. The change concerned all areas of Alpha's operations from customer services to back office (banking operations) to risk management and regulatory compliance, and to a lesser degree the change concerned finance and treasury functions.

The AlphaCoreIS project was established as a temporary division of IT developers and specialists from all business areas. The main project activities were threefold: first, re-specification and adjustment of new information systems to business needs and envisaging realisation of strategic outcomes and advantages for Alpha (which is the domain of IS strategy; second, revision of old policies and definition of business processes; and third,

communicating and training the mass of end-users in new business processes and software.

By virtue of staffing and activities, the AlphaCoreIS project was a case of technochange (Markus 2004). Alpha top and middle managers explicitly defined the change as organizational not only technological change—however, the commitment was made to adjust business processes and work organisation to IT solutions, because it was considered cheaper than change in software, which was the first twist in management decision premises noticed. The second twist was the practice of business ownership for software application and development, which implied that the IT specialists got rid of responsibility for systems development. Delivery of formalised list of IT services to end-users required more than ordinary IT support, specifically, business operations support/systems configuration and continuous in-house IS development. The study of such technochange project with contradictions shall satisfy the research question of how it is managed internally in the IT function and delivered to different users of complex organisation.

Breadth of data was collected from Alpha about IT and business operations including business process material, the structure of interdependencies well beyond the formal authority hierarchy. Only generic data was collected about the company's strategic processes (e.g., balanced scorecard and structure of top management including relations among the key steering committees of Business Change Forum, Product Development, the TMT of Alpha's executive and operational directors, the Board). Much information about computer systems was collected including printouts of screens, descriptions of systems, instructions, and infrastructural schemes. The federalisation of the IT function (see Appendix 5) made interesting impact upon data collection and the course of interviews, for example, the information required was easier to receive from workers of the AlphaCoreIS project rather than the IT professionals of SOS Division.

Skandia case

Interest in the Skandia case was initiated by their earlier approach to Intellectual Capital, based upon a simple framework of Skandia Navigator aimed to be "process model" and "strategy map". The initiative appear to diminish to a version of a balanced scorecard. Based on those developments Skandia sponsored a subsidiary in order to develop software called Dolphin Navigator System, which is a version of multi-level balanced scorecard and a coordination means that was meant to coalesce aims across the organisational levels from top management down to each employee and facilitate translation of aims into measures.

The Skandia case started with an several e-mails contacts with strategic planning and business processes reengineering office at the Skandia global headquarters in Stockholm and a site visit and interview with programme managers at the UK headquarters. The author also received the original Skandia Case material from Earl and Nahapiet (1999) and access to the company's web and electronic discussion forum about intellectual capital, knowledge management, and Dolphin Navigator software.

Secondary cases, industry reports, and the lines of comparison

The following cases were found suitable and were used for the purposes of comparison and control.

Cases of banks with similar scale and type of banking operations. (1) The case of a medium-sized UK building society by Walsham and Waema (1994) was used as a controlling case, because it described a similar mutual institution in financial services with the similar case of prolonged change of core information systems. (2) The case "Skandiabanken: Developing Information Capabilities for an Effective e-Business Strategy" by Marchand and Paddack (2001) was used for comparison, as a case of a similar financial institution.

Cases of IT infrastructure and operations. (3) The case of "Postgirot Bank and Provment AB: Managing the Cost of IT Operations" by Applegate et al. (2003) was used as an example of professionalisation of IT-Operations with appearance of sophisticated benchmarking and dedicated core division in charge of IT infrastructure only. (4) The case "Infrastructures at Norsk Hydro" by Hanseth and Braa (2000) was used as an example of implementation of enterprise-wide systems (SAP) and own momentum of IT infrastructure.

Cases of business processes reengineering in customer services. (5) The case of "CRM in IBM Europe" by Ciborra and Failla (2000) was used as an example of re-engineering of customer services using business process approach. The comparison here is valid as the majority of Alpha's new business processes were aimed at its customer services and both cases describe commercialization of customer services (with priority of high-value operations and customers and orientation towards sales orientation). In both cases, the resultant organisation of work and systems at the workplace allowed provision the knowledge-intensive services by a means of low qualified and high turnaround workforce.

Two reports by the IBM Institute for Business Value, namely, (6) "From banks to banking: The on demand journey" (Lund et al. 2003) and (7) "Business and IT operational models in financial services: Beyond strategic alignment" (Renner et al. 2003) provided organization structure and operational models of "a typical retail bank." (8) The report by Weill et al. (2002) on "Building IT Infrastructure for Strategic Agility" was used for its detailed evaluation of 70 IT infrastructures of service companies, from which the authors developed 10 capability clusters for evaluation of the IT infrastructure.

(ii) Document gathering and analysis

An abundance of documents was collected from Alpha during visits to the company and by request. Complete access to the corporate intranet proved invaluable for getting documents. The documents gathered include information about corporate strategizing in Alpha (e.g., balanced scorecards, committees composition and roles), IT decision-making (e.g., IT policy documents on delivery standards, software selection, IT task request and helpdesk processes and more as cited in the empirical chapters), business process material, project management and communication information on the AlphaCoreIS project, IT infrastructure diagrams, types and instructions for IT and business operations support and much more. For business processes with apparently high socio-technical interdependence (e.g., "Rules/Parameters Change" in banking systems, and "IT Support") original document templates, workflow diagrams, and printouts of computer systems' screens were gathered.

(iii) Interviews and social encounters

With Alpha, 27 full scheduled and *semi-structured interviews* of 1,5 hours duration on average were held. The people from all business functions of AlphaCoreIS technochange were interviewed, and especially interesting dialogues were with Alpha's Associate Group Directors the head of risk and compliance. The interviews were done during visits to the headquarters as well as banking branches. *Social encounters* were also valuable opportunities for following up with checks and new questions or assumptions made. Under circumstances of limited access to some financial and IT professional positions, social encounters were invaluable means of gathering information that is sensitive and even not formally stored, for example, about technological contingencies and real options.

Table 3.6. Full interviews in Alpha case

Role	*Amount*
Operations and IT Director, AlphaCoreIS Project Co-Director	3

Business Change Director, AlphaCoreIS Project Co-Director	4 (1 in Jan, 1 in March, 2 in May)
Project Manager (consultant)	1
Project Analyst (Project Office)	1
Associate Director for IT Infrastructure	1
Design Authority Team leader (systems specification)	1
Assistant to Operations and IT Director	1
Business Operations Support function leader and liaison between branch (sales) and centralised customer services (operations)	3 (1 in April and 2 in May along with time spent in branch visits)
Training and Communications Team Leader (consultant)	3 (1 in April, 1 in May and 1 in June)
ACE Team Leader	1
Associate Director for IS Development	1
IT professional (SOS Division)	1
Delivery and Acceptance Team Leader	1
Associate Director for Compliance and Operational Risk	1
Financial officer (liaising AlphaCoreIS project)	1
Various branch staff	3 plus one-off questions, observation and hearing to situations at work 1 (Branch Manager) 1 (Branch Assistant, working day)
Total:	27

Interviews: sampling, preparation, and issues discussed

The selection of interviewees was defined by *network traversal* of their own networks of work relations. The software-enabled ontology of interdependence helped in identification of the individuals who were in key positions for particular issues (e.g., keeping risk registry for AlphaCoreIS technochange). During a meeting, the researcher interacted with the ontology using his laptop and asked questions about presence and detail of a work relation in question.

For each interview, a set of clear paper sheets titled with the subjects to discuss was prepared (e.g., "technological contingencies" or "interdependences"). Interviews were structured around themes of issues and contingencies in implementation of Alpha's information systems, business process definition exercise, gaining and delivering IT expertise, and the practices of technology use. It proved impractical to focus the

interviewees on pre-set template of themes. Then questions were used unobtrusively to the narrative of interviewees. Depending on the position of the interviewee, the questions focused them to talk about interaction with IT people (e.g., difficulty in getting the right data view configured), how they use specific software facilities in their work, which piece of systems' functionality their team is responsible for, and how their work affects other parts of the organisation.

The tool of interdependence ontology was an excellent addition to the techniques of interview and observation, because it structured the direction of enquiry and interview questions and contributed to their validity, because it became easier to cross-check interdependences through asking different interviewees about the same relation and use the full visual representation or the formal query of relations according to some criteria. Further special use of interviews for interdependence analysis, particularly for creation of software-based interdependence ontology is presented as a method of its own in the section about (Advanced Qualitative Data Analysis) Interdependence analysis (p. 182).

Interviews processing: full transcribing and open coding

All interviews were recorded in different ways: first, the full record by digital voice recorder was kept continuously, second, notes were made by hand using prepared forms, and third, occasionally a notebook with Microsoft Word was used in order to type in notes during the talk and retrieve information quickly.

All interviews were then fully transcribed, observations were noted, and participation experiences were described. The data analysis of interview transcripts borrowed from the grounded theory coding techniques: paragraphs of transcribed text were aggregated around research model's categories openly coded ("interdependence," "technological contingency," "fragmentation"). Some categories emerged from the data. The transcripts were revisited many times and sometimes they were rearranged around new categories.

(iv) Ethnography elements

Ethnography is traditional to studies of customer services and software use at the frontline workplace. Inspired by the work of Shoshanna Zuboff (1989) the initial sketch of this work had plans for ethnography of both IT professionals and end-users. That strategy, however, was discarded as requiring more project time and resources than were available for the doctorate. Also, the ethnographic observation happened to be non-instrumental for exploring "how information technology is actually delivered and managed?" The political analysis of the practices of IT support (based on juxtaposition of interviews) and careful

reading of IT policies were more helpful in understanding IT delivery.

The major ethnographic component was visiting banking branches in order to get a grasp on technology use practices at the grassroots of the frontline workplace. Such ethnographic observation helped in noticing and framing as legitimate research issues the two following observations from practice.

(1) Various management systems and logic (e.g., ideas of complexity removal from branches, organisation of IT and banking operations support, strategic IT-controlling, and certain strong decision premises) did not come along at the edge of practice. Sometime they conflicted with one another, and sometimes they just did not enable productive practice (e.g., delays in getting back to branch staff by centralised customer service units).

(2) There were definite although invisible linkages between activities (and even behaviour) at the remote workplace at branches and organisational arrangements ordered centrally at the headquarters (e.g., again the organisation of IT and other kinds of professional support including politics by the IT function and the definition of business processes that in Alpha were implemented as the on-line material for routine guidance).

Observer-as-participant approach

Visits to 5 branches were arranged with Alpha's managers, then, one branch was visited for follow up. A visit took approximately half of the working day. The researcher was located behind the counter and mostly observed the work of branch staffs making notations of their interactions among each other and use of computer systems. The researcher was free to talk to any of the staff, when they were not engaged with customers. After first few visits, the researcher started to participate, for example, in finding how to proceed with unusual transaction with the instructions of the on-line business process material.

Observation was helpful in understanding what observable practice is, and that there are factors (e.g., IT policy) that affect the behaviour of branch staffs. Observation-as-participation allowed discovering variations of technology-in-use, for example, how branch staffs managed their own local customer relations with own small spreadsheets.

During visits to the head office, it was useful to observe and make own notes about the environment of AlphaCoreIS project and the "Project Wall" on which all current project management information was displayed, for example, stages for each business process,

lists of faults and additions to the core banking systems, lists of in-house IS developments, and schedules of systems' development, roll-out and training.

Engagement with systems

The researcher spent some considerable time on discovering Alpha's computer systems, including windows and command-line interfaces of International Comprehensive Banking Systems being implemented in Alpha. The windows interface was used by end-users in customer services, whilst the command line interface was used by back-office and experts in order to configure the complex banking systems. The engagement with systems gave the researcher an idea about the systems' architecture, embedded logic, and how they could be used in various contexts. Such insight will be laborious to formalise explicitly, especially as the researcher comes with the first degree in computer science and experience in software development.

Impact of Organisational Context: not only ethnography

It is possible to study the impact of a rich organisational context without the expense of full ethnographic engagement.

The conceptual choice of the predominance of context over individual was quickly confirmed with first interviews and applied. For example, information systems field has a popular question of "hybrid IT-educated business managers" that are supposed to deliver better performance in IS projects. Whilst most of Alpha's IS initiatives were indeed managed by people from business, they found themselves in the constraints of the scarce IT resources, schedules, and dependence upon specialists from the core of the IT function who were in charge of the infrastructural software, databases, and computer configuration.

The research proceeded with analysis of interdependencies and decision premises with the variety of techniques from multiple regression for determining certain interdependence associated with high use of certain software features as the major determinant for project management decisions, to content analysis of the sample of 100 IT task requests, to the network traversal and work relations cross-check with the interviews (Table 3.2).

(v) Questionnaires from Alpha: perception of systems and feedback from branches

The impact of attitude (including confidence) towards information systems upon competence, satisfaction, and productivity attained with those systems is another typical issue of ethnographic enquiry. This question was facilitated courtesy of the company who provided the data from their own questionnaire surveys administered because:

Simply train and leave is not enough, experts need to provide support in case of paralyse with the new systems situation... without support and confidence boosting training is much less effective (Training and Communications Team Leader)

One set of questionnaires measured competence, confidence, and attitude towards new comprehensive banking systems three times: at the stage of training, at the stage of systems going to live usage, and after a period of use, normally, after three months. The competence part was evaluated by a trainer or super-user. Learning Evaluation in Alpha assessed the basic question of "Are the newly acquired skills, knowledge, and/or attitude being used in the everyday environment of the learner?" and classified end-users' competence into user, super-user, and expert categories. Another set of questionnaires concerned general feedback from branch staffs and was performed once per six months.

Confidence levels dynamic was low before training, increased after training, decreased just before go-live, if go-live went acceptably increased considerably, then went slightly lower for business-as-usual.

The confidence curves are different in the branches than in head office. In head office the confidence levels just prior to go-live, this is what happened with investments, were lower in branches, after go-live head office maintained and they're started moving up, branches went up again and then start to drop. (Project Manager)

The results of the questionnaires also indicated the impact of "small" contextual differences and powerful end-users upon information systems implementation:

[Competence] I would say probably on average we would have fewer red and more green in head office than we do in branches. It's a more sophisticated group, because it's younger, probably better educated people in head office where we probably pay a bit better.

[Confidence and Attitude: Head Office] I think, you got more sophisticated, more capable population. If they convinced themselves that they're don't like, they've got problems with it [reflected in confidence levels]... when actually they can handle it quite easily... we work with it.

[Confidence and Attitude: Branches] At branches we don't have a big labour market, I think we got slightly older people, slightly less sophisticated...probably on the attitude side we got more positive individuals in branches than in the head office...because of the job they ought to do—they need to be more positive. (Training and Communications Team Leader)

Further and interesting discussion on the results of surveys is continued in empirical Chapters, particularly in regard to The Political Delivery of Information Technology.

5 (Advanced Qualitative Data Analysis) Practice Lens and socio-technical approach

> *People are purposive, knowledgeable, adaptive, and inventive agents who engage with technology in a multiplicity of ways to accomplish various and dynamic ends. When the technology does not help them achieve those ends, they abandon it, or work around it, or change it, or think about changing their ends. Wanda Orlikowski (2000, p. 423)*

(i) Which practices to study?

The research of organisational IT function was initiated as *collection of individual and group practices of the IT professionals*. After the recollection of practices gained into Analysis and Discussion part of the work, it was understood by the author that the collection of practices gained (in the areas of use of software, IT support, definition of business processes, and strategic decision-making about IT) was diverse and fragmented and can not be explained by extant theories of IS research field; hence, the author adopted political consideration in the third year of the research project. This is the part of the work where practice is treated in *phenomenological* sense, practice-as-observed or heard from the interviews.

Other part of the work involved investigation of *practices of technology use* (equally in banking branches or in management of IT-operations themselves), this part employed the technology-in-practice framework and treated practice in more *ontological* (e.g., "practice is what we know and observe") and even *epistemological* (e.g., "practice is how we know" or "we know only through practice as repetitive experience") senses. Being taken either phenomenological or ontological, the practice lens focuses on specific issues of technology use: what, when, where, and how individuals and groups do with technology on day-to-day basis, in recurrent interaction between subsets of facilities of technology and structures of the organisation, at the same time and over time (Orlikowski 2000, p. 420). What the seeing through Practice Lens confirmed is the delusion of conventional distinctions, for instance, between technological determinism and social construction. Then, which are more feasible distinctions?

(ii) The technology-in-practice framework

(Presupposition of Practice Lens) The difference that makes difference is the simple *distinction between technologies and technologies-in-practice*. Researchers and managers will get more meaningful results if they look for returns on the use of technology rather than material technology itself, for example, technology per se cannot increase or decrease

workers' performance, only use of it can. The issue is beyond semantics, it is a cognitive bias related to other biases of IS implementation, specifically, *accent on technology, desire of getting all at once, and thinking in terms of the visible at first sight (e.g., activities, software functionality, and resources)* (p. 94). Orlikowski (2000, p. 425) confirmed, "...by emphasising material technology people tend to continue with this emphasis in their allocation of funds, attention, and measures." Whilst technology as designed defines the range of possible uses, technology-in-use determines the immediate value to individual customers and the extent to which technology succeeds in accumulating a critical mass of committed users (Fichman and Kemerer 1998).

(Presupposition of Practice Lens) The practice lens accommodates people's situated use of dynamic technologies, as it makes *no assumptions about the stability, predictability, or relative completeness of the technologies* (Orlikowski 2000, p. 407).

(Presupposition of Practice Lens) The construct of technology-in-practice was defined by (Orlikowski 2000) as "a set of structures recurrently enacted for use of the specific machine, technique, appliance or device in everyday situated activities." Even technologies-in-practice became institutionalised, there is always the possibility of a different structure being enacted. The practice lens presupposes *emergence and impermanence in social structures*, i.e., possibility of radical shifts. "While habitual, routinised, and institutionalised patterns of using a technology may be evident, there can be no single, invariant, or final technology-in-practice, just multiple, recurrent, and situated enactments" (Orlikowski 2000, p. 412).

Methodology Note 8. (Technology-in-practice) Every implementation of information technology (e.g., software package, database engine or software development tool) in every organisation is different. Within the organisation there are several distinguishable technologies-in-use commonly defined by the workplace and purposes for technology use (i.e., belief systems about technology).

For example, in the Alpha case a pristine distinction was observed between two uses of the same software in banking branches and in the centralised customer service/call centres; such distinction was named "an hour difference" (p. 198).

The structuration theory offered the framework of facilities, norms and interpretative schemes to explain "enactment of structures" Giddens (1984). The framework was extended for the study of practices of information technology use in Table 3.7.

Table 3.7 Facilities, norms, and interpretative schemes for structural enactment

Facilities (as units of functionality)	Technological artefacts (e.g., physical-kinaesthetic, observable-visual on the computer screen, and even heard through the equipment), design features and items of functionality. (Another hierarchy of classification) Hardware, software, networks, and interfaces.
Norms (phenomenological)	Rules, procedures, controls, codes of conduct and etiquettes, interfaces, routines, mind and body habits.
Interpretative schemes	The views and models of the world, paradigms, presuppositions and assumptions, decision premises, attitudes and expectations, belief systems.

(Customisation versus Determinism?) Even for seemingly objective at a physical level resources and technologies, the structuration theory ascribed social construction as follows: "facility is an object of environment, but its status is not purely physical and independent, because it has its meaning and utility only within processes of structuration" (Giddens 1984, p. 33). For information technology, such "social construction" can be tested in its immediate practical sense (e.g., by the question of "how customisable are the systems?"), for example, algorithms are encoded, settings are customised, and data is entered, yet such 1st order of technological actions does not fully represent the levels of determinism of social systems.

The original analysis by Orlikowski (2000) used the framework facilities-norms-interpretative schemes as in Table 3.7 and offered textual description of implementation of groupwork software package (Lotus Notes) in a loose fashion, specifically, by dedicating a paragraph or two to each item. The technology-in-practice framework drawn in Figure 3.1 is extended to *a continuum matrix of facilities-norms-interpretative schemes*; an alternative arrangement of items is possible (e.g., authority hierarchy is much more complex than a norm) yet the framework conceals some large entities in order to reflect their relations with technology. The framework applied in the description of Technology of Coordination Case. "Live On-line Business Process Material" (p. 216). This more complete technology-in-practice framework can indeed "serve as a behavioural and interpretative template for people's situated use of the technology" (Orlikowski 2000, p. 410).

Figure 3.1 The technology-in-practice framework as a continuum from facilities to interpretative schemes

	Technological and physical	*Sensemaking and interpretative*	*Organisational and institutional*
Facilities (structure)	Hardware, software of operation systems, physical level of communications infrastructure	Databases, data entry forms, and other facilities of applied end-user software Email along with lists and discussion forums that support "communities of practice"	Task descriptions, documentation material, business process, project management, and planning documents per se
Norms (more of structure)	"Servers should be kept turned on 95% of the time"	System logics and algorithms (impact of the code) Constraints, system checks, job roles and information access as specified within the systems	IT standards and service level documents Authority hierarchy
Interpretative schemes (process)	Technology trends and discontinuities	(Individual maxims) "Empowerment of workers is economically unsound." "Change in the work organisation is cheaper than change in systems."	(Belief systems) Management decision premises, strategy documents

A viewpoint from which technology-in-practice is drawn is important, because it reflects the interests of certain positions of individuals, groups, or coalitions. Whilst the framework was designed by organisation theory researchers, its empirical application in the study tends to favour the viewpoint of IT people, which is different from the viewpoints of end-

users, middle managers, top managers, professional staff (e.g., marketing and CRM), the Board, and the stakeholders that are formally external (e.g., trade unions).

"A practice lens allows us to examine the institutional, interpretive, and technological conditions which shape the ongoing constitution of different structures, and how such constitution in turn modifies these conditions" (Orlikowski 2000, p. 421); the statement re-iterates the idea of the duality of structure. She broadly defined *technological* as software and data properties, *interpretative* as conventional understandings and shared meanings used for sensemaking, and *institutional* as normative and authoritative social structures. This chain corresponds to the header row of Figure 3.1 and was used in order to organise Chapter 4 Alpha Case. Complex Organisation of Simple Means: Decision Premises, Software, Structures, and Institutions.

Orlikowski (2000) arranged consequences of technology use as *technological*, *structural*, and *processual*. The header column of Figure 3.1 shows that facilities are understood as mostly structural, whilst interpretative schemes are processual.

Because conditions and consequences overlap, it is not possible to translate directly from technology-in-practice framework to content-process-outcome for studying organisational change (Pettigrew's 1985). The upper left of Figure 3.1 represents more of content, the down right is process. The application of the set structure-boundary-process type frameworks is again indirect, because there are structures that are content, and there are structures that govern the process. Yet boundaries are usually process-governing structures.

"Knowledge" can be added as another column of the technology-in-practice framework in order to grasp the "embodiment of knowledge" into technology and its recurrent use practices (Orlikowski 2002). It is a whole other discussion of institutional knowledge stored in norms and routines. If knowledge is treated as a resource or thing, it could be could be equated with facilities and norms. If knowledge is treated as a process, it is the interaction of facilities and norms governed by interpretative schemes.

Whilst the technology-in-practice approach appears more as a presuppositional guidance method, Figure 3.1 can be applied as a consultancy matrix, by filling out with the relevant data collected by interviews, observation and action research with information systems.

Generic technology use patterns: presuppositions for technology use and end-user behaviour

Any in-depth description of technology-in-practice would gravitate around the common issues of socio-technical research, such as whether technology is a cause for change in organisational design. This subsection reviews the issues, contextualised answers to which can be inferred by the empirical application of technology-in-practice's definitions, presuppositions, and frameworks described by this section.

(Technology: a cause for structuring?) "The structural consequences are much more likely to be unintended consequences of action" (Orlikowski 2000, p. 421). Her detailed studies showed how organisational structures changed insignificantly even in the cases of active technology implementations supported by the senior management and consultancy. Whilst the structural consequences are measures of change in contingency theory and a number of statistical variance organisational research tried to utilise the interdependence-contingency linkage, technological change is less amenable to be measured that way, because it is realised through technological facilities, business processes and norms, and interpretative schemes rather then observable organisational structures. On top, Pfeffer (1992) proposed that structural change (e.g., new units and career decisions) is the most power-intense change, and this research concurs that, the implementation of a large information system requires politics on many organisational arenas (peripheral incrementalism).

(Agency of Designers: intentions and imbedded structures) Examination of the extent to which users realized designers' intentions for a technology is another question of structural change.

> *By ignoring technology-in-practice we forget that technology is not valuable, meaningful or consequential by itself; it only becomes so when people engage it in practice. ... Such neglect encourages us to make simplistic assumptions that: if people have technology they will use it; they will use it as designed; such use will produce the expected outcomes. Orlikowski (1999).*

Those assumptions are simple but frequent presuppositions, to which IS developers and researchers hold on in their daily work and writing[38]. Yet "it has long been recognized that

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[38] In December 2004, I reviewed 23 papers for the information systems stream of the Critical Management Studies Conference. To my much disappointment, even the sample from critical audience was invariably confirming the power of simple presuppositions, simply, many works took for granted that technology is used as designed.

technologies are often not used as designed or intended" (Orlikowski 2000, p. 424 with reference to Bijker, 1995 and von Hippel 1998). The distinctions of technology-in-practice, dualities of structure and technology, and means of discontinuity (e.g., time-space separation and conceptual closure) are generic conceptual tools for exploration of the drift between design and use of technology that occurs in practice.

(Agency of IT Professionals) IT professionals identify the following factors of stability and inertia in usage of advanced technology: competency traps and well-working tools, skills and expertise lock-in, framing of use in terms of familiar patterns, and inactive expectations management a-la "let users convince themselves" (Finholt 2004). There is a risk to organisational growth as well as to IT professionals and computer scientists themselves in their being reactive rather than proactive.

If we build it, will they come? Presentation Title

(Agency of End-Users: beliefs and attitudes as resources) Interest and motivation to use technology do depend upon the interpretative schemes. The whole Technology Acceptance Model strand of the IS research field is built on the presupposition that if technology is considered useful, it will be used actively and with positive outcomes (Davis 1989; Bagozzi et al. 1992). End-users *prefer* (a) stable and predictable technologies (Orlikowski 2000, p. 411), (b) to assimilate new technologies under previous patterns of practice and interpretation (Barley 1986) and apply a new technology to existing tasks as a response to encountering unfamiliar technologies (Orlikowski 2000, p. 417), and (c) effectiveness of technology, which is more important to the frontline workers than the extent to which they are able to control it (Frenkel et al. 1999, p. 87). At the same time end-users *experience* unawareness, unpredictability of outcomes, additional workload, and as a result, stress. Institutional consequences of interaction with technology are often not reflected on by users, who are generally *unaware* of their role in either reaffirming or disrupting an institutional status quo (Orlikowski 1992, p. 411). Users operating complex technologies often have to deal with high levels of stress, ambiguity, and unstructured local situations that deviate from "normal" operating conditions (Orlikowski 1992, p. 712).

(A generic pattern: quickly stabilised but potentially open) "While regular interactions with the same technology tend to reproduce the technology-in-practice being enacted, such reinforcement is not assured" Orlikowski (2000, p. 410) repeated. Yet, the earlier predictions remain more practical, "Initial patterns of using technologies congealed

quickly, becoming resistant to change despite on-going operational problems in use and performance" (Orlikowski and Tyre 1994). "Rapid establishment of relatively fixed technologies-in-practice is influenced by corporate pressure to improve productivity, unavailability of technical support staff, and users' expectations of and preferences for stable and predictable technologies" (Orlikowski 2000, p. 411).[39]

(iii) (Advanced Qualitative Data Analysis) Actor-network analysis

Actor-network theory is an approach for studies of the networks of interdependent social practices that constitute work in science and technology (Latour 1996; Law and Hassard 1999; Monteiro 2000). By virtue of the concepts incorporated (e.g., "action" and "networks"), actor-network was employed as a method for studies of IT infrastructures at firm, industry, and global levels (Ciborra et al. 2000) as well as for studies of city infrastructures that include architecture, sewage, communication, transportation and so on (Latour 1996).

For the purposes of this research, actor-network is a way of combining of factors that are immediately important for particular usage of systems for particular purposes without problematising about conventional distinctions between social constructivism and technological determinism. For example, a-bureaucrat and a-bureaucrat-with-a-system constitute different actants with different possibilities and outcomes[40]. Technical and non-technical elements of actant are normally granted with same semiotic status for explanatory purposes. Here, actor-network approach involves operation with anthropomorphized nominalizations attributed with their own logics. The similar manoeuvre can be observed when research talks about, for example, "strategic role of information systems." Yet, actor-network is not an attempt to mix things of different logical order, rather it is an attempt of putting together all elements relating to the same process (e.g., de-nominalization of "IT Task Request Database" into "process of coordination for routine IT tasks." There is no one accepted method to represent an actor-network. One example is presented in Appendix 7 Technology of Coordination Case: IT task requests database and coordinating actant (an actor-network), where processes, technological facilities, and human actors are presented with different graphical elements, and "technology" is separated from human interaction in order to highlight its secondary role in that particular actant.

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[39] All of these features were evident in Alpha case, especially the overlap of lack of IT support and necessity of stable systems for ongoing retail customer service in banking branches.

[40] A-man and a-man-with-a-gun for a stronger example.

6 (Advanced Qualitative Data Analysis) Interdependence analysis

Methodology Note 6 proposed that it is non-trivial to grasp social structure that underlies the organisation. Three forms of representation of socio-technical structure of the Alpha organisation were developed in the work, specifically, actor-network, clustered organigram, and ontology of interdependences – each representation is illustrated graphically in Appendix 7, Appendix 6, and Appendix 4 respectively.

(i) Representation of interdependence: coarse-grained clusters rather than charts

> *Organisation charts do not provide much information about coordination mechanisms, informal relationships and power distribution that flows outside of formal authority hierarchy. Mary Jo Hatch (1997, p. 182).*

Representation of organisation design with clusters addresses those limitations in part by representing size, embeddedness, and interdependence. If teams work closely they are put closer and sometimes slightly overlapping even across divisional borders. Considerable overlapping means that the same people participate in teams overlapping. Subordinate units and positions are drawn within superordinate ones. Cluster's size is proportional to unit's size and influence; hence, the authority hierarchy is not the only base for clustering. Cluster-based description is denser yet more compact than an organisation chart, as the example Federalised IT-Operations of Alpha organisation (a clustered organigram) in Appendix 6 shows.

This cluster-based organigram indicates how complex interdependence is: Directors take multiple positions, people from multiple areas of business participate in business processes design teams, and "team" itself is attached to the units of various size and internal work organisation, irrespectively of actual teamwork. It is appreciated that the name "team" presupposes and signifies teamwork. Within the core of the IT function, teams were not just defined and formalised; the IT professionals cooperated and shared knowledge informally but to certain degree, which contributed to the "problems with manageability" of the IT function. The lack of interdependence is also more visible with an organigram rather than an organisational chart, for example, with the distance between units.

(ii) Representation of interdependence: ontology with Protégé software

The work done quite unique representation of interdependence in the Alpha organisation, with Protégé software for semantic analysis and creation of "ontology" that can be defined as an object-based and hierarchically-organized data set. For example, the core of Alpha's federalised IT function of 60-70 people produced above 900 distinctive work relations,

which were possible to represent in different ways, from positions of different individuals and teams, and through which it was possible to browse dynamically as presented in Appendix 4 Interdependence analysis with Protégé software: ontology structure and a snapshot from dynamic browsing business processes. It will help if you actually familiarise yourself with Appendix 4 that suggests how productive future research might look like. Whilst it is not possible to represent the entire ontology unless by means of CD, the ontology was a sensemaking device to the author.

In practice, people do not create such advanced dynamic representations of complex relations in which they operate, but rely on their intuitions. The experience of scrupulous specification of work relations with the ontology tool (i.e., in some formalised way) revealed that there is nothing magical about those intuitions, although individuals differ considerably in their political skill of discovering relations and which tasks of their jobs are actually shared with others (Perrewe et al. 2004).

Interdependence ontology structure: classes of interdependence captured

Protégé ontology consists of classes (:Class) with defined properties (:SLOT). Class is an abstraction for a real-world entity, each class could have any number of instances. Classes are linked by means of parent-child relations, in which a child "inherits" its parent's properties (characteristics) and might have its own in addition; a child might have many parents. Therefore, ontology can represent a hierarchy, tree, network, or web.

Authority. :Employee-Unit-Authority-Relation (111 instances) reflects the assignment of individuals to positions and teams and :Unit-Unit-Authority-Relation (45) reflects the hierarchy. Information about authority, functional dependencies and task-based clustering primarily acquired from documentation, such as, general charts, job descriptions from intranet, and project management material.

Business process. :Business-Process-Ownership (60) and :Business-Process Stakeholdership (404) are the most populated classes. Analysis of business processes was based on the high-quality documentation that Alpha had. Even if the content of business processes was clear, all interviewees acknowledged the problematic status of task forces, some of which were never enacted and there were no common patterns in their work (sometimes people were listed as nominal figures). Therefore, the ontology does not contain any of such task forces in :Unit class.

Task/workflow. The conceptual choice linking employees through their positions where possible, resulted in low amount of direct relations under :Employee-Employee-Task-Relation (8) class, most of which were collaborations for complex tasks of training and CRM. :Unit-Unit-Task-Relation (52) encompasses interdependencies that did not fall under authority but were fairly formal. Workflow relations among individuals were simple to interview about, but not to specify. It was difficult to identify dependencies that are long-standing and critical, especially as only one or two meetings with an interviewee were normally held.

The ethnographic observer-as-participant work was not very helpful in establishing interdependencies – the method was aimed at practices of working with technology. The immediate relations at the frontline workplace of a banking branch were quite simple, but the ontology did register the effect of cross-functional interdependence exercised in the headquarters upon the customer service performed at the frontline. For example, the structures of business operations support and IT support defined how branch advisors proceed about problem: which teams they would contact at the headquarters or try to deal with the problem locally, how far they are likely to engage in workarounds, whether they prefer to contact immediately or later with more questions, whether the method of contact is phone, e-mail, internal post, or indirect through other people at the headquarters.

Choices and findings of empirical interdependence modelling

Several important decisions were made about ontology design in order to make ontology a research tool. Non-trivia of interdependence appeared for distinguishing among levels, i.e., attributing interaction process to individuals and units. Intention was to draw a map of work relations among employees within their units, then draw how those relations are "channelled" among units. Such map might look complicated, but the principles of its design are simple. A practical limitation was to include only durable dependencies from the researched part of the Alpha organisation, but the model propagated quickly. Cross-level interdependence (e.g., training teams and business process task forces) overrode that hierarchical approach in favour of other ways of analysis, such as dynamic browsing.

(1) Choice was made to model interdependence with digital directed binary linkages (e.g., :Relation has properties of :FROM depends on :TO). In other words, the choice was to spilt interdependence patterns to simple units possible. Yet it was difficult to pinpoint a social relation to a one-sided dependence. Interdependence patterns of three and more parties (or positions) were common (Proposition 2.1).

(2) Choice was made to disjoin an individual from his or her position or role where feasible. Interdependencies were assigned to positions and units, except unstable task forces for business process definition. Therefore, directorial and liaison roles were coded as separate positions. Ordinary team members were linked to their teams directly, whilst directors and project managers happened to occupy multiple positions, at some point of ontology development, there were 131 instances of :Employee for 60 instances of :Unit, which reflects intensive restructuring for political reconciliation brought by the AlphaCoreIS technochange.

These choices for modelling interdependencies at the lowest level possible were intended for studying practices of coordination, which were found ambiguous in different ways. Interdependence among high-level clusters (e.g., business functions) was found ambiguous to interpret but at least durable (e.g., stabilised with strategy, programme, and project management documents). At the lower levels (e.g., individual positions and teams), task specifications and priorities changed quickly and again were ambiguous or vague.

Dynamic browsing through interdependence ontology as a research tool

Protégé ontology could be browsed using any semantics, e.g., by entire ontology structure, by marking some classes as "reified relations", for example, two different graphs will result for instances of :Unit linked using :Unit-Unit-Task-Relation or :Unit-Unit-Authority-Relation, or by a property of a class that is of another class type, for example, :Unit has property that lists all its :Employee. Touch Graph VizTab software plug-in for Protégé environment was used for visualizing classes and their instances as dynamic graphs.

> *TouchGraph provides a hands-on way to visualize networks of interrelated information. Networks are rendered as interactive graphs, which lend themselves to a variety of transformations. By engaging their visual image, a user is able to navigate through large networks, and to explore different ways of arranging the network's components on screen. (http://www.touchgraph.com/tech_overview.html. Accessed 04.11.03)*

Dynamic browsing is a powerful tool for understanding. Imagine holding nine hundred contextualised relations in your mind and then freely browse through them. The task is overwhelming for conscious mind. First, during the interviews, it was possible to select an individual and see graphs of his or her relations, positions, and business processes, to see "the organisation" from the position of that individual. Second, it was possible to browse through levels and visualise interdependencies among units and whole business functions. An example snapshot of such browsing offered in Appendix 4 shows how business processes were "attracted" to finance, mortgages, investment, and customer service

functions, as people from different sides of business participated in definition and enactment of those processes. Third, dynamic browsing was instrumental in answering questions, such as how certain business processes fall under responsibility of a function and notice irregularities that highlight the difference that is used as a source for power. (a) Alpha's finance function was in charge of the premium for 3rd-party mortgage introducers (see upper left on the graph), and (b) some functions controlled the most cross-functional processes, e.g., Maintain Workflow, Branch/Head Office Support, and processes on Printed Forms and Jetform Letter Templates (see down right on the graph) – these processes were core to a knowledge-intensive function of Business Operations Support.

(Consideration of ontology as a research method)
First, whilst not a conventional research method, the technique of dynamic browsing, transparent description of ontology structure and data acquisition, design choices made with awareness to their implications and with regard to organisation analysis contribute to the validity of such original method of research and data analysis. Simply having interdependences refined, recorded, and visibly retrievable according to any interpretative scheme, makes the difference to research. Second, ontology offers a high-density, ordered, and cohesive data set. The facilities of Protégé software check for robustness and internal agreement of the data entered. Versatility of data retrieval contributes to reuse and comparability of the research material. Third, once ontology's structure is formulated and filled with data, work with an ontology-based research model is about *interaction* with phenomena at data collection as well as analysis stages.

7 An Overview: evaluating information systems research

This large Research Methodology Chapter is complex at the level of social theory, complex at the level of methods and choices from organisation theories, and complex at the level of techniques. The complexities of the model are requisite for the research issues and propositions specified and address the issue of limited data for such sensitive issues as studying politics of IT function, for which not much data is possibly collectable, yet invariably affecting the phenomena studied.

First, methodology is enlarged by the incorporation of Inductive-Deductive Recycle, epistemological shortcuts, and concise choice of presuppositions of organisational analysis that are not normally made explicit. Both the research model and empirical analysis were revised several times together. Second, there is a possible issue that empirical data does not fully address elaborated theory; therefore, secondary data and elaborated techniques were

used in addition to basic data analysis (see Table 3.2). Because of the space and multi-method, some details of actual technique implementation were omitted and only results were presented, as with the dynamic browsing interdependence ontology, psycholinguistics of modelling literature reviews and explication of decision premises (belief systems), and content analysis of IT task requests. Third, a compact representation of data has been sought and achieved by means of appendices and tables that are packed with information. Therefore, it will help if the reader actually familiarises himself or herself with the Appendix referenced, before continuing to read after the reference.

Interoperability is a test for clarity of thinking and validity of research outcomes. Table 3.8 presents the results of interoperability test of evaluation of this Research Methodology with "A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems" (Klein and Myers 1999) which was named as MIS Quarterly's best paper and which, in fact, evaluated studies by Orlikowski (1991) and Walsham and Waema (1994) that were used by this work directly.

Table 3.8 Interoperability exercise: evaluation as an interpretative IS field study

Klein and Myers's advice-principle	*Examples of implementation and interoperability*
Hermeneutic circle: understanding is achieved by iterating between the interdependent meaning of parts and the whole	Big-O approach of remembering the organisation as a whole. A whole Interdependence as set of concepts and as methodology.
Contextualisation: critical reflection of the social and historical background	Distinctions between context and content. Elaborated literature reviews and research models (e.g., Precision for Power and Appendix 1).
Interaction between researchers and subjects: critical reflection of how the research materials were socially constructed	Elaborated and explicit model of basic and advanced Organisation Analysis Choices. Multi-method. Network traversal and crosscheck for interdependence. Elements of psycholinguistics and attention to beliefs.
Abstraction and generalisation: relating idiographic details revealed by data interpretation through the application of principles one and two to [social] theory	How data is a case of general and generic theories, patterns of technology use, patterns of coordination, or cognitive biases is considered. Yet the reverse is practical issue: how individual behaviour and practices are instances of generalisations. Concern with acceptable levels of abstraction (Kurtz and Snowden 2003), distinguishing linguistic generalisations in literature reviews, actual interviews, and own writing (Bandler and Grinder 1975).

Dialogical reasoning: sensitivity to possible contradictions between the theoretical preconceptions and "the story which the data tell"	Choices of Organisational Analysis for the configuration of multiple theories into Lenses for the purposes of this research. Search for most fitting theories and techniques. The ideas of incrementalism and practitioners' Results Driven Incrementalism were discovered this way and helped to generate a sensible process-based explanation of the politics of IT support, hard to reach otherwise.
Multiple interpretations: sensitivity to possible differences in interpretations among the participants	Explicit description from multiple positions from the Introduction to the thesis and explicit reference to the position in text as necessary (e.g., Table 5.2 portrays technology-in-practice from managerial viewpoint).
Suspicion: sensitivity to "biases" and systematic "distortions"	Cognitive biases of IS delivery that are in touch with cognition literature and demonstrated in Fichman and Moses (1998) as well as the language and work outcomes of actual interviewees. Use of constant heuristics to compare against (e.g., requisite interdependence defined by Proposition 2.2).

This evaluation is an interpretability exercise. Several possible examples are offered in Table 3.8. These principles are interdependent in a belief system of their own (Klein and Myers 1999, p. 78). It would be suspicious to assume that the specific epistemology and techniques of this work are translatable to the "principles of interpretative field studies in information systems" before those principles themselves are further investigated as a whole for their own presuppositions and modelling elegance. The author also has his own interpretation of those principles and exercised more precision than "interpretative comparison" and "social construction," particularly with the epistemological shortcuts of Batesonian epistemology and cybernetic thinking in terms of boundaries and reverse variables, psycholinguistics, and complexity science heuristics. Actually, the epistemology of the information systems field and tools of computer science offer attractive ways of doing organisational research. Information systems researchers are in a powerful position and need to operationalise "the organisation" as a whole, because systems implementation affects or depends upon most of its parts anyway.

Chapter 4 Alpha Case. Complex Organisation of Simple Means: Decision Premises, Software, Structures, and Institutions

A practice lens allows us to examine the institutional, interpretive, and technological conditions which shape the ongoing constitution of different structures. Wanda Orlikowski (2000, p. 421)

1 Institutional-interpretative conditions: several stable shared simple decision premises for technochange

To maximize the power of the guy at the top to influence action. James Brian Quinn (1998, p. 4)

This Chapter discuses how Alpha organisation was integrated in economic ways with *decision premises* to which managers of different levels and functions (e.g., IT, banking operations, risk and compliance, and sales) upheld in order to create stable authority and impose cause-effect logic upon the emergent complex of technology, people and institutions. These *stable shared decision premises* were activated on different occasions of political life in response to the high but disjointed interdependence (business processes design), activity fragmentation, other issues with front-line customer services workers, and technological complexities – all within several stable conditions of the environment and market, as described in the respective parts of this Chapter. A parallel way of this Chapter's design is proposed by Practice Lens (p. 174), specifically, consideration of institutional, interpretive, and technological conditions to interdependence and politics.

Several stable shared simple decision premises were introduced by Chapter 1 Precision for Power in conjunction with the linkage between incrementalism and learning with elements of sensemaking and as a straightforward representation of management belief systems and presuppositions that form business language (p. 82). *Management belief systems* should be treated instrumentally rather than psychologically, which is what top managers do by promoting and imposing such beliefs on every occasion in order to adjust the emergent but expectable phenomena of organisational levels to their specific rationality, which was proposed in the conclusions to Chapter 2 Interdependence-Contingency Perspective on Technology and Organisation. Term "decision premises" from management literature is used here (March and Simon 1958), but it is useful to clarify some features of how belief systems work. Decision premises are several but not many, simple but integrated into a self-referent system (Clarke and Mackiness 1998), and upheld regardless of the context, which constitutes a process-based definition. The value of belief systems is not in their being true, but in providing guidance: it is *useful* to operate out of certain beliefs for getting certain things done in certain places, even against actual circumstances

(Andreas 2002). Under complexity and uncertainty, humans naturally adhere to their familiar belief and value systems (Weick and Sutcliffe 2001), and such meta-strategy is actually profitable in the circuitry of high but disjointed interdependence (Figure 2.3). These features, *literal* definition of *several stable shared simple decision premises* as well as linguistic techniques were applied in order to elicit decision premises and presuppositions from interviews and documents, particularly in regard to AlphaCoreIS technochange of large information systems implementation. The results are presented in a compact form in Table 4.1. The first and major implications of this summary is that economic efficiency and dealing with complexity dominated managers' concerns, and the 80-20 rule was imposed: many consequences were developed from few stable decision premises, which were applied with limited attention to the context and ahead of outcomes known. These decision premises reinforced Pareto Dynamics of Strategic Adaptation presented in the core of Chapter 1 Precision for Power.

Table 4.1 Several stable shared simple decision premises for technochange

What they say: surface structure of beliefs and maxims	*Meaning and organisational implications*
Technochange management	
"It is easier to change business processes rather than software." "Adjust business processes to IT solutions"	Organising and structuring *around* information systems. Systems become rigidified and institutionalised ("where else")
"Business change first"	Considerable business change is necessary in order to succeed in making large IS project productive, from other side, IT professionals can exploit such maxim to pursue technological ways useful for them; hence, such maxim is a double-sided sword for business
"It is okay for business process to have caveats"	Commitments were necessary in order to make banking operations managers working with new business processes
Top management functions are "provision of executive management focus, brokerage of acceptable business solutions, and quality of the relationships with vendors"	Practices of championship and sponsorship were expected from top management for mustering political support and signifying commitment necessary
Economics of IT delivery and technochange	
"Change in practices is cheaper than change in IT solutions."	See Workplace and technology use: implications of decision premises

"IT department is committed to providing an efficient and cost effective service."	As economic beliefs begin to govern IS strategy and delivery, the politics of IT support thrives on economics
"Where else is the software installed?"	Institutional and purposefully simple criteria for systems selection
Complexity and interdependence management (implications for work in customer services)	
"Process orientation" "No key-man dependence"	Interdependence within the overall organisation increases
"Processing of operations that require expert knowledge should be centralised."	Removal of capability (e.g., knowledge and software) from end-users in banking branches. Avoid risky investment into the high-turnover branch workforce. Creation of multiple operational cores, federalisation of business functions (e.g. Business Operations Support)
"Queue management"	Acceptable queue levels were defined as policy and constitute main efficiency criteria around which work was organised in retail branches and the call centre both
"Change from service to sales culture in branches"	Change in appraisal, work practices, and relations at the micro-level of banking branch
	"Triple economizing" on technology (institutionalised software selection), coordination (pooling interdependence and creating actants for technological liaising), and adaptation between technology and the organisation (simplistic genric patterns of technology-in-use)

Management decision premises offered in Table 4.1 are the domain of top management who are proactively promoting them into large and routine decisions and actions. The decision premises are means to getting cause-effect manageability of the complex organisation. Unquestionably, decision premises about "how to manage" are based upon some experience and ongoing evidence. But at some point in time, they are generalised and conceptually closed, and as such they present opportunity for goal displacement. For example, in Alpha most of such management decision premises were exploited IT managers and professionals in order to gain autonomy and freedoms of task prioritisation and performing jobs in convenient ways (which impacted which software was selected), which is discussed further in Chapter 6 The Political Delivery of Information Technology.

Both isomorphism of decision premises accepted in multiple positions and the observation that managers of different levels and functions share decision premises question the idea of productivity of hybrid managers that are business managers transferred to manage IT projects (Earl 1989, 1996). In Alpha, business managers came to lead system development but happened to be subject to the same constraints of budgets, scarcities of qualified human resources, and project schedules. The separation of infrastructural IT services from systems development made the core team of IT support less accessible for management by non-IT professionals. Software development in Alpha was not a priority of the core IT function. As a means to engaging IT professionals, they and their logics were given the leading role, for example, AlphaCoreIS technochange was headed jointly by the corporate directors of IT and Business Change, and after initial technochange success, the IT function was joined with centralised banking operations under management of the IT director.

The research design choice that organisational context shapes individual agency in rather dominant way gets confirmed with operation of omnipresent decision premises (i.e., management logics on Figure 1.1) that are powerful in guiding change and individuals, as managers uphold to them contentiously and operate out them as beliefs systems in making key decisions. The reach of the premises presented was noticeable for frontline workers at the geographically remote retail workplaces.

(i) Business processes in Alpha: heterarchical content and incremental process of change

(Business Process Classification: Content of Change) At the time of the research, definition of 60 business processes was pursued at different stages. Some business processes had sub-processes that were elaborated more than other entire business processes.

Alpha's classification of business processes was based upon the idea of complexity, and Alpha's managers had no clearer definition of complexity beyond the categories presented here. Managers simultaneously used several "hierarchies behind thinking" that are certain value systems about what is important (e.g., customers or financial controls) in order to arrange and prioritise business processes. Such hierarchies of thinking are denoted with (H). The hierarchies are ambiguous in at least two ways, firstly, in terms of the same words used (e.g., "customer business process" mean only approximately the same thing in different hierarchies) and secondly, one hierarchy might include another entire hierarchy as one member. Yet, different hierarchies are likely to be applied at different time stages and

with different stakeholders. The classification of business processes was a multi-faceted heterarchy (Andreas 2002).

Table 4.2 Business processes in Alpha: a complexity-based classification

	Customer	*Back office*	*Expert*
Complexity evaluation by management	"Well-defined to make branch work simpler and quicker"	"Specialist, complexity of back-office is removed from branch work"	"Expert, draw expertise across businesses and markets"
Workload	Voluminous bulk of job	May be voluminous but automated as batch jobs (e.g., humans do not process volumes as with customer processes)	Non-voluminous
Risk (if process goes wrong)	Low risk	High risk, when the process affects a whole business	High risk
Frequency of review and use	Frequent	May be frequent	Rarely reviewed
Examples	(customer) Engage Customer, Open Investment Account, Customer and Account Enquiries, Insurance Illustration, Lost Items	(control) Branch Support, Exception Handling – Investments (finance) Control Branch Cheques, Tax Year End, Transaction Processing	(control) Rules/Parameters Change Product Maturities (CRM) CRM Analytics CRM Create Campaign

(Hierarchy 1) is based on whether "customer", "control", "finance" (e.g., financial check), or CRM functionality was in the centre of business process. (Hierarchy 2) is based on traditional functional areas of investments, mortgage servicing, and insurance (e.g., banking logics). The second illustration in Appendix 3 shows a spatial grouping of business processes around (H1) and (H2) and how, for example, a business process might be understood as "customer" and "control" from (H1) and one category of "investment" from (H2), as assigned by Alpha's managers themselves.

(Hierarchy 3) is Table 4.2 and represents "complexity" along the continuum of "customer", "back office", and "expert" business processes, as it occurred to Alpha's managers.

Customer and back office processes were reviewed with significant involvement of end-users who actually enact those processes daily (the distributed sales function was represented by their managers at the headquarters). Customer processes were visible in performance, bulky in amount of transactions, and low-risk. Back-office processes were not as visible and bulky, required more expertise and were risky depending upon the length of interdependence sequences triggered. *Expert processes* were reviewed and performed rarely, but required significant expertise and issues resolution, because they were associated with change of rules and policies that affected a whole business at once (e.g., change in branch structure or interest rates); thus, they were high risk. Such processes as "Updating Process Documentation", "Rules/Parameters Change" (in banking systems), and "IT Support" were cross-functional (meta) business processes. "IT Support" business process was deliberately defined at high level, with minimum specifics and in two different versions, one for headquarters and one for retail banking branches – all in order to leave flexibility for the core of IT function as it is discussed further in Chapter 6 The Political Delivery of Information Technology.

(Hierarchy 4) worked when business processes were reviewed and the following distinctions were introduced: front office/back office, high/low user-customer interaction, high/low expertise, high/low risk (e.g., risk if not implemented on time or will not be workable in practice), high/low impact upon business.

> *80% of [business process] design effort was spent to improve customer service. (Business Change Director)*

The impact of "customer" business processes upon Alpha's performance was visible, because they were less automated jobs that involve high user-customer interaction; those jobs were performed by most of Alpha's workforce (e.g., banking branches and call centres) in most of their servicing of the customer.

Appendix 5 presents the results of the multiple linear regression that was run on business processes project management data from Alpha and put priority of business process implementation as a function of user interaction, impact-risk, and number of stakeholders, where the independent variables were digital (e.g., High/Low). *User interaction and risk of non-delivery* of software that enables a business process without faults were found to determine *task priorities of business process review and related software changes* (observed interdependence). User interaction was defined as interaction with software while servicing the customer, and some software forms/interfaces were used much more

frequently by more people than others. Number of stakeholders assigned to the business process was not correlated with priority and slightly correlated with perceived risk (perceived interdependence, see Figure 2.1).

(Business Process Formulation: Incremental Process of Change) Alpha's "Design Methodology" has strong managerial intent component that is a part of logical incrementalism, and the following decision premises:

> *Design towards what we want to achieve. Focus on policy, design starts from policy and ends with checking against policy." (AlphaCoreIS Project Director)*

The "*strategic design stage*" was high-level view from organisational top, where begin and end points, check for duplication of participation and work redundancy was made. Then, for each business process, a team of owners and stakeholders was conveyed, who eventually "signed off their process" (i.e., committed to work with the process "as is") with caveats and policy changes to be implemented at the next "*detailed design stage*, after which same sign-off commitment procedures were repeated. These stages culminated in the final check:

> *Iterative, emergent... and in the final step-by-step validation [of checking the business processes material against software and real life jobs and customer data] issues cannot be hidden. (Business Change Director)*

Alpha's top management took the business processes redesign exercise as incremental with purposefully designed layer of commitment and politics, which is in accord with the meta-strategy of incrementalism. "Strategic design stage", "detailed design stage", starting and ending points, completion of each unit of delivery in full and reviewing the project sequence at each completion, process-based versus function-based approach were the elements of incrementalism, that Alpha's managers employed in their work naturally.

(Dynamic Interdependence. Amorphous Teams for Political Reconciliation) Each business process was implemented by the team of its owner and stakeholders, where both roles were defined by the following combinations of decision premises:

> *The primary role of the Process Owner is to adopt a real sense of ownership in their process, ensuring that they nominate, monitor and brief a sufficient number and mix of skilled Stakeholders to ensure that all issues have the right input levels. ...Processes owners (or nominated authors) revise materials and put changes into the learning material. ...An owner could resign only if he or she finds another owner.*
>
> *The role of the Stakeholder is to provide technical expertise, as directed by the Process Owner.*

Stakeholders are called upon from every business area concerned, and preferably should be business experts in their areas. (Business Change Director, company documents)

There were no set patterns of how owners and stakeholders interact in order to define business processes. It occurred to the participants that,

Process owners participated, coordinated, catalysed, delegated responsibility or were figurehead. ...Business process definition was a function of individual management style.

The functional team of the AlphaCoreIS project (e.g., investment, mortgage, insurance) revised the outcomes of process definition by business representatives and prepared a version of process for publication on the corporate intranet as the Live On-Line Business Process Material. The Design Authority team and Business Change director checked that software specifications were aligned with the material proposed and authorised publication. Some of these relationships were captured in the ontology of interdependence, yet the overall picture of dynamic interdependence for definition of 60 business processes was too complex and fragmented to capture in one-to-one relations.

(Business Process Implementation: Process of Change) The practices of use of business processes by the mass of end-users in banking branches, call centre, and transactions service centre are described in Technology of Coordination Case. "Live On-line Business Process Material" as technology-in-practice that served as a tool for complexity management and centralised management of decision premises (Chapter 5, p. 216).

(ii) Workplace and technology-in-use: implications of decision premises

Most of the implications of AlphaCoreIS technochange observed in banking branches came from the management beliefs presented in Table 4.1, particularly the combination that *change of work organisation is cheaper than change in software and IT infrastructure* AND *business processes are to be adjusted to IT solutions* AND *to remove complex operations from branches is better for branch staffs themselves as well as for delivering acceptable levels of service, whilst maintaining operational efficiency.* On top, Alpha's top managers aimed to *re-orient branch culture from service to sales,* so that every customer service person should exploit sales opportunities, refer customers to specialised advisor and so on; this decision premise threatened the sole power source of the branch workforce, which was in knowing and having relationships with local customers.

Qualitative trade-offs of technochange

Alpha suffered from high branch staff turnover of 25% per year that is comparable to 30% reported for U.S. financial retail (Lund et al. 2003; Renner et al. 2003). Even in an ordinary banking branch, good performance by an employee required proprietary knowledge of

systems and policy that could be gained through long-term stay in Alpha's customer services. Yet, both Alpha's management and Alpha's operational workforce themselves had no incentives to advance the workforce.

It was known to Alpha's management at all levels that fair share of issues could not be taken out of the branches due to interfacing with customers, authorship of transaction and original paperwork stored there. Yet, management consistently and purposefully applied those several stable management decision premises presented in Table 4.1 in order to achieve acceptable levels of customer service, speed up queues, and operate with low-qualified staff. Under those circumstances, *gains from IT become proportional to quality and exploitation of human resources*. Branch workforce ended up with more demanding and fragmented work, yet with same pay and same incentives for learning and qualification. Topped with the AlphaCoreIS technochange of main banking systems and policies, the circumstances brought considerable tension to the branch workplace. The overall picture is comparable to one presented by Frenkel et al. (1999) for work organisation at the front-line of customer services.

The technological liaison and actant of Live On-Line Business Process Material was instrumental in removal of complexity from branches, enactment of pooled interdependence, and decreasing dependency upon customer service workers. However, the material did not seem to eliminate the requisite interdependence necessary for well-coordinated levels of quality and immediacy of customer services (Proposition 2.2). Removal of complexity from its grassroots of face-to-face customer services heated the relation between branches and the head office. Use of e-mail and technological liaisons removed the opportunity for reciprocity which re-enforces nonlinearity highly interdependent but disjointed socio-technical systems.

Activity Fragmentation: a new way and outcome of organisational integration

The ethnographic observation of customer services in Alpha's retail banking branches revealed that there was the extent to effective practice: fragmented ways of working demonstrated by branch staff behaviourally showed that certain amount of controls can be put into customer service practices before they will become impractically disjointed and simply slow. Employees mixed their activities of different purpose, priority and logical order into fairly disjointed operations. The switch of their attention to computer systems, other workers, phone calls, tills and paperwork was volatile, for example, a cashier might pick up the phone call while serving a customer facing him or her. These were examples of

activity fragmentation.

Looking from the organisational level, activity fragmentation at the workplace is not random. As the grassroots practice is stuffed with increasing number of rules and facilities that are immediately effective through the software, fragmentation appears as a pattern of development of firm-level agility with generation of the requisite variety of local specialised practices and competencies which are joined in disjoined ways.

There are several sources and kinds of fragmentation, specifically, psychological, observable, and conceptual. Activity fragmentation is behaviourally observable but has psychological self-reinforcing sources. Fragmentation of information systems, organisational structures (federalisation), and business processes is observable from documents but has conceptual sources of being just a concept imposed upon experience. Further consideration of fragmentation constitutes a separate research area developed outside of the thesis.

An Hour Difference: a nonlinearity of IS implementation?

> *There is a difference between understanding technology [by an individual] and capability to use it to perform. Some people fall by the way side. (Team Leader of Systems Development)*

Adjacent to fragmentation is the nonlinearity of how reasonably small variations in organisation context produce significant variations in perception and use patterns of the same software, as presented in Table 4.3 using output of company's own surveys of two kinds: for perception of systems and feedback from branches (Research Methodology, p. 172). The nonlinearities of Pareto Dynamics presented in Table 4.3 contribute to eventual drift from incremental practice to discontinuous innovation. A special class of generic coordination means, specifically, stability and usability of computer systems are crucial to productivity under fragmentation.

Table 4.3 'An hour difference' nonlinearity: 'small' differences in context for 'large' differences in outcomes

Element of context	*Branch*	*Headquarters*
Contact and relation with the customer	Immediate contact. Long-term personal relations.	Document and phone-based contact. No relations.
Timing	Tense: branch closes at fixed time, and there are routines to complete	Relaxed: an hour of evening time that makes the difference in comprehending the software or completing operations

IT Support	Outsourced desktop support. Instability of systems is disruptive for immediate service and adding to stockpiles of paperwork	"Team can be upstairs immediately". IT people are available for ask questions to them
Organisation of operations, business support	Algorithmic and step-by-step on-line business process material	Every support plus experts in business processes
Outcomes along the continuum of satisfaction-attitude-confidence in information systems (interviews, and Alpha's own surveys)	Positive attitude. Confidence in systems' functionality but not in own capability. Use is specified and predictable.	Satisfied but not that positive. Confidence in systems' functionality and own capability. Mastering systems and bending rules.
Outcomes (shifting staff profile – kind of staff attracted and recruited to the changing front-line workplace)	"A middle-aged bank cashier," frequently woman with no degree	"A younger person working on career in financial service," normally of both sexes with or in due course of higher education

2 Technological complexities: International Comprehensive Banking Systems as the core technology of the Alpha organisation

Alpha did not prioritize technology. Being a financial institution, it did not develop an ATM network or on-line banking as a priority. Alpha's website was updated with necessary value-added minimum, such as product information, on-line quotes for mortgage and insurance, and contact facilities. Alpha did not employ content management services and its CRM and knowledge management initiatives stayed at the pilot stages.

At the time of the research, Alpha endeavoured to implement the £15 million (initial price from the vendor) proprietary International Comprehensive Banking Systems (ICBS). The endeavour was similar to an enterprise-wide installation of a SAP or similar kind of enterprise resource planning system. The ICBS has two main end-user interfaces, graphical and windows-based for customer service workers, and command line for back office and expert configuration. Although the ICBS were installed at the number of similar institutions globally, each installation involved adjustment of the software to each particular organisation. Readiness to improve and adjust systems by the vendor and

withdrawal of the extended support by the vendor of Alpha's previous systems were decisive factors in the purchase. The quality of relationship with the vendor was the area of direct action of Alpha's CEO and executive management team.

A few practical indications of complexity of comprehensive information systems: new contingencies

The technology-in-practice framework, proposes that delivery of any information system involves cycles of its continuous readjustment to the organisation. Separation of adjustment by the degree of perceived possible change reveals the following picture: the level of computer platform and IT infrastructure is taken as the least adjustable (i.e., companies simply bear the costs of buying new platform computers, operational systems, and development tools), the level of software functionality is considered adjustable but costly in the case of lock-in into proprietary systems, the level of workplace practices is considered as nearly totally flexible (here, configuration, datasets, and use patterns are often different from logical ways intended by designers).

Even with operating from the decision premise of adapting business processes to IT solutions, adjustment of banking software to Alpha's needs involved about 640 major improvements and 1,000 software flaws, these numbers reflect only authorised changes that were registered by AlphaCoreIS project. Many changes were proposed but not authorised, or implemented by the side of authorisation, or authorised but not registered, or substituted with workarounds. Such adjustment has its price. The price of the ICBS turned out to be £17 million paid to the vendor plus costs of in-house developments that, for example, for the financial year from the August 2003 amounted to about £1 million, and the overall project was initially budgeted as £39 million over 7 years (further details are in Economic conditions that drive IT politics, p. 234).

Another indicator of technology complexity was in 14 types of *computer environments* of operational systems, standard office software, and database access for business-as-usual job roles (e.g., branch assistant, mortgage advisor, call centre operator, service centre team leader) and 15 types of computer environments for software development, testing, and training. Each computer environment involved about 5,000 settings.

Yet another technology complexity came from 30,000 specialised and interlinked parameters of International Comprehensive Banking Systems.

There are experts in certain business areas, but even they tend to forget meaning of parameters

they use... effects could be unpredictable, difficult and timely to resolve and ramify. ...There are 29 products and large number of parameterised rules for each one. There is a clear issue to maintain rules, we do not understand all the rules' meaning and consequences. To discover the right setting of one parameter for product maturity took 7 days. (Business Change Director)

This is a comment on unexpected ramifications as nonlinearity of highly interdependent socio-technical systems. Change in one configuration parameter in banking systems might unpredictably (to end-users and even risk experts) affect real-time operations of seemingly unconnected parts of the bank.

Minor technical issues could become significant work problems... [such as] slowness of systems. (Compliance and Operational Risk Director)

Some "small" issues about computer systems (e.g., a bit of slowness) are unnoticeable and acceptable in one context (e.g., to computer systems administrators and service centre workers that process transactions), can ramify in another context (e.g., in time-critical and customer-facing work in banking branches).

3 Structural conditions for AlphaCoreIS technochange: federalisation

Alpha' federalized joint IT-Operations function is represented with clustered organigram in Appendix 6. It will help if you actually familiarise yourself with Appendix 6 before continuing to read, because Appendix 6 is a sensemaking device that presents all data on Alpha's structure in a compact way; even size and overlapping of clusters is meaningful as described by (Advanced Qualitative Data Analysis) Interdependence analysis in Research Methodology.

Two steering committees on information technology and product development were central to actual operationalisation and implementation of Alpha's "corporate strategy". Ultimate decision-making upon information technology was vested in a steering committee called Business Change Forum (BCF) that assessed business case, expenditure, priorities, and approximate sequence of implementation. The CEO, Directors of the AlphaCoreIS Project, and the IT support director (SOS Division) constituted the Business Change Forum.

(Infrastructural Core of the Alpha's IT function) Systems Operation Support (SOS) division was in charge of the IT infrastructure including telecommunications and IT support. SOS consisted of the following specialised "teams" of 5-6 professionals each: release management, management information (technical), product support (software that run in "production mode"), testing, IBM platform support (AS/400), Windows NT platform support, network, architecture, desktop, and IT Helpdesk. Whilst the

specialisation of some areas was high (e.g., for IBM platform), the "teams" were kept informal intentionally, and work of some teams was subject to external authority (e.g., management information and testing).

Within the core IT function, there was continuous contest for getting expensive IT training, which was a part of managerial problems, about which IT top management was aware. The function was not "managed" but rather governed by the "Group IT Managers" for networks management, infrastructure development, systems development, information management, service provision, and "IT channel development" (i.e., e-banking).

(AlphaCoreIS Project) was posed as organizational change of which new technology was only a part. The AlphaCoreIS technochange was championed by CEO and Group Development Director (who was in charge of formal company-wide strategy and balanced scorecard), and operationally headed by two Directors of Business Change and IT and Operations. A professional contracted manager and an office of few analysts supported project management activities and coordination. In the earlier stages (first two years) of the project, the team leaders from within the AlphaCoreIS project were convened as Programme Management Team.

(Business Function after AlphaCoreIS Technochange: Multiple Cores)
As the dynamic task forces on business process definition dissolved, Business Operations Support (BOS) division was created in order to configure the comprehensive banking systems, seek better business practice, and optimise business processes. This new knowledge-intensive operational core was buffered from the mass of end-users by means "Updating Process Documentation" and "Rules/Parameters Change" business processes, which prescribed procedures and proforma for changes in systems' rules and document templates (e.g., correspondence to customers).

Perhaps the most interesting manoeuvre was transferring banking operations to the management of the IT Director. Service Centre with Central Processing Unit (i.e., a branch in the head office), Call Centre that served customers and branches, specialised Branch Support team and some teams from Finance functions, such as Taxation Services, were joined into the large federalised IT-Operations function. Such structural change did not seem to have explicit benefits to the top IT managers, and the manoeuvre can be considered as an attempt to align its operations and IT services by the organisation, a demonstration of emergent high-level agency.

Thompson's (1967) propositions about unit grouping according to interdependence complexity and similarity (p. 114) were found generally applicable to Alpha's core IT function of Systems Operations Support and AlphaCoreIS Project. Firstly, units were grouped by the strong task dependence that required mutual adjustment (e.g., network team, Windows NT support team, data conversion team, and so on). Secondly, units were pooled in such clusters as "Functional Teams" (for insurance, mortgages, and investments), "BOS", "SOS", and "Service Centre".

Comparing to another similar UK financial institution studied by Walsham and Waema (1994) and the operational models of a typical retail bank by (Renner et al. 2003)[41], Alpha's IT function was considerably customized to its organisational context. Such variation in the IT function's design and governance across comparable institutions is a sign of both strategic drift and political adjustment.

4 Institutional-environmental and market conditions: do they explain the complex organisation of Alpha?

Financial markets of private banking underwent internationalization of customer base, and geographical effects were washed way with IT distribution channels and infrastructures that operate for the whole financial industry (e.g., cheque clearing). Economic effects of user-networks took their strength (Arthur 1996). Yet, Alpha maintained community-based conventional distribution strategies through the channel of its about two hundred branches, rather than the Internet channels. *Euro-institutional change* added overhead with euro monetary system, new European law and regulatory institutions, particularly, with complicating mortgage and money laundering regulations. Euro-institutional change has direct impact upon the customer services, banking policies, and operational model of Alpha. In fact, the justification for Alpha's multi-decade million pounds purchase of new banking systems and AlphaCoreIS technochange were grounded in the necessity of compliance with new regulatory conditions.

[41] Secondary cases, industry reports, and the lines of comparison in Research Methodology, p. 167.

Alpha had blurred boundaries that defined the following structure of IT delivery. First, consultants and qualified project workers populated AlphaCoreIS technochange[42], they were needed for interaction with banking industry, strategy formulation, human resources, and risk assurance and IS project audit (IBM). However, hiring IT professionals for substantial jobs was considered "a waste of money" by the IT managers. Second, basic IT support for branch network was *outsourced* (e.g., desktop computers and operational systems). Third, all acquired banks, subsidiaries (investment firms, brokerage, and off-shore services), and alliances (for insurance and mortgages) had their own *systems and even IT infrastructures*.

Being a medium-sized financial institution, Alpha did not escape the global trend of *industrialization of financial services* that focused on operational efficiency and questioned profitability of traditional banking functions. A number of management fashions arouse and affected Alpha, for example, strategic IT-controlling, centralisation of transaction processing, IT outsourcing, more alliances, change in approaches to human relations, particularly attracting younger cadre with higher education and putting less emphasis on personnel development. Having significant but finite amount of resources, Alpha put only small share of them knowledge-intensive technology and considerable share in the IT infrastructure and updating its core technology for banking operations, which both would bring capability for customer service and market readiness, flexibility for back-office, and a platform for further e-solutions if needed.

These scarcities and necessities upon Alpha show how formative institutional and market factors were. Their impact was traceable in decision premises (Table 4.1), business operational models (e.g., business processes and organisational structure of IT-operations), and the issues with the front-line customer service workplace, as presented in this Chapter 4. The contingency-structure linkage would be less than appropriate in discussing these intricacies emerging from simple means of well-known software, organisational structures, and workers governed by *several stable shared simple decision premises* that can be recognised in behind operations management techniques of any large company.

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[42] It was utmost surprise to the researcher to realise how he received considerable share of information from contracted specialists, who were not actually employed full-time with Alpha organisation – a company run effectively by people who are not in traditional employment relation is a definite sign of new phenomena.

These decision premises are simple tools activated on different occasions of political life in response lack, disjoint or over-use of interdependence, i.e., if variation from the constant of requisite interdependence is considerable (Proposition 2.2). Therefore, further empirical analysis and discussion of the thesis turns to application of the sophisticated research models in sequence to each other. First, Technology of Coordination is presented in Chapter 5 High but Disjointed Interdependence: Technology and Practice of Its Coordination. Interdependence as a condition for power use (Proposition 1.8). Hence Second, how the federalised IT function achieves decisions, interacts with end-users, maintains IT infrastructure and implements information systems under punctuated conditions presented in this Chapter 4 is explored in Chapter 6 The Political Delivery of Information Technology using the models of the power-action and incremental delivery that both introduce time and process-based understanding of successful strategy and uncover what is behind the simplicity of the 80-20 rule and pooled, sequential and reciprocal interdependence patterns.

Chapter 5 High but Disjointed Interdependence: Technology and Practice of Its Coordination

1 Generic coordination practices

Taking upon the issues with the conceptual tools of the contingency theory specified in the conclusions to Chapter 2 Interdependence-Contingency Perspective on Technology and Organisation and operating with necessary distinctions for patterned research of organisational change and Practice Lens specified in Chapter 3 Research Methodology, the first move of this interdependence analysis was collection of every evidence that responds to Thompson's interdependence patterns presented in Figure 2.1 A map for studying interdependence. Then the framework of software-based coordination by Malone and Crowston (1994 pp. 97, 105) was found to offer distinctively identifiable clusters, each of which has its own interdependence configurations and software packages. The framework was complemented by empirical and secondary data as well as the author's expertise, and is presented in a compact way in Table 5.1. These generic coordination practices are applicable to Alpha, Skanida, or any typical business organisation in each of their detail from the same software used for scheduling, to the problems of prioritising, to shift from reciprocity among co-workers to dependence upon systems (Proposition 5.1), to passive and unaware uses of technology, to emergence of actants. Because these uses of common software for coordination are widespread, readily used and recognised as standard, they form an *institutional praxis* (Whittington 2002) that makes them "generic" to most organisations with little variation, which is a relatively new phenomenon.

The review of generic coordination practices directed the search for interesting features of the design of Alpha organisation. First, the main impact of the "new contingencies" was found in the form of *pooling and disjoining response to high interdependence* by means of remote presence, technological liaising, and passive use. Second, the complex coordination actants—predicted by the unified framework of the four stages of emergence as the stage four emergent coordination that is more powerful than hierarchies (p. 39, Chapter 1)—would be difficult to detect without this groundwork (i.e., find actants' purposes, boundaries, and how and when they affect the organisation and its politics).

Table 5.1 Generic coordination practices: interdependence and software

Generic practice	*Interdependence patterns and purposes of IT use*	*IS functionality and examples of common software*
Task definition: separation and prioritisation *Task assignment (including market mechanisms)* *Resource sharing*	*Interdependence:* pooled pattern is presupposed, because each task is the inseparable unit *Essence of IT use:* action tracing and recording, structured and plain electronic communication	*IS:* Enterprise resource planning (ERP) and manufacture resource planning (MRP) systems. Business process enablement systems. *Software:* SAP, Dolphin Navigator (Skandia)
Scheduling	*Interdependence:* pooled and sequential patterns (schedule sequences). *Essence of IT use:* action tracing and recording property, enhanced with alerts and controls.	*IS:* Centralised (server-based) scheduling services and planning applications. *Software:* Microsoft Exchange and Microsoft Outlook, Lotus Notes, Microsoft Project,calendar software.
Mutual adjustment (including task and time) *Group decision-making (including committee and dynamic groups)*	*Interdependence:* reciprocal patterns (which include pooled and sequential by presupposition). *Essence of IT use:* action tracing and recording, structured and plain electronic communication, support of weak ties, advanced communication.	*IS:* E-mail, instant messaging, voice over IP), groupware, executive, expert, and decision-support systems. *Software:* Lotus Notes, each e-mail client.
	Coordination across and uncovered by levels and authority (Table 2.3)	
Liaising	*Essence of IT use:* interfacing through technology, automated structured communication	*IS:* electronic data interfaces (EDI), content management services, (e.g., report generation), Internet/intranets facilities. *Software:* Each web browser

Prerequisite *Usability* *Interface* *Standard* *Rule* *Control*	*Essence of IT use:* prerequisites, usability, and interfaces for building "a technical liaison" that not only structures and streamlines communication but also carries out some purposeful coordination *Essence of IT use:* robust and automated enablement of rules and controls	*IS:* Software development and database design environments. Administrative systems configuration including access and job roles *Software and programming languages:* Microsoft Visual Basic; Perl, Java, VB scripts for controlling web pages; SQL and Oracle database environments. Utilities of operation systems

Interdependence patterns and generic ways of their coordination by modern software

The framework of pooled, sequential, and reciprocal interdependence (Thompson 1967) has surprising resilience in determining which sort of coordination is needed. Pooled interdependence requires detailed task definition and some liaisons (primarily technological intermediaries and complex data bases) in order to aggregate work results. Sequential interdependence is managed with project management and scheduling software (and there is considerable reverse task engineering when work is specified in way that should fit presuppositions and format of project management software, such as Gant diagram). Reciprocal interdependence is the most complex, for instance, schedules fail in dealing with mutual causality required; groupware and various proprietary packages are used for reciprocal interdependence with varying degree of success.

The substance of *task separation, prioritisation, and assignment* is performed by managers, whilst systems are used for recording, tracing, and alerting. Prerequisites and rules are used to set up recording and alerting capabilities, whilst usability and interfaces are important for human end-users' receiving, comprehending and acting upon such alerts and records. *Information systems are rarely "a decision-maker". Tasks are to be specified in great detail, or indeed "programmed", in order for any software to take the central place in human coordination.* The issue of over-specified tasks follows the issue of high interdependence. This is the story of the Technology of Coordination Case. Live online business process material that was designed in order to provide nearly algorithmic procedure from organisation's centre to each and every branch (p. 216). *In practice, most software used for coordination looks more actionable than it is, as some information is*

recorded post-factum and some adjustment is just not captured. This is the story of the Technology of Coordination Case. IT task request database where the database itself was imperfect recording device (p. 220). The two cases represent certain dichotomy in which management of high interdependence might fall between attempting to specify details into proprietary software OR use some facilities of standard software at hand in ad-hoc fashion. Such is discussed in the conclusions about interdependence management, particularly the issues of over-simplified and over-complicated interdependence and do good business processes deliver better match between policy and practice?

Resource sharing is the background to any task definition. Distribution of allocations of resources is optimised with information sharing, efficient planning, various software packages that support methods such as ERP, MRP, and JIT. Authoritative resources of time and information are shared well with scheduling software, e-mail, and the Internet, yet more *complex and intangible kinds of authoritative resources (e.g., production capacity, allocation of human resources to teams, or experts' time) are not that amenable for sharing automation.* One mechanism to tackle the issue is intra-firm market or just formalised auctions where capacity is allocated as a result of trade with equivalents of currency and prices, and prices reflect other capacities (e.g., a salesperson who can attract more paying customer receives more or quicker production capacity) (Malone 2004).

Individual and group *scheduling* tools help in task assignment and resource allocation according to pre-set criteria (venues, projects, priority, timing, etc). Human agents themselves use scheduling software for elected scope of their activities at their micro-level of inter-personal coordination. Most *project management* software with various optimisation methods also *adds the time component to task definition.* However, typical role of software is static and about registering the design of task programming.

Mutual adjustment and *group decision-making* cover task definition, resource sharing, scheduling, liaising, and controlling. The higher level coordination by multiple adjustment relies upon lower level ones. On micro level, adjustment means communication through e-mail, scheduling software (both are frequently integrated), message and discussion boards, chat, instant messaging, web forms and other Internet/intranet facilities, teleworking (e.g., step-by-step editing of an Microsoft Word document by making and accepting/rejecting changes by different parties at times of their convenience), and simultaneous working (e.g., instant chatting, joint drawing/brainstorming by several parties simultaneously, or video conferencing). On macro levels, adjustment means use of scheduling software,

groupware, or business process management software or certain accounting and risk management software in order to set conditions that would drive mutual co-working and information sharing.

The integration of levels (e.g., scheduling by individuals and project planning for a few units) involves trade-offs and processes that are not captured with software, which is evident in *the gap between many standardised software packages for scheduling, and few proprietary systems that aim at groupwork and decision support and mutual adjustment. In order to overcome the gap, most software is designed for grasping the most complex interdependence possible.* For example, Microsoft Exchange software "integrates" e-mail, scheduling and resource sharing functionality and appears actionable and versatile, whereas each layer of the functionality requires separate implementation. Generic e-mail is ambiguous tool, it could be used for pooled (e.g., sending message to a list), sequential (e.g., chain of forwarded messages) or reciprocal (e.g., mutual adjustment with back and force messaging) interdependence.

However, the presupposition of the requisite complexity of software does not work straightforwardly. All-inclusive software is over-engineered to produce and maintain and overloaded with systems logics that impose upon end-users, for example, contemporary software imposes process orientation and only a few ways of integration. Again, the issues of unnecessary complication of interdependence and interdependence management arise.

(IT Facilities—Coordination Means: ambiguous linkage)
Because the same software is designed and used for different coordination purposes, it is hard to define which IT facilities (defined as visible artefacts) contribute to which generic coordination means. Institutionalised coordination means, such as "team" or "liaison", have the same labels but different coordination processes and technologies enabling them. A similar problem is of relating "software functionality" to "job description," generally, a job, activity or rule is enabled with several IT facilities on multiple levels of software architecture, such as interface forms and database consistency checks.

A facility of information technology can be defined as a piece of functionality. If functionality is measured in terms of computer screens, software menus and other items of user interface, the definition of functionality is clear in that it is amenable to observation. Yet the items of functionality from user interface are not nearly equal in their value to end-users as workers and in their consequences. If functionality is measured in terms of

particular work or business purpose, the definition of functionality becomes subjective, particularly subject to evaluation based on several stable decision premises for IS implementation. More "objective" measurement of IT facility in terms of programming code or some formal logic is even less sensible for practice, it is one of those "hard to scratch below the surface" measures. For example, within the code a procedure is a defined unit marked at its start and end, but procedures are not equal in what they do, and when the code is run, the use of programming language or low-level assembler in order understand how code affects practice is not particularly helpful. Yet another possible measurement is usage of standardised procedures called Application Program Interfaces (APIs) that have some meaning in business or professional terms; Alpha's comprehensive banking systems had APIs that were of help at software development stage rather than roll-out and technology-in-use stage.

(ii) Interdependence Disjoint: remote presence, technological liaising, and passive use

Technological disjoint or disembodiment of work relations—that otherwise tend to be interdependent and develop advanced forms of reciprocity—was offered as a nonlinearity of high interdependence. From one side, the disjoint is useful for it enables *remote presence* (of powerful stakeholders) in effective and timely manner. From the other side, the disjoint contributes to fragmentation and unawareness of work relations, and "if people do not realize their interdependence, they are not likely to undertake mutual adjustment or collaborate" (Morgan 1998, p. 185). Whilst technological disjoint is only one nonlinearity, it contributes to a whole pattern of highly interdependent but disjointed socio-technical systems (p. 131) that removes the opportunity for reciprocity which re-enforces.

Putting a *technological liaison* instead of human interaction is common and well-accepted, for instance, a web site or intranet is offered for logistics or coordination purposes. Technological liaisons are complex coordination means that rely upon configuration of rules and standards, prerequisites and usability, and interfacing. *Use of a technological liaison enacts pooled interdependence* patterns for human co-workers, but one-sided dependence is rare and, in fact, ill-formed for social settings (Proposition 2.1). Effectiveness and value of such a liaison are defined in terms of cutting off unnecessary interaction with rules, high interconnectivity, and usability— typically, a technological liaison represents general efficiency concerns of middle and top management (Methodology Note 1). Interconnectivity delivers outreach and functionality, the more interfaces with other systems and databases a liaison offers, the more valuable it is; yet

each interface is a transform that distorts or re-shapes information.

Reliance on IT-enabled liaising inevitably punctuates work contexts. As people come from different backgrounds, positions, and intents, IT enables pooled ways of their working and actually reinforces divergence of thinking (Dewett and Jones 2001). Micro-level (among individuals) divergence and inflexibility are the costs of technological liaising. Individuals cannot negotiate convenient ways of working with systems, for instance, one cannot negotiate pre-set data requirements with a computer system. Hence, coordination issues of technological liaising were simplification of interdependence, impersonalisation, and "disembodiment" in the sense of Child and McGrath (2001).

Proposition 5.1 Shift from reciprocity among co-workers to dependence upon systems.

Decrease in the opportunity for reciprocity initially described as qualitative trade-off of technochange (p. 196). First example is never-ending lack of interaction through intra-organisational boundaries, even if such interaction is actually beneficial to productivity – easily implemented software facilities can facilitate the issue, but that would require re-definition of coordination purposes behind software design.

> *When a task was referred by e-mail from a branch to Financial Accounts unit or Taxation section: a reply was neither planned in business processes nor supported with tracing software facilities (e.g., tracking number, confirmation tickets or instant messaging). Usually, the specialists at the headquarters performed operation requested without any feedback. Branch or a customer needed to check the results themselves, and cases of miscommunication, loss in documents, and starting the transaction anew were frequent and to the customer dissatisfaction. (A common explanation from several Branch Assistants from different branches)*

Second example, as branch culture was "re-oriented" from service to sales, co-workers were expected to pass customers of sales opportunity to either more qualified colleague or those who are free from serving the queue. The authoritative measures of such cultural change questioned the chances of reciprocity among co-workers developing to necessary levels of smooth operation and smart sales, because appraisal depended on individual sales and even if the area of sales was beyond one's expertise, one might choose not to pass the client if there is a risk to long-term relationships – knowing and relating with local customers comprised sole power source for the branch workforce.

Yet another "coordination practice" can be observed, as *people may find themselves passive users of technology*. Not only majority of employees do not choose which software to use, but also use can be imposed upon them, for example, they can be included in e-mail

distribution lists or their data can be automatically collected and used somewhere. Interesting side of the phenomenon is when people are treated as a group through technology, which might go against their intent or just without their awareness. These coordination practices are as omnipresent as e-mail lists or groups in Microsoft Exchange or Lotus Notes groupware which are over-used, for example, if one person create a group that she or he thinks is interested in certain information and starts to distribute messages regularly. Outside of organisational boundaries, this is known as spam.

(iii) *Complex* coordination actants: powerful purpose and emergence

In organisations, coordination means exist as generic as described in Table 5.1. Yet, each organisation varies and recombines coordination means in order to handle multiple purposes at once. As a result, some durable complex configurations of generic coordination means *emerge* with purposes and momentum that they sustain on their own. They are called actants, a term for self-activating and self-referent actor-networks (Latour 1996).

(Cases of Actants) Alpha organisation had at least two of such complex coordination means, specifically, the live on-line business process material and database of IT task requests plus the IT Helpdesk. A similar actant called Dolphin Navigator was employed in Skandia Group of multinational financial companies, its software implementation was a balanced scorecard unfolding down organisational levels along the five dimensions of finance, customer, human, process, renewal and development[43]. Implementation of Navigator was portrayed as a behavioural knowledge management (Earl 2003). Whilst any IT infrastructure is actor-network that once established acts on its own, the purposes, design and dynamics of such actor-network are rationalised post factum, if such rationalisation is at all possible or stable (Methodology Note 7). This makes the IT infrastructure less purposive, therefore, less powerful actant and more of a random obstacle and also makes qualifications of emergence less applicable to IT infrastructures.

(Emergence Qualifications: purposefulness, limited distributedness, stochastic high variance of enabling structures, embeddedness, and self-reference)

The emergence of the actant can be supported by design and (centralised) intent, but the logics of the actant cannot be said deliberately planned, and yet the actant emerges in order to fulfil certain purpose, significance of which can be seen after the actant is shaped. For example, in Alpha the actant of IT Task Request Database emerged for coordination of IT

[43] Skandia company documents, particularly, "Five Focus Areas."

function on the micro level of routine tasks without interfering with strategic IT resources allocation but with providing a structure for mutual adjustment between IT specialists and task requesters from business side. Yet, an actant is distributed over specific software, space, and groups of people typically without full understanding of its human participants.

Actant emerges and stabilises through *high variance* of organisational structures and practices, with ecological mechanisms of variation, selection, and retention (Weick 1989, 1999). Alpha's IT function was federalized, AlphaCoreIS technochange bred initiatives into structures and launched new units for the benefits of autonomy and (political) reconciliation[44].

Whilst mimetic selection of systems by the organizations is frequent (e.g., they look at where else the system is installed), the variation of structures and practices leads to emergence of different actants and infrastructures, even for the seemingly similar companies and systems (Ciborra et al. 2000). Alpha selected their core International Comprehensive Banking Systems based upon fair share of institutional criteria, but comparison with secondary cases and industry reports along the lines of similarity in business process definition, CRM functionality, and IT infrastructure) did not offer much insight into what went on in Alpha.

Distinguishable purposefulness and stochastic emergence through high variation make actants right candidates for "new kinds of coordinating structures and regulation processes [that] must emerge if adaptive capability and efficiency are to be maintained" – the top stage four of the unified framework of the four stages of emergence (p. 39, Chapter 1) (Lichtenstein and McKelvey 2004). Such complex coordination means emerge after the stage of hierarchies formation. The coordination situations of the stage four emergence are difficult for stable resolution at any given level of the organisation, such multi-layered system is constantly becoming (Tsoukas and Chia 2002). Complex coordination means also resemble complex power resources in being governed by the same formula: *emergence plus embeddedness plus recursiveness.*

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[44] For estimation of structural changes that are strong 2nd order power-actions, see The power law of information technology management (p. 262).

Embeddedness. Actants are constructed in nested ways, where each level involves different technologies or organisational units (e.g., computer platforms of Microsoft Widows, Unix, IBM AS/400 or MacOS are used for building infrastructures, which support databases of MS SQL, Oracle or DB/2, which IT specialists configure and from which management information reporting is pre-set by developers, and all of that is used by workers in service centre for banking transactions processing). On the other side, pooled, sequential, and reciprocal interdependence patterns are also embedded (e.g., reciprocal interdependence envelops sequential scheduling and pooling with technological liaisons).

Coordination of coordination. Complex coordination means require noticeable effort for their maintenance. This makes them distinguishable. Alpha's live on-line business process material was maintained by few dedicated teams of AlphaCoreIS technochange at the command of Business Change Director, and after technochange, by new Business Operations Support function and task forces on business processes with participation of members of all business functions from finance to risk management and regulatory compliance. The special project management team was in charge of keeping track of business process material creation and the special Design Authority Team was in charge of its release. The database of IT task requests was maintained by the IT Helpdesk and "released" by IT managers in charge of System Operations Support. In general, any standard-based corporate information infrastructure itself requires an extensive underlying and supporting infrastructure (Case of Bridge project in Norsk Hydro by Hanseth and Braa 2000, p. 129). Both *IT infrastructures and actants are nested and self-referential.*

(Pooling Interdependence) In both cases of Alpha's actants, interdependence was handled through pooling effort of employees and coordinating them with a technological liaison. However, neither actant was vested with "decision-making authority" in task definition and did not elaborate interdependence with task programming. As such, the on-line business process material and IT task request database were used as a reference (e.g., for recording, tracing, and alerting) and both were supported with parallel human communication for mutual adjustment.

(Centrality of Human Agents) The difference between the two actants was in the role which front-line agents played in them. Task implementers were not central in the actant of live on-line business process material, and as such the material was effective coordination device for (remote) presence of interests of the firm as headquarters, top managers, business process experts saw them. The actant of database for IT jobs was also a

facility for IT management to trace what is going on (e.g., with daily reports); however, it did not prevent mutual adjustment between IT specialists and their front-line business customers.

The further details about usage of actants, interdependence patterns, and consequences for organisational design and practices are considered right in the next section on Technology of Coordination. Yet, at this stage the trade-offs among within pooling interdependence and human centrality provide some evidence for the presupposition of the constant of interdependence, as the complexity of coordination is put either into work organisation or into (technological) mechanisms that support simplified work organisation.

2 Combination of generic coordination practices in Alpha: Technology of Coordination

(i) Technology of Coordination: 'Live On-line Business Process Material' as technology-in-practice

Chapter 4 introduced how business processes were developed in Alpha by explaining the process of design and the designers of the processes. This section applies the model of generic coordination practices in order to describe actual structure, implementation, and usage of those generic practices in a particular technology-in-practice of 'business process material' (Table 5.2).

(Structure of the Material) The on-line business process material was comprised of the set of web pages arranged by business processes. The material has two types of content: (1) diagram-based descriptions of how the process goes through business functions, decision points (e.g., if...then), and feedback loops, and (2) step-by-step instructions for how to undertake a procedure through the software and which team to contact. The technological complexity of the material was insignificant comparing to its coordination impact: the developers used standard HTML web pages and Microsoft Office (upper left).

Table 5.2 Live on-line business process material: technology-in-practice from managerial viewpoint

	Technological and physical	*Sensemaking and interpretational (mostly for design rather than use)*	*Organisational and institutional*
Facilities	Software to create and use the material: HTML web pages created with Microsoft FrontPage, Internet browser Functionality and features of Internet technologies (e.g., hyperlinks and data entry forms) Microsoft Excel and Microsoft Project for project management	Algorithms, dataflow and workflow notations were used in business process material that was complied of two major components: (1) diagrams and (2) step-by-step instructions "Project Wall" – few walls in headquarters, on which tremendous amount of project management material of business process definition were displayed (e.g., schedules for 60 business processes and necessary software updates needed)	Sponsorship by top management (a resource) Business process teams from across the organisation: operational analysts, software developers, experts from finance, tax, risk, purchasing areas Design authority team for centralised project management and alignment to core information systems

Norms	Business process material should not be printed out for regular reference, because procedures may be changed centrally	The same Intranet for the entire organisation, but different entry points and navigation for different business functions and job roles 4 degrees of priority based upon the classification (e.g., user-customer interaction, impact upon business, and risk of non-delivery). The priority was driven by actual interdependence.	Ownership and stakeholdership "It is okay for business process to have caveats" Legitimization procedures (e.g., sign-offs) Weekly update meetings for business processes at HQ. Each Thursday, from 9:00 to 9:30 branch staffs are updated on business processes. (plus) Practice of self-study by branch staffs
Interpretative schemes (frames of thinking)	Computer platforms: Microsoft Windows and IBM AS/400	Cognitive bias: business analysts praised definition of workflow (e.g., how the process will work within current job and human relations), whilst IT specialists considered defined dataflow as "fair enough."	The very paradigm of "business processes"

(Purpose of the Material). Managers and process designers intended the material to be available to any Alpha employee as the only live reference and to be used simultaneously for the purposes of task instruction-job description, policy document, instructions for the use of banking systems, and learning material for training and self-study.

(Usage of the Material) The technology-in-practice framework of the live on-line business process material presented in Table 5.2 represents Alpha documents, interviews, and observations in some compact way. It can be used to infer the practices of business processes application at the customer service workplace, as the following examples of

inference illustrates:

Each Thursday, from 9:00 to 9:30 branch staffs were updated on business processes changes, plus branch managers were held responsible for their staff having one hour per week, free of all other tasks, for self-studying certain business processes with focus on policy and procedure (rather than software use).

The format, support, and enactment of the non-static on-line business material of Alpha were positively different from the fragmented and text-based policy materials common to large institutions. Whilst the material was beneficial in integrating Alpha's operational practices into steady customer service delivery, there were usability practicalities aimed at management of decision premises. First, the full material was available on the Alpha's intranet, but has different entry points and navigation routes for different business functions and job roles; so that different parties were presented with different information. One consequence was that explanations of software functionality available to the staff at the centralised service centre were commonly more complete than explanations available to the staff in branches. Second, the material should not be printed, because it might be centrally changed. As branch advisors switched back and forth among screens with customer records and helping material, it slowed down the operation. Even with regular updates and self-learning, it was impossible for all branch staff to be updated about all changes, particularly for infrequent or unusual operations.

(Interdependence Implications: Pooling and Technological Liaising) The on-line business process material was designed as a technological liaison for coordination of the extant pooled interdependence of many relations, for example, between branch staffs and service centre staffs; furthermore those who defined tasks (Business Operations Support) were separated from the mass of end-users who implemented those tasks, specifically the branch staffs.

The material itself contributed to pooling interdependence further with the presupposition of complete shift to the systems for reference (Proposition 5.1); in practice observation, the branch co-workers asked each other first, and only then, often together sought through the material. Another designers' presupposition did not work ideally too, specifically, that members of different parts of the organisation will be coordinated if all of them refer to their part of the material. The complexity of policy and failing assumptions that systems would be properly configured, data properly supplied, and outcome (e.g., statement

printouts or maturity notification) would follow in automated way – all disturbed the presupposition of coordination ordered by means of advanced technology. These presuppositions by Alpha managers reflected the larger presupposition of economising on coordination, even through those practitioners were not institutional economists.

(ii) Technology of Coordination: 'IT Task Request Database' as actor-network

> *The ITTR database is the server based system used by the Help Desk to capture information relating to every ITTR raised. ("IT Task Request" document)*

(Usage of the ITTR Process) An IT task request could be initiated by any employee, then it should be approved by respective line manager who then e-mails a standard proforma to the IT Helpdesk that then lodges it into the database. Then the request is considered by the IT managers who screen reports daily (SOS Division/Systems Development), and if further questions of feasibility or resourcing arise, the request is settled with respective business function management (informal mutual adjustment) or goes to Business Change Forum (formal pooled adjustment). The process is illustrated in Appendix 7 with large transparent arrows. Appendix 7 is rather complicated drawing and a sensemaking device to emergent actant entity, it will help if you actually look at Appendix 7.

The purpose and impact of such sequence on Alpha's end-users, quality of IT support, and firm-level capabilities is discussed the section on A content probe of IT task requests: discouragement form seeking advanced support and localisation of strategic capability (p. 249); that section also comments upon initiators and content of IT task requests, that varied from a new computer installation, to change of parameter in computer environments, to request for software to change in IT function's policy including service level objectives.

The technology behind the ITTR actant was simple, a database and a set of report forms that were generated as HTML web pages on the Alpha's intranet. The IT task request proforma, offered in Microsoft Word format, imposed prerequisites upon how IT jobs were formulated. The very coordinative purpose of the ITTR database was somewhat defeated with the lack of actual priority information in the database (i.e., it was simply not entered). Also, the actant did not include scheduling and cost allocation functionality. In terms of usability, the ITTR database and reports were apparently designed for IT specialists.

Not all IT jobs were captured as IT task requests. As it was supposed by "IT Task Request" policy, changes in banking systems' parameters and delivery of management information had their own ways of coordination with respective business processes and organisational

units in charge. As it was not supposed by the policy, all fields of IT task request proforma were filled out, and textual description was made by non-IT-professionals. As it was not supposed, some negotiation, approval and implementation of IT jobs was done by the side of IT Helpdesk or registered post factum.

(Interdependence Implications: Fragmented Pooling and Technological Liaising)
In the section on complex coordination means it was noted that both the on-line business process material and database for IT jobs were coordination means initiated by management purpose. The ITTR database was NOT in the centre of (human) coordination processes of IT job initiation, decision-making and implementation. In practice, the ITTR database was used as a reference and archive not work medium. The ITTR actant did not prevent mutual adjustment at the grassroots between IT specialists and their front-line business customers, so that human agents remained central to the coordination and Proposition 5.1 on the shift of dependency from colleagues to systems was not applicable for coordination of the Alpha IT function itself.

It seemed technically possible and even easy to build the decision-making rules for allocation of manpower and authorisation of IT task requests into the ITTR actant. Those "rules of trade for IT resources" were actually specified and simple (e.g., "approve job, if it requires less than 20 man days of work"). Thus, the ITTR actant MIGHT have enacted pooled interdependence patterns between the end-users and IT function, but it did not.

Hence, the following *interdependence patterns* worked for coordination of the Alpha's IT function: pooled interdependence among end-users (their micro-activities were not coordinated amongst themselves; hence, the on-line business process material and IT task request database were created in order to avoid work redundancy); sequential interdependence for management that made task definition, prioritisation, and funds allocation decisions (formal budget procedures are sequential in most cases); reciprocal patterns inside the IT function (mutual adjustment among many SOS teams and IT specialists was necessary in order to implement one IT task request), and between the IT task request's initiators from a business function and implementers from the IT function.

> *Individuals within the IT organisation are allocated responsibility for IT Tasks and Faults. These individuals contact the requestor and agree on estimated completion date, giving due attention to priority, duration and workload. Subsequent changes to the agreed estimated... must be agreed between the parties. (Project Methodology: IT Task Request – a policy document)*

Juxtaposition of the *interests* made the IT task request actant what it was. IT function was not interested in task allocation, prioritisation and project management that were visible (not to say originated) from the outside – in terms of incrementalism, the IT function avoided commitments. And end-users were interested in quick and accurate delivery, which they saw as best achieved through direct mutual adjustment with immediate implementers from the IT function.

Prioritization of IT task requests and fault resolution

The prioritisation rules for IT jobs were kept broad, and ITTR database's potential for coordination was defeated by the lack of actual priority information in the database that would be easy to correct. IT managers referred to non-official "function support matrix" that determined criticality of the services they delivered, where "function" was less than business function. Three priority categories were used for both IT tasks and faults, namely,

> *A – Essential (e.g., business imperative, legislative requirement), B – highly desirable (i.e., the work has a demonstrable short term payback); C – nice to have. (Project Methodology: IT Task Request – a policy document)*

Such simple but rigid categorisation based on only one (conceptual) hierarchy might lead to inflexible prioritisation (Andreas 2002).

> *If the function is non-critical and there are no other dependencies upon it, a decision may be taken to "skip" the function. (IT manager)*
>
> *It is not possible to specify a time for fault resolution. Service levels are for the commencement of fault investigation and are as follows: Fault Priority: essential (<1 hour), highly desirable (<4 hours), and nice to have. (IT Service Level Objectives Agreement – a policy document)*

The practice of categorising into the levels of IT support is institutionally common across different firms and industries. The levels of IT support or faults have direct projections to organisational structure: for each level of IT issue, a specialised team and procedure is created, sometimes, IT professionals are assigned to resolve certain level issues for certain percentage of their working time.

> *Level 1 Error means any error that causes the System substantially to stop functioning, or has a critical impact upon the business... [for example] massive data corruption to either client facing, account or bank financial reporting information.*
>
> *Level 2 Error means any error (other than a Level 1 Error) that causes significant degradation of functionality within the System, or has a serious impact on the business... [for example] branch teller [software] in off-line mode only.*

Level 3 Error means any material or significant error (other than a Level 1 and Level 2 Errors), that does not seriously impact business operations...[for example] cosmetic errors in screens menus reports causing minor operational impact, operational reporting errors, subsystem processing errors that cause little or no financial impact and manual procedures are available

Level 4 Error means any error that does not fall within Level 1-3 above.

Level 5 Error – Any Questions... will aim to provide an answer as the appropriate resource becomes available.

(Fault Definitions – an internal IT policy documents)

The levels of Alpha's IT support for software faults were presented above in decreasing order of importance to the IT professionals. Branch staffs' logic of importance was different. Only Level 3 priority was assigned to cases of "minor operational impact" and with "manual procedures available" that were the very cases when systems instability created disruption to ongoing face-to-face customer service, additional manual workload, and tension of performing up to the standards of queue management and timely operational day closure.

The policy of "IT Fault Handling" also provides insight into internal work organisation of the IT function.

IT manager for service provision – mainframe falls (IBM AS/400 platform).

IT manager for infrastructure development – PC/Server faults.

IT manager for network – network and communication faults.

The above assignment of responsibility for fault resolution shows that "computer platform" was unit of thinking, unit of task definition, and unit of evaluation by the IT professionals, as it indeed appeared in how the IT function defined the boundaries of their own responsibility and the boundaries of end-user participation in the governance of the IT function as discussed in the next Chapter 6 The Political Delivery of Information Technology.

3 An Overview: Increase in Interdependence

(i) Business process approach and process-based streamlining

From manage down to manage across. AlphaCoreIS Project Manger

Increase in interdependence is a result of shift towards process-based structure and complication of operations with new multiple cores and technological liaisons showed by the Alpha case (Child and McGrath 2001; Malnight 2001). Alpha's top management was

aware that their comprehensive banking *systems had process and transaction-oriented logics* and supported orientation towards process in their belief systems. Alpha's business processes were intentionally designed cross-functionally in order to speed customer service operations, avoid work redundancy (same processing by the different parts of the bank), and align with the banking systems. Alpha's business processes were designed around same transactions, but considered those transactions from different perspectives of customer service (branches), customer relationship management (marketing), financial stability and profitability (of the institution), and management information-performance control (operations). Service companies, especially financial ones, have traditional *issue of tracing customer account* (e.g., dealing with all information about the same customer in an intelligible manner). The integrated customer account issue is a source for interdependence. Alpha's new banking systems allowed more integrated processing of transactions and offered CRM opportunities that required more coordinated actions, particularly, between the headquarters and branches.

(ii) "No key-man dependence" – more interdependence

> *There must be no key-man dependency; i.e., critical elements of the plan will not be reliant on any single person or small group of individuals to succeed. (AlphaCoreIS project Learning Strategy and Plan: Critical Success Factors)*

The use "no key-man dependence" idea increases the amount of (horizontal) work relations and strengthens federalised structures, yet reciprocity occurs in temporary and weak forms and contribute to the level and nonlinearities of high interdependence of the organisation.

(Human Liaison Positions) Contrary to "no key-man dependence" rule, *liaison and gate-keeping positions in Alpha's structure* were occasionally used in order to meet chunks of interdependence needed, particularly, on routine interaction for IT task requests and software development. One permanent full-time liaison position of "IT Architecture and SOS liaison" was used in order to bridge IT infrastructural services with systems development. Liaising was also implemented through (paid) secondments of specialists from insurance, mortgages, finance and risk/compliance functions to business process teams.

(Technological Liaising) Both live on-line business process material and database of IT task requests not only supported extant pooled interdependence, but also made pooling and disjointing impact upon human interdependence in Alpha. Another implication of technological liaising offered in Proposition 5.1 was difficult to measure but evident from

interviews and live observation, specifically, *interdependence with a colleague was shifted to dependence upon systems*, and such shift was encouraged by top management as a part of their decision premises about what constitutes efficient operations.

(iii) Waves of dynamic interdependence through the lifecycle of IS implementation

The lifecycle of the large AlphaCoreIS technochange was ultimate source for change in interdependence patterns and restructuring. At consecutively different times, each slightly overlapping stage of the lifecycle required new teams and intensification of work relations among various parts of the federalised IT function as well as business functions (Avison and Fitzgerald 2003; Avison and Shah 1997). (Stages) For business process definition and (information) systems specification, the amorphous teams of business process owner and stakeholders were convened. New functional teams of AlphaCoreIS project were started and shut down in the Functional areas of investments, insurance, mortgage, mortgage illustrations, and finance in order to review and integrate business processes into the live on-line business process material. (Stage) When the core technology of International Comprehensive Banking Systems has been adapted, the business process network of relations was partly transferred to testing team that liaised with professional groups of end-users and organised User Acceptance Tests. (Stages) The communications of AlphaCoreIS technochange were continuously supported by the Training and Communications team that also served as an attractor of interdependencies for systems roll-out through the geographically distributed branch network in order to coordinate training, learning, and initial support which should result in at least confidence of end-users in systems.

(Stages) The adjustment of these new systems involved much in-house software development for which the Design Authority team liaised between Functional teams and Systems Development teams. *Data conversion* from the old banking systems was another contingency that attracted special effort of creation of Data Conversion Team that wrote programs in order to automate conversion of several millions of customer accounts distributed across different databases.

Such waves of interdependence raise key issue of interdependence management for productivity, specifically, when to INTERACT increasingly and when to CLOSE even discontinuously and reap performance. The thesis will return to the meta-strategy for dealing with high interdependence in concluding Chapter 7. *The dynamic interdependence for the lifecycle of IS implementation is most closest to high interdependence.* Alpha's core of IT function has 60-70 people with above 900 distinctive work relations

(interdependence ontology), which is close to the power law proportion (Proposition 2.3). As they happen in Alpha, the overlapping stages with no clear sequence of reviews were insufficiently incremental to meet the nonlinearities of high but disjointed interdependence. Cases of Technology of Coordination showed the complexity and cost of technologies-in-use enabled crucial interdependence—by facilities of a simple database, spreadsheet, report forms, and HTML web pages—was insignificant comparing to their coordination impact.

Chapter 1 Precision for Power defines interdependence is a condition for power use (Proposition 1.8): high interdependence facilitates advanced forms of reciprocity as well as advanced uses of power. Modern software used for coordination does not appear to provide usable opportunity for reciprocity (p. 208), whilst technological disjoint and modularity tend to remove the opportunity for reciprocity and introduce localised resistance and local solutions (e.g., fallacy of centrality in heavy networks). Such mix of nonlinearities makes high but disjointed socio-technical system to drift (p. 131), which is evident with intensified but sometimes exhausted politics based upon risks expected rather than resources had (Proposition 1.11) and presented with advanced, diverse and innovative practices in Chapter 6 The Political Delivery of Information Technology next.

Chapter 6 The Political Delivery of Information Technology

Alpha is not a political organisation. (IT and Operations Director)

1 Scope of IT-politics: what do IT professionals need power for?

The core idea of probability-based approach to power offered in Chapter 1 Precision for Power, the getting things done definition of power through the expected effectiveness of its application translates into the research question: *how is power effective in hands of IT professionals whether for the good of the organisation or the professionals themselves*? Rationalisations for politics offered by IT professionals themselves vary: freedom of manoeuvre for best self-organisation, ability to negotiate IT tasks for best allocation of scarce IT capability, or simply getting IT investment for the good of the firm that is commonly projected over long term. "Technological authority" of IT professionals is difficult to control from outside of the IT function, which is the first indicator of the strong domain II of power resources that IT professionals enjoy if they stay within the frame of top management's decision premises. The following framework examines the sources and functions of politics in IT delivery in Alpha organisation and uncovers how the IT function is an attractor and reflector of politics of a whole organisation (Methodology Note 1).

Cross-functional and transformational impact of information technology upon business processes and organisational form: the IT function intervenes in others' work with requirements and failures, task rationalisation and new communication effects (Dewett and Jones 2001; Hatch 1997). Efficiencies of technology use do not lend themselves to management within a particular unit (Yetton 1994).

Sheer costs make the issues of IT-operations political, because the processes of building IT expertise, maintenance of IT infrastructure, and change in comprehensive software information systems are likely to be gradual, long-term, sensitive to "small" nonlinear disturbances, and requiring learning-by-doing. Such processes are costly.

Technology imposes its own logics and structures; such rigidity comes from the IT being a black-box even for IT professionals. Information systems and policies and practices of their use are tangible repositories for rigid mechanisms of institutions and the organisation. The original technology-in-practice framework is one way to represent those structures with facilities, norms, and interpretative schemes that include designers' logics and presuppositions behind it.

Protection of the integrity of core IT infrastructure is an institutionalised conflict. The IT function struggles to protect integrity of complex infrastructures of hardware, software, settings, interfaces and communications, WHILST the business sides attempt to get most out of the IT shop and services in a way that disturbs stabilised computer environments. Such dialectic sets the root separation of positions, even when economic incentives and responsibility are shared between the IT function and business units. Stability of systems is not technical even for IT professionals, they appreciate that stability rests upon use patterns: less end-user computing[45], less intervention into IT decision premises, and less reputation for IT knowledge by end-users.

Foreclosing prevention of resistance to changes in information systems is of interest to the whole organisation but commonly and implicitly charged to the IT function, which makes the scope of IT-politics proliferate.

(i) Initial evidence for considerable politics in IT jobs: examples from Alpha case

Getting things done through means that deem feasible to IT professionals is itself a test for power. Some practices are particularly indicative of politics even in their common sense understanding without special power tests. For example, Alpha's IT function studied attitude, competence and confidence in systems by end-users and explicitly applied different communications to the various groups of internal stakeholders including important stakeholders at the organisational periphery. Alpha's top management conducted sign-off procedures, in which line managers were asked to commit to work with the new systems or state their objections right now, in such circumstances only present time actions are accepted as legitimate. These and other power-actions were found in work of the IT function in Alpha, they are described in how it is politicised section that shows how inventive and generative politics can be.

Alpha's IT function proactively participated in the definition of its own tasks, incentives, and corporate IT policy including terms of service and strategy. The proactive position by the IT function led to a generous budget and decisive participation of IT top managers in the allocation of financial resources to the IT function itself as well as allocation of IT resources to other organisational parties, which is a self-referential resource allocation.

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[45] End-user computing is defined as buying, developing and installing software of end-user choice.

These achievements were obtained under conditions of non-immediacy of the IT channel in Alpha's sales and customer services (e.g., no Internet banking) as well as non-significance of content management and knowledge management to Alpha's enterprise. This success to the level indicated in the highly institutionalised environment of a financial institution is hard to achieve without effective politics.

(ii) Beyond the scope: IT-politics for institutionalised conflicts

Alpha's IT function was a typical example of the IT function becoming involved in new tasks and conflicts beyond its capability and normative responsibility.

Proposition 6.1. With extension of the scope of jobs, the IT function becomes involved in tasks and conflicts untypical to the IT profession earlier, and such bounded rationality favours further politics in the delivery of information systems.

The high but disjointed interdependence and actants of technology of coordination contributed to Alpha's IT people interacting with more parts of the organisation with mutual adjustment for routine IT tasks. First, the interaction between IT staff and sales-operational staff became more immediate, whilst the traditional IT Helpdesk became a recording instrument and the part of ITTR actant. Second, the interaction between IT staff and expert staff who developed and configured systems, CRM functionality, and risk management increased. Third, right after the AlphaCoreIS project achieved its first implementation results, Alpha's centralised banking operations and some teams from the Finance function were merged into the federalised IT-Operations function under the management of the IT Director. Invariably after its structural extension, the IT-Operations became a container for distinct interest groups and their conflicts, yet without active participation in coalitions by IT professionals. In these circumstances, the institutional theory expects the *practices of IT support to reflect governance arrangements of conflict foreclosure* (Hayward and Boeker 1998). Indeed, communications strategy, intensive and expensive training programme and other practices of IT support become the arrangements for foreclosure of institutionalised conflict, for example, between the headquarters and branches or between risk management/compliance and sales.

Politics is local and very contextual, it is always performed by someone for some purpose (Methodology Note 5), but politics is located within the global context. Cultural and educational factors (e.g., the culture of IT professionals and educational levels of staffs) as well as euro-institutional changes (e.g., institutional and market environment presented in Chapter 4) were key to putting Alpha's IT function into preferential yet demanding position beyond its control and expertise beyond organisational boundaries.

2 How IT is politicised in actual practices of IT support, funding and delivery

The above section on the scope of IT-politics introduced generic circumstances of the typical IT function using Alpha case. It makes apparent the extent to which the work of the IT people at routine and strategic levels is "political."

This Chapter itself is a result of the project of collecting data on actual practices of IT support. Studying power processes from the viewpoint of followers was advocated by Methodology Note 4. Studying the practices collected through the Practice and Politics Lens is the forms this Chapter (Figure 1.1). This sequence of lenses is particularly useful for orientation of politics towards delivery, and when politics is unrecognised as such by participating agents, which is itself latency property of power.

The ensuing discussion shows the diversity of "how IT is politicised" by structural, economic, institutional, intelligence, communicative, and reputation means. The collection of practices will be rendered in a compact way in Table 6.2 Matrix of the practices of IT support arranged by the power-action model in order to understand how those diverse practices form multi-level patterns beyond the remedial incrementalism of "garbage-can" decision-making. The ensuing discussion and analysis of diverse practices (pp. 231-278) is written simply. However, the IT-politics case is neither simple nor garbage-can as it might appear on the *surface*: there are continuous consequential multi-purpose stable patterns of IT-politics that include components of incrementalism and process management by *simultaneously* first, unfolding at multiple organisational levels in embedded ways, for example, 3rd order decision premises affect 1st order technological actions in non-causal manner (Table 1.2); second, implemented whilst and even before formulated and reflected in strategy (interlocked successive sequences); and third, stochastic but within a spectrum that defines which combinations are feasible for IT management. *Deeper* than contextual patterns of IT-politics (or at a higher level), the Patterns of Power in Practice, such as incrementalism, strategic nonlinearities and cognitive biases, will be applied to Table 6.2 in order to render lessons for technology management as well as for IT professionals. *Even more deeper* (level up) generic distinctions, presuppositions, and methodology notes (Precision for Power model) serve for generic guidance for any empirical study of power, including this one, for example, words such as latent, frequent, self-referent, commitment are used as descriptive properties of power. The patterns of power are *complex*; therefore, they are prone to misuse and overuse, which leads to "garbage-can" decisions and radical interventions.

In some respects this Chapter refers before Chapter 1 Precision for Power to the Circumstances of research on power, technology and information systems that are as basic as the culture of IT professionals, use of institutions, stability of software run, and interaction between IT professionals and researchers who are in dependent position. *This study of the political delivery of information technology is concerned with common questions of strategic (information systems) research*: What the information strategy process and its variations mean for organisational design for getting things done (outcomes)? How are large core systems, standardised office software and infrastructures decided upon? Are there specific agents making those decisions or are the decisions emergent and encountered? Is there IT governance by non-IT professionals (e.g., participation test)? What and who controls risks, particularly the risk of IT delivery becoming self-referential?

(i) Structural means and conditions of IT-politics: manoeuvring for autonomy in the federalised IT-Operations (2nd and 3rd orders)

Organisation structure is a means of politics and a condition for politics (duality of structure). A condition for politics at one level is also politics at a higher level. Organisation structures route and constrain power-actions of 1st order, so that they are used for distributing and securing power at 2nd and 3rd order. Description from multiple positions allows understanding the levels of politics, for example, a new unit created for someone's autonomy, and once created a unit is a means for some and a condition for others.

Launching initiatives as new units: a political key to success

Creation of new units is a very powerful action at all power-orders simultaneously and with considerable consequences. For the research period of about a year, more than ten new units were created and dismantled for AlphaCoreIS project of changing core banking systems, then sales and operations functions were restructured considerably. Each significant undertaking was framed as a separate project with at least a temporary unit with its own budget, responsibilities, and channel to top management. As a result, some hybrid of project-based and matrix-recombinant organisational form emerged (Appendix 5) and was naturally fruitful for conflict intensification and political interaction. But if managed properly, the new units deliver benefits of autonomy, responsibility, budget line, and boundaries for accumulating power.

Amorphous and hidden work organisation of the IT function (3rd order)

It would be very unusual for these groups to be stable, labelled, and obvious. It is more likely that their boundaries are fluid, indistinct and permeable. The groups may not be identified on any organization chart, they might all nominally report to the CIO and they might be considered to be temporary teams. Cynthia Beath (2004)

Alpha's core IT function had no formal structure and work distribution, or such information was not presented outside of the core. Whilst detailed corporate structure with job descriptions was displayed on the intranet, there was one roughly defined business process of "IT support" and no job descriptions for about 60 IT professionals of System Operations Support division. In order to obtain IT operational plans one would need to contact IT top management and provide the rationale. Such is a common institutional practice in many industries. Being amorphous serves purposes of building local capabilities with the means that are convenient for IT professionals as well as having the freedoms of isomorphism to redistribute resources, tasks, and effort.

In the situation of amorphous hidden structure, provision of services is subject to negotiation within the IT function. In Alpha, the implementation of any authorised IT task request still required mutual adjustment between end-users and technical implementers as well as between technical implementers and their IT managers, so that technical implementers-IT specialists were most dependent but gained the most flexibility out of their liaison position (see Appendix 7). Because of high IT task complexity and specialisation, usually the top IT-Operations management supports the fluidity of the IT function, and "artificial uncertainty" is a power source for IT personnel.

Membership on committees other confirmations of embeddedness into networks

Literature and the research find the following kinds of strategic steering committees: IT, programme/strategy, product development, and the Board. Steering committees on IT (Alpha's Business Change Forum) are concerned with IT-operational issues, although expenses and stakes involved are high and strategic. Steering committees on Strategy *per se* are surprisingly unstable, they are convened and dismissed for diversity of issues and reasons, whilst a Programme Management team supports and encodes strategy formation, for example, summarises input from various functions into a balanced scorecard. Steering committees on Product Development (same name in Alpha) are a stable type of strategy committees that are composed of experts with in-depth knowledge of operations and business processes who concerned with integration of firm-level core capabilities.

In Alpha, the same people who were in charge of information systems and IT infrastructure

management (SOS Division) occupied positions in all of the strategic steering committees simultaneously. Such arrangement of committees appears as not an urgent coordination means but a vehicle for negotiation with multiple rounds.

Over-use of structural means for politics: self-reference of the federalised IT function

The clustered organigram in Appendix 6 shows how *federalized* the Alpha's IT function was, especially in proportion to the size of Alpha company, which was not more than 3,000 excluding acquired banks and subsidiaries with their own IT. The proliferation of semi-autonomous IT projects and units occurs commonly.

A political system is defined as a means to goal attainment and mobilisation of support (Giddens 1984; Martin 1977). Towards which common goals could the federalised IT function mobilise and exercise power? The answers are the maintenance of the function itself and arrival to implementable decisions on information technology in the organisation. Thus, the fragmentation of structure increases self-reference of political processes. For example, (a) the core IT division of System Operations Support took charge of actual technology and infrastructure, but its own internal task prioritisation and decisions remained hidden. (b) Steering committees, particularly Business Change Forum, played integrative role to the federalized IT function, as certain centralisation of the IT function, at least of its management, is necessary in order to reach decisions (Monteiro and Hepso 2000, p. 154-155). (c) More and clear responsibility boundaries were established with the practices of commitments and sign-offs, limiting IT services and responsibility for their quality, business ownership for software applications including development, and the overall pattern of buffering from the mass of end-users.

AlphaCoreIS technochange was performed through many "virtual positions" (Mackenzie 1986) including liaison roles, cross-project appointments, memberships in multiple business process teams at once, and formal management positions occupied by the same people. Compared with membership in a network, a virtual position offers more access opportunities but requires more working time and is more likely to be compensated. Such time-paced semi-structures are indicators of the continuous incremental side of organisational change (Brown and Eisenhardt 1997).

Why was such a seemingly artificial complexity of the organisation created? Changing core information systems and business processes, cross-functional work negotiation, and over-specialisation of IT labour yet amorphous in work organisation – all required

differentiation of roles and reconciliation of jobs, for which *AlphaCoreIS Project was essentially a political vehicle* for driving the momentum of organisation change over the inertia of "business as usual." Practices of launching initiatives as new units and hiding internal organisation of the IT function show how for information systems implementation considerable amount of structures are created in order to meet and eventually reconcile requisite interdependence (Proposition 2.2), and then such structures are transformed and people transferred. The metaphor of waves was applied to show the dynamic interdependence necessary for different stages of the lifecycle of IS implementation.

Whilst Alpha's IT function did some effective politics by using its own federalization, the condition of federalization prevented the strong uses of power by individual IT managers who were unlikely to drive the politics of the organisation.

(ii) Economic conditions that drive IT-politics (2nd and 3rd orders for 1st order)

> *The business case is based upon cost avoidance. (AlphaCoreIS Project Business Case)*
>
> *IT department is committed to providing an efficient and cost effective service to its customers. (IT Service Level Objectives Agreement – a policy document)*
>
> *[Category of IT Task Request] B – Highly desirable (i.e., the work has a demonstrable short term payback). (Project Methodology: IT Task Request – a policy document)*

The economic underpinning of Alpha's IT policies, delivery standards, and operations has been initially described with several stable shared simple decision premises for technochange. *The firm-level economics of information systems drives and shapes IT politics.* The impact is institutional because of comparable cost structures of systems development, business models for IT services, and increasing returns on IT resources (Arthur 1996). The industry-level economics of IT industry also impacts individual firms.

Indications of cost structure of intra-firm IT services

Appendix 8 presents the framework of generic intra-firm economics of information systems developed from Alpha case. It will help if you actually familiarise yourself with Appendix 8 before continuing to read, because Appendix 8 is a sensemaking device that maps scarcities and cost structures of IT and IT-in-use resources as follows:

- IT hardware and some standard software are commoditised, so their costs are fixed and moderate.
- *The costs of change in proprietary software and IT infrastructure are commonly higher than the costs of change in work organization*; stable running of IT infrastructure involves some non-fixed and non-linear costs that are difficult to estimate, for example,

costs of security and scalability (e.g., volumes of information processed).

- IT human resources and their professional development are long-term and expensive.
- Costs of end-user training and formation of the effective practices of technology use—the costs of learning—are high but rarely assessed.

Appendix 8 also indicates scarcities, cost features, and valuation of IT resources that defined or were simply directly translated in "the several stable shared simple decision premises for technochange" listed in Table 4.1.

Investment in information systems skills and R&D, for example, research for the best software solution, requires political will of executive management and legitimisation by the Board, because it is a capital investment in non-material, non-fixed cost, and unpredictably depreciating assets. For such economic decisions, institutional resolutions overcome logical incremental justification, for example, in software selection in Alpha: logical comparison of software functionality was eventually dropped as a method of decision-making. In sum, three following economic factors make IT delivery political and contribute to the intensification of organisational politics (Proposition 1.9): *scarcity, cost, and the non-material character of the most costly IT assets that are proprietary software and skills in business use of that software.*

Budgetary procedures. Hiding real IT expenses

Budget procedures and resource allocation are commonly used for assessment of the *outcomes of politics*, which is domain II-domain III approach of power studies. At the time the research commenced, Alpha's was in the third year of implementation of £39 million 7-year budget associated with delivering new International Comprehensive Banking Systems; the budget included the AlphaCoreIS project but was commanded largely by the core IT function and its management. Such allocation appears both generous and precautious and makes the discussion of budgetary proceedings insignificant for the research purpose, because the struggle for financial resources was less intense than the struggle for getting high-quality IT services (e.g., time of certain professionals).

In due course of AlphaCoreIS technochange the monies were released from the overall budget and in the midst of the year of 2003, it was proposed to allocate an additional £1 million in order to deliver functionality for various business practices, largely for better provision of management information. That million was cost of politics of institutional ways of systems selection and implementation.

The ability of Alpha's IT professionals to set their price was evident. The resources for major IT initiatives were allocated from the pooled corporate budget, there were no e-banking or knowledge management projects that typically involve large fixed IT costs, and £40 million was a significant allocation for a mid-size financial institution.

Despite the generous allocation, budget procedures had certain political features of 3rd order, such as the practice of *passing on costs*. Federalisation of the IT function, the sheer amount of IT expenses, and corporate concern for containment of fixed operational costs[46] created necessity for the Alpha's IT function to pass on costs to the budgets of other units and functions, that manoeuvre was performed in many ways, for example,

- Avoiding estimation of the costs of distraction to banking service operations in branches.
- Creation of independent projects with their own budgets.
- Cost transfer to the budget of an originator of major IT task request.
- Having the members of other business functions seconded to work for AlphaCoreIS project but paid fully or partly by their home units.

Politics of the institutionalised intra-firm market: costs and hierarchies

As the research attempted to estimate benefits and costs of politics, the following distinction was found. *Political costs* are of the benefits that are deliberately political (e.g., advancing a specific agenda or including interests of a specific stakeholder), including the costs of deliberation and articulation itself (e.g., certain initiatives are carried out with unprecedented precision and thoroughness). *Costs of (the consequences of) politics* are of dealing with outcomes of politics, often unexpected. Sometimes, "paying for the benefits of politics is necessary" because not making certain expenditures will cost more. Therefore, *a conversion rule between political costs and costs of politics appears as: if necessary political expenditure is not made, then ramifications generate costs of politics*, for example, the untrained mass of end-users will cause considerable demand in IT services and disturbance to the stability of systems.

The following cost indications show how the expense of skills in technology deployment makes it political. First, the overall cost of adoption of the new banking systems by the end-users was not even assumed, and the training budget for systems roll-out across the branch network alone comprised £300,000. Second, a typical off-site training course from

[46] Which is an institutional approach to assess competitiveness.

IBM costs £2,000 and an IT professional receives 5-10 weeks of training per year. Two teams of core IT services support division (product support and technical teams of SOS) received about 75% of annual IT training budget of about £100,000 that, in turn, constituted up to 25% of the SOS budget (core IT expenses) excluding salaries. Third, consultancy and IT project audit fees were counted in thousands of GPB per consultant per day, and hiring individual contractors for a specific IT job was considered "money wasting" by the IT managers, which is a rare case of decision premise that affects economic logic rather than vice versa.

Political expenditures in Alpha included enabling fragmented organisational structure of the AlphaCoreIS project along with task forces for 60 business processes (see Appendix 5), surveying end-users and communicating to various stakeholders of AlphaCoreIS technochange, and auditing IS projects by consultants from IBM in order assure the Board who had ultimate power over financing the IT function.

Costs of politics in Alpha included the costs of using institutional solutions, costs of 640 additions and 1,000 software flaws of the systems selected by institutional criteria and process, and generally costs of several stable shared simple decision premises for technochange.

Whilst Alpha's IT function remained non-transparent to the organisation at large, within the IT function, a hierarchy of discretion over the allocation of IT resources was traceable.

> *The appropriate Group IT Manager on a daily basis for new ITTR's agrees/negotiates the ITTR's category [that is an equivalent to priority] with the Group Business Manager who authorized the request and apply the following controls:*
>
> *Category A – Refer the ITTR to Director of IT/Director of Customer Services if > 20 man days total effort (including testing and implementation).*
>
> *Category B – Refer the ITTR to Director of IT/Director of Customer Services if > 5 man days total effort (including testing and implementation).*
>
> *Category C – Reject request and inform requestor.*
>
> *Two levels of appeal exist which involve referral to the: 1. Director of IT/Director of Customer Services. 2. Business Change Forum. (Project Methodology: IT Task Request – a policy document)*

In sum, if an IT task request required more than a given threshold of resources, it required passing upwards to Business Change Forum (IT steering committee), where the method of

funding is to be agreed.

Any major IT task was subject to cost-benefit or some type of ROI analysis. The interviews with members of the Business Change Forum revealed the following decision premises for rejection: lack of specific IT resources (e.g., expertise in certain systems), heavily under-resourced area of business (i.e., inability to fund IT task), and difficulty of quantification of benefits. But as the political processes were applied to more than resource allocation, non-economically aimed uses of politics contributed to the paradox of the strength of power. The interviews indicated that financial justification alone (e.g., having funds to pay the IT people) was not enough for getting IT things done.

The necessity of defining "who pays" is an intra-firm market charge mechanism. The Alpha's IT function appeared to provide limited level of service for a fixed fee, and everything above was traded on a competitive basis, which is a market. In terms of transaction cost theory (Williamson 1996), the IT function commanded proprietary resources on the intra-firm market, leveraged a considerable share of lock-in, and used extant hierarchies in order to set their prices, which all three are not really market mechanisms.

(iii) Unusual use of institutionalisation by IT professionals (3rd order)

Contrary to being attributed with having technical jobs and a technical mindset, the IT professionals studied by this research prefer to exercise power by managing decision premises and IT policies (Proposition 6.3) as well as by trading their proprietary knowledge and scarce time.

Proposition 6.2. Several stable and simple decision premises and institutions of IT management co-evolve with the complex politics of the actual delivery of IT support. Simple institutions work at the interface between the IT function and corporate top management, whilst politics work at the interface between the IT function and end-users.

"Simple institutional factors for complex proprietary technologies" is a characterisation of routine IT support. The following view through Institutional Lens on the issues of IT politics describes institutional praxis (Whittington 2002) – practices that are accepted as standard, used readily and make "generic" phenomena possible in different firms.

Institutionalism Example 1. A common criterion for purchase of software is the number of other firms in it is used. The criterion is economically sensible in terms of network effects and value added through compatibility, connectivity, and the likelihood of longer and

better support by the vendor. Nonetheless, the use of such criterion is imitative (i.e., looking at what others do). The case is presented in the section Institutional solutions for distortion of decision premises: a case of software selection process (p. 241).

Institutionalism Example 2. Measures of IT resources, such as the number of technology adopters or website visitors, are easy to gather but difficult to scratch below the surface. It is in the interest of IT professionals to remain with institutional interpretation and surface measures, because in-depth measurement would provide outsiders with means of evaluation and cost control. The case is most described in the section Definition and evaluation of IT service levels by... IT professionals themselves (p. 245).

Institutionalism Example 3. Negative trends, such as the drift and lack of control over IT infrastructure, are similar across different industries and firms. Hence, "dealing with IT issues" through simple institutional means is similar among firms, whereas "creating capability" is different and unique. Creating efficient practice and business success with IT is unique to each firm, because it requires diversified and immobile strategies (Ciborra et al. 2000). The empirical case of Alpha firm showed how IT management used politics beyond the routine protection of their interest but creatively for a smooth implementation of a large-scale AlphaCoreIS project. The most sensitive uses of politics by IT professionals are described in the sections on Intelligence by IT professionals and Limiting end-user reputation for IT expertise (pp. 252, 256).

(iv) Decision premises for IT delivery: power from policy (3rd for 1st order)

The process of IT decision-making in Alpha can be described by the Pareto Dynamics, with its several stable shared simple decision premises for technochange and powers concentrated in the hands of a few corporate and IT top managers. The bounded rationality of few decision-makers contributed to political ways of information systems delivery.

Displacement of goals and other distortions to decision premises: different logics

People do hide issues. (IT and Operations Director)

Considerable revision of top management's decisions about technology occurs at the level of professionals. The more malleable technology is and the more limited its users are in concealed generic patterns of use, the more freedom professionals have. For example, distortion of 3rd order decisions through amorphous and hidden work organisation of Alpha's Systems Operation Support Division, gave the IT professionals freedom of adjustment at 1st order in taking technologically convenient ways and working with end-users directly, if necessary (see Appendix 7). Alpha's top management including the IT

director had little impact upon those processes and appreciated it in the form of "managerial problems" within the large federalised IT-Operations function.

High complexity and specialization of information and communication technologies are stable sources of distortion to any purposeful action taken with and through technology. In terms of the power-action model, with information systems, the 1st order dynamics of actions of system design and configuration are considerably divergent from 3rd order dynamics of decisions about systems. Hence, the causal linkages between goal-oriented managerial activity and outcomes of technology-in-practice are weakened – logical incrementalism of technology implementation (that includes methods of project management with Gant diagrams and most of formal strategic or operational planning) does not bring logical outcomes. The power-actions on IT by Alpha's top management were remedial rather than preventive and visible rather than latent. That intensified politics increased the amount of resources spent on political activities, for example, getting an issue to the top management's agenda became more expensive.

Alpha's *banking systems have many decision premises (3rd order) wired-in in their "systems logics"* as any large specialised software does. Whilst it is unfortunate that it is impossible to elaborate on systems logics because of commercial privacy, relation to the security of real IT infrastructures and the lack of space, the accepted examples are in the text, at least in the form of testimonies about outcomes:

> *To discover the right setting of one parameter for product maturity took 7 days. (Business Change Director)*

Which shows that Alpha's top management appreciated inaccessibility of "systems logics", which is vividly illustrated in how a large software package is purchased by the company.

Information technology-in-use is shaped through the interaction of the following distinct belief systems: *top management's logics* of both IT and non-IT, as they share their several stable shared simple decision premises for technochange, which represent their logics (see Table 4.1); *systems logics*, which are presented partially and indirectly through testimonials and outcomes; *IT professional's logics*, which are presented in this Chapter through description of practices of IT support and rooted in IT professional culture; and outcomes of technology use patterns, which are outcomes of the *"end-users' logics"* which do not really form a logical system because end-users are numerous and diverse. The end-users' logics do not really concentrate in patterns of thinking and interest-driven behaviour

of certain groups. The end-users' logics do not have their own shared infrastructure as the three other do, for example, top management's logics is cultivated through strategy workshops and work of steering committees, IT professionals' logics through education and socialisation, and systems logic has "hard" infrastructure of being coded.

Software selection: meeting distortion with designed discontinuity and institutions

[AlphaCoreIS] business case is based on cost avoidance. (IT top manager)

The very *business case* for implementation of the new International Comprehensive Banking Systems in Alpha was justified on institutional grounds, such as broad considerations of new functionality required for product development, compatibility with the IT infrastructure of the financial industry, support for the Euro, and compliance with regulations. The estimate for maintenance of the legacy systems proposed that it would cost more than a purchase of new software over a long-term of 5-7 years. The expected formal withdrawal of support for the legacy systems by ICL-Fujitsu was of considerable concern to the Board, even the systems themselves operated fine for many years. Therefore, the purchase of new banking systems in Alpha was not an ultimate necessity but designed discontinuity in order to prevent more radical consequences, which concurs with Proposition 1.5. Whilst business case was made, the process and outcome of new software selection do not reveal considerable purposiveness or logical incrementalism.

The new software was selected from 9 alternatives, and the process of selection was governed by the Software Selection Governance Proposal and Package Shortlist Selection that included comparison guidelines, which documents indicated institutional character of systems selection criteria and process (Proposition 6.2). *Governance Proposal* included a detailed hierarchical diagram and description of roles for the Software Selection project, and therefore served as a means to foreclose inter-functional conflict among the functions of Finance, Compliance and Operational Risk Management, Operations and Customer Services as well as IT. Alpha's Finance function controlled for viability of solution and contractual flexibility. Risk Management function reinforced use of institutional means, for instance, by investigating reputations of software vendors. Operations and IT (e.g., "business as usual" and "process improvement") were represented by the people who subsequently joined the AlphaCoreIS project of systems implementation. As the project re-worked business processes, all of those business functions were transformed in ways that were not predicted at the beginning. Therefore, negotiation between the functions and evaluation of options proceeded on broad institutional terms and went on for a year. Different selection teams assessed software choices for technical feasibility, success of

application elsewhere, functionality, and commercial value. The Governance Proposal reflected concerns for business application, computer environments of hardware and software, and technically viable implementation, which were largely issues of IT infrastructure. The level of attention to technical issues and the number of IT professionals involved, comparing to representatives from the other functions, indicate pervasiveness of the logics of IT professionals.

Most software selection criteria were measured institutionally, for example, through reputation, through where else the system was deployed, and through what IT experts think about technology feasibility. Only two criteria were overtly rationally logical: checklist-based assessment of core functionality and scalability assessment in terms of bank accounts run on the same software elsewhere. The functionality of reporting to regulators and interfaces to the IT infrastructure of financial industry were claimed to be crucial.

The process of selection of banking systems by Alpha had an interesting leap. Whilst regulatory reporting and good management information were claimed crucial, the software finally bought did not satisfy those criteria. In fact, that software was initially excluded from consideration precisely because of the lack of management information functionality and issues with reporting to Building Societies Commission. Yet, the software bought was "technologically sound" and easier to maintain by the IT function. The vendor's reputation and assurance of their interest in improving the software were additional factors that helped Board's authorisation of the expensive purchase of £17 million contract.

> *Even after we return to business-as-usual and AlphaCoreIS project is done... business requests from senior management all will be like a waterfall. (Team Leader of Systems Development)*

Use of those institutional means for software selection and preference for the convenience of maintenance had their costs and consequences. AlphaCoreIS Project turned around significant amount of work on both reconciliation of business processes and adjustment of software to Alpha's needs that included 640 functionality updates and about 1,000 flaws authorised from among a larger number. The in-house systems development of management information and regulatory reporting capability was slow because of the need of integrating with the software bought in some non-straightforward ways (e.g., using non-documented Application Program Interfaces). The core IT infrastructure on the server side was shifted from Microsoft platform to IBM AS/400 platform. These developments required significant money and manpower, and the resources came from the pooled

corporate budget but were commanded mainly by the IT function. Except for the costs of IBM AS/400 platform, the software bought and re-training of IT personnel, the full costs of the institutionalism of software selection was not known to the firm itself.

Commitment procedures

In Alpha, acceptance procedures were held in order to commit business mangers to work with changed systems, tasks, business processes, and work organisation. *For line managers, sign-off procedures* were held, when in presence of Alpha's top management line managers were asked to commit to work with new systems or claim any caveats to be resolved. Similar sign-off procedures were held for committing to the ownership of risks. *For end-users, user acceptance tests* were held, when some end-users represented their units in testing new systems with performing their typical work according to the new business process material.

The sign-offs and user acceptance tests were recognisable commitment devices of 3rd order and the political layer of the meta-strategy of incrementalism: OPERATE-LEGITIMATE-(TEST)-COMMIT-EVALUATE-(EXIT) that contributed to the image of consensus and continuity of the organisation (Proposition 1.5).

Boundaries for service: separation of IS development from infrastructural IT services

Alpha's *IT function was divided into two large clusters for IT infrastructure support (SOS Division) and software development (AlphaCoreIS project including Software Development Teams)* as shown in Appendix 5. Software development and adjustment were handed over to business users, which is the practice of *business ownership for software applications* that includes the following labour re-distribution:

- specification of business needs into requirements for software, the traditional job of business analysts;
- in-house software development including adjustment of third-party software and provision of management information and customised standard documentation (e.g., letters to customers);
- configuration of the comprehensive banking systems including front-end applications and data sets; and
- support of software use including preparation of instructions (e.g., the on-line business process material) and ongoing in-house training and consultancy.

The practice of business ownership for software does not work ideally in practice because of the onion-like architecture of the IT infrastructure: business applications rest on

databases that use client-server middleware that runs over operation systems and IP networks that are supported by the hardware and physical networks. The core IT units remain in charge of many levels and points of control.

(a) Most operations with software development required assistance by the specialised teams of SOS Division (e.g., in preparation of a data set or installation of a computer environment). (b) SOS Division retained the right of the release of software into "production mode" in which software is guaranteed to run at the agreed level of stability; such gate-keeping function was a complex power resource. (c) If a software development task required significant IT resources, it should be brought before the IT steering committee of Business Change Forum populated by IT managers. Alpha documents showed that about 2/3 of IT task requests were rejected or put aside with resolutions, such as "good, will wait" or "we will return when resources are in place."

SOS Division prioritised business-as-usual over systems development of AlphaCoreIS technochange:

> *Priorities are clear: telecommunications, [banking] branches, AlphaCoreIS project. (IT Manager of SOS Division)*

> *How much does it take for IT people to deliver computer environments? Is it a tricky question? In practice to prepare some small database on customers, it took a week to communicate and prepare, such work is supposed to be one-off. Communication back and forth on computer configuration [with SOS Division] is generally issue for struggle. (ACE Team Leader for developing capability for marketing campaigns)*

The results of business ownership for software in Alpha included firstly, delays with preparation of data sets and computer environments for software development and management information provision and secondly, blurring boundary between IT and non-IT jobs but not teams.

> *Things take a lot longer...2-5 months delays in in-house software development became normal. (Team Leader of Systems Development)*

IT professionals win from the practice of business ownership for software, because they limit their own responsibility but retain necessary control with ease. IT professionals also find a way to distance themselves from laborious systems development and business operations support.

Self-Reference: definition and evaluation of IT service levels by... IT professionals themselves

"IT Service Level Objectives Agreement" between the Alpha firm and its IT function defined standards for IT delivery on annual basis. The agreement listed supported services and their delivery levels. The services were databases or data sets, software applications, reports or printed output, financial industry interfaces (e.g., cheque clearing), and hardware including communications.

(a) Each service had its own out-of-service time, acceptable number of faults, and fault management procedures. Depending on kind of service, a typical aim for a non-hardware service read: "95% availability each month between the hours of 08:00-18:00" or "database/report by the 5th working day of each month," and a typical aim for hardware service read as "99% availability 24 hours a day, measured over a calendar month."

(b) While the provision of reports, file backups, or reserve PCs was fairly standardised and expected on the scale of hours or several working days, the provision of computer environments had the scale of days and weeks, because it required more coordination between "teams" of different IT professions: "to provide server resources to the requestor within 1 calendar month of receipt of a duly authorised request." Another comment on preparedness of IT professionals was the statement that "it is not possible to specify a time for fault resolution."

(c) "Third-party software fault resolution, core amendment to systems, management information," outsourced maintenance of desktops in banking branches, and business operations support were explicitly excluded from the scope of the IT service levels.

Each IT fault and task request received formal priority categories. Inside the IT function, the priority categories were not applied straightforwardly. It depended upon IT "teams" to organise their jobs as they see fit and with a slack of contingency resources. A common result of the imperfection of core logical project management is the practice of multiple levels of IT support determined by criticality or IT resources.

In resonance to the practice of hiding work organisation of the IT function, the operational plans and Fault Definitions policy used by the IT professionals themselves were not on open access to other stakeholders within Alpha. The methods of evaluation of IT

professionals were institutionally similar to methods in other firms, for example, stability of technology was measured by the time of stable running only without regard to additional work occurred if systems fail or "hang", delays, and consequential loss.

> *These objectives will be reviewed for service performance, new technology, responsibilities and systems as required. This review will be conducted by the Associate Director – IT Support [who is in charge of SOS Division]. ...*
>
> *Where extensions or variations are needed on a one-off or ad hoc basis to the standard services, these should be discussed and agreed with the person responsible for the specific service. ...*
>
> *Where formal objectives are required for services not currently defined or they require amendment, these should be addressed in the first instance to the Associate Director – IT Support (IT Service Level Objectives Agreement – a policy document)*

The frequency and figures of review for IT service level objectives are power tests. Interpretative control over these policy premises (3rd order) was translated into control over operations with technology (1st order) and funding (3rd and 2nd orders). The pay structures and incentives of IT professionals were linked to the time of stable running that was measured by the IT professionals themselves. Alpha's IT professionals also had freedom in allocation of the budget for the whole federalised IT function. These self-referent linkages in technology management concern strategic issues and are not recommended by the strategy researchers (Ross and Weill 2002).

(v) Limiting end-user participation and incentives for it (3rd for 1st order)

Structure of opportunity for end-user participation in IT governance

> *Anyone can task IT function to implement a change to either hardware facilities or software functionality currently provided or IT policies and delivery service standards. (Project Methodology: IT Task Request – a policy document)*

While Alpha's IT policies included the formal option for end-users to participate, it did not happen in practice. Participation in IT governance and getting advanced support were routed through one's line manager up to the senior manager in charge of business area. Under political lens it is clear that, end-users avoided spending their power resources on arguing or motivating their line managers to go up the hierarchy and end-users' requests were tied to the priories, projects and resources of their local business function.

Alpha's IT policies were reviewed by the IT top management and required agreement by the IT manager responsible for the area. Locating ultimate decision-making on IT at the top corporate management level was a considerable obstacle for change, because issues

escalation became difficult because of the limited attention of executives and scarcity and dispersion of local power resources (Proposition 1.11): how to spend limited power resources, on making systems better or on getting salary increase? *Under centralised decision-making and "exhausted politics", the IT professionals retain considerable autonomy.*

Responsibility instead of participation

In all Alpha's IT policies, the responsibility of IT professionals was limited to the expression of their best intent, for example, "in all cases IT support staff will use their best professional endeavours to resolve the fault with the minimum of disruption to the Alpha's business" or "every effort will be made to resolve the problem." Each IT service has slightly different boundaries for end-user participation, and those boundaries were determined by the platform on which the service is run (e.g., mainframe, Unix, Windows, IBM AS/400, client/server, and desktop PCs). *The IS policies accented end-user responsibilities rather than participation.* Alpha's "IT Service Level Objectives Agreement" concluded with 2.5 out of 9 pages on end-user responsibilities, and similar assumptions were met throughout the document, for example, in the procedure for ad hoc services. Considerable share of responsibility for smooth operations of systems was transferred to end-users, which was a distortion of top managers' and organisationally shared decision premises for technology management, and about which the following summary from IT Service Level Objectives Agreement speaks for itself.

Responsibilities for end-user work practices:

> *To maintain passwords and access codes securely and not to disclose to unauthorized users.*
>
> *To maintain all distributed systems in an active state as required by Production Support.*
>
> *To maintain responsibility for the content of the user level data, its accuracy and completeness.*
>
> *To ensure that any changes to business practice are notified to IT Director and the Associate Director – IT Support, giving effective dates and projected volumes, such that the impact can be assessed on current system performance, capacity, runtimes and system developments.*
>
> *Staffs are trained in the use of application software.*
>
> *To notify all faults and incidents on all IT provided services, as defined in this Service Level Objectives, to the IT Help Desk*
>
> *All users to sign out [of certain service/system] by [certain time] [for various back up, batch tape processing and other technical maintenance activities].*

Responsibilities for function's practices and business operations:

To notify Production Support by no later then 12:00hrs each working day of the non-receipt of computer reports...

To ensure that the system is financially reconciled each day and any requests for re-runs are notified to Production Support no later than 5.00pm...

To ensure that no new or amended software is requested to be released into any ANY live environment after 12:00hrs each Thursday..., except by express agreement by the Group IT Manager – Service Provision.

To maintain the accuracy and completeness on the system rules.

Any request for additional out of hours support of live or test services to be made to the Associate Director – IT support not less than 24 hours prior to the requirement and full budget to be provided.

Responsibilities for firm-level capabilities, such as market flexibility and readiness:

To ensure that all details, effective dates and amendments to Rules for investment and mortgage rate changes are notified and agreed with Production Support... not less than 3 working dates before the date of the first run.

To ensure that all maturity dates and projected volumes on Fixed rate, TESSA and discounted rate products are notified to Production Support not less than 1 calendar month before the effective dates.

Discouragement form seeking advanced support. Localisation of strategic capability

Several kinds of support were available to Alpha end-users, specifically, IT Helpdesk, Branch Support/Service Centre, and Business Operations Support. The routine maintenance of branch desktops was outsourced and interdependence between branch staffs and centralised support services was disjointed geographically, technologically (e.g., requests are taken via e-mail or phone but with no feedback, so that branch staffs or customers needed to follow up to discover if the issue were resolved), and organisationally (e.g., different lines of authority).

Ordinary end-users in branches rarely sought considerable assistance. They had no incentives for making a substantial comment about the systems they used for their work or IT policy. Seeking support required transaction costs, for example, with the customer queue in front, it is easier to re-boot the computer rather than to understand an issue and initiate a case with IT Helpdesk.

IT task requests: content analysis of the sample of hundred requests

A probing dataset of a hundred IT task requests was taken from the database. Not all IT tasks done or proposed were captured in the database as explained in Technology of Coordination Case. "IT Task Request Database" as actor-network.

Source. IT task requests were originated primarily by the staff from the headquarters and insignificant amount of ITTRs came from branches – there were none in the sample analysed. Some tasks were self-generated by IT specialists for IT specialists.

Content: IT issues and beyond the scope. Alpha's IT function set boundaries for its services and responsibility, but the content analysis of actual IT task requests revealed extraordinary variety of the issues asked from the IT function ranging from clearly business tasks to under-specified tasks to technical tasks (see Table 6.1). Acceptance of those tasks to ITTR database meant that they were implemented with considerable participation of IT professionals.

Table 6.1 IT task requests: results of content analysis

Patterns in the kind of support requested	*Implementation features*
Specific operations of business nature (e.g., to link certain business data in systems, to add a field to a report, to create a template for new document/customer letter, or to correct an issue of business rules integrity)	Some of such operations were not formally supported by the IT function. Considerable share of such operations remained from prior projects (AlphaCoreIS) and other special arrangements with IT function about systems development. Many requests for management information.
Specific operations of technical nature defined in the larger context of some business purpose (e.g., to trace know-how in vendor-provided software)	

Under-specified operations that did not differentiated on business capabilities or within technology	Change or addition to software functionality. Undefined kind of support (e.g., "provide support on Microsoft Access database") that might mean everything from a technical issue to teaching a course on databases. End-users framed their issues in common sense language.
Standardised routine operations on software: (e.g., provide an office software package, access to service, or new computer environment)	Some of such operations were time-sensitive for business objectives and systems development. Considerable share of such operations came from systems development part of the federalised IT function.
Standardised routine operations on hardware (e.g., deliver printer, computer or network connection)	Major share of IT tasks requests by amount but not labour.
Faults of various proprietary software and services for banking operations	Reported rarely (i.e., only several issues recorded as faults in the dataset analysed). Software code faults took the longest resolution times compared to all but systems development tasks.

Content: Specificity. The specification of IT issue usually allows (a) clear differentiation of whether task is more business, technical or system fault one, (b) definition of task priority and proper route through various IT specialists, and (c) determination of labour and costs involved.

End-users specified their requests with apparently limited level of technological understanding, different depth of description of the context of the issue (which is important with computer problems), and different rationales. For non-routine IT task requests and faults, end-users preferred not to elaborate on technological detail. From the viewpoint of IT professionals, the requests were of "everything is possible" and "passing on" style without appreciation for technology structure. Potentially, increased education in IT would lead to self-adjustment of end-users. However, the analysis does not claim that unrealistic requests were allowed and subtly expected, so that it would be easier to manipulate how

such requests are addressed or dismissed.

Content: Strategic Issues. In line with nonlinearities of Pareto Dynamics, business capability indeed may be localised or clogged in fairy unpredictable "locations". IT task requests are supposed to be ordinary and dealt through routine IT Helpdesk mechanism, but some of the actual requests were immediately crucial for market readiness and back-office capacity of the entire bank (e.g., "to produce personal notifications of interest rate changes for savings accounts," "a report is required to identify the number of annual mortgage statements that are expected to be produced," "to cross-match ISA/TOISA accounts held by [an acquired subsidiary]").

Actual IT task requests illustrate how the organizational technology of service firm is continuously changing in many directions and at several levels, and such fluidity goes is technology-in-practice that exists in the state of continuous re-adjustment to the current organisation regardless of boundaries.

Are Frequently Asked Questions neutral?

Frequently Asked Questions, Top-100 Support Topics, and Workarounds List are the instruments for making operations support efficient and avoiding unnecessary referrals. This implies avoiding human interdependence. Commonly being prepared without awareness of ramifications such "simple" institutional practices slow down work, because one needs to read the instrument first, make a decision whether explanation is satisfactory and how and to whom to go for support (e.g., to colleagues, informal contacts within the organization, formal helplines; by phone, email or even a meeting). Such practices are likely to restrain learning and responsiveness at the level of the firm.

Pattern of limiting participation: buffering from the mass of end-users

> *No, we do a limited search here... and then go to head office, and that's why we call the helpline. If I've been stocked up, don't know how to do this, then I'll call... if they pick the phone [laughing, high tonality of voice]...they usually pick my call and say, "Right, if I put you on hold." ...and that kinda delays the whole thing... customers...they wondering what's happening and I'm just saying, "I'm just trying to help and trace it for you.". (Branch Employee)*

As a result, front-line workers in banking branches organized their labour in order to avoid unnecessary interaction with centralised support services.

(Implication 1) The practices of service demarcation, limiting end-user incentives for

seeking advanced support and limiting actual end-user participation in IT governance do not pass the participation test for end-users in IT governance. Applying null-set hypothesis, a standard scientific reasoning, the author endeavoured to interview to seek the cases of how end-users did participate in IT governance and how end-users did obtain advanced IT support. Apart from some positional mechanisms, such as imposing risk management requirement (the headquarters) or developing a workaround (branches), the ways of influencing the IT function remained obscure, if they existed. Resistance was foreclosed, but working with the systems *as is* led to a number of workarounds and additional work. End-users explored their own means in the systems, which contributed to instability of technology, thereby costs.

(Implication 2) Branch Support and Business Operations Support happen to share the same style of treating end-users as IT support. Both Alpha's IT and operational managers seem to avoid dealing with the mass of end-users and prefer dealing with their managers or group representatives. *Buffering from the mass of end-users* appears as a pattern of protection of the knowledge-intensive operational cores of both IT-Operations and Business Operations Support. Yet it was illustrative how various management systems and logics (e.g., from HR and cultural change programmes) clashed in at the edge of *practice* of IT support, for example, there was a prize of £2,000 for "best practice" that actually turned out to be discovering a workaround to computer systems.

(vi) Intelligence by IT professionals (3rd for 1st order)

Training and Communication team funded under AlphaCoreIS project studied intra-company customers of new systems and IT services. These activities helped to smooth acceptance and showed the difference in how things were done: importance of technology, the image of successful implementation, and assurance on risks were continuously communicated to stakeholders of the technochange.

Communications strategy

Professional communication consultants were invited on a long-term basis in order to develop and implement *Communications Strategy* for AlphaCoreIS technochange. That strategy summarised critical success factors for acceptance of the systems as follows: confidence, competence, systems efficiency for a given job, and information (i.e., end-users should be appropriately informed and have the sense of being fully informed).

Communications Strategy distinguished the following stakeholders of AlphaCoreIS technochange, to whom there was different communication approach, so that 3rd order was

managed directly:

- project teams who were business analysts and end-user representatives, who performed IT-related jobs or worked with IT professionals closely, were to be treated differently from the mass of end-users;
- head office users and branch users were groups of different status;
- bank customers; and
- others who were mostly external to the firm (e.g., strategic partners from IT industry, insurance industry, mortgage agents, consultancy firms, regulators, trade bodies, and press). The presence of the customers and stakeholders external to the firm in IT strategy documents confirms the extension of the scope of IT function.

Communications Strategy defined message-audience mixes, so that different sets of messages were delivered to different stakeholders by different media (ways of communication), such as awareness events, training workshops, "grumpy's gossip," informal branch updates by e-mail, and "godparent visits." Messages were specified with the keywords and phrases. The statements like the following actually include subtle presupposition, that when the systems are released means that stakeholders are ready to accept them:

> *We will not release the system into the Branch Network until we are confident and comfortable with your readiness to accept it. (Communications Strategy)*

Communications Strategy outlined main interdependencies (e.g., who should take which actions and who are going to be message carriers) and relations to other corporate initiatives (e.g., HR or marketing projects). Communication's content and outcomes were reviewed weekly, which is a considerably high frequency of review.

Presenting Success Continuously: building credibility, awareness, and legitimacy

> *The users' attitude to and impressions of the system are fundamental to positive contacts with the customer, which is in itself a direct result of the amount of ownership of and empathy they feel they have with the AlphaCoreIS Project. ...A user who...views it as a positive initiative will forgive a lack of functionality or reporting, and will enthuse over the system in front of the customer.*
>
> *Board-level reviews of the Project are clearly important...focus on progress reports. However, even such high level reviews should routinely include the key messages and critical success factors, so that they are recognized and endorsed by the Board. (Communications Strategy)*

Communications Strategy prescribed using every opportunity for positive messages.

Particularly and purposefully, top management was involved in communications. Directors and project managers of AlphaCoreIS technochange made presentations about agreement on a business process, successful roll-out of a piece of systems, successful sign-off or user-acceptance procedure. Corporate senior managers convened explanatory presentations and issued statements, particularly on what the technochange would mean for different parts of the business. There were "caring" visits to branches by both business change and SOS division specialists. The atmosphere of effective and well-coordinated undertaking was created, in just a way described in modelling incrementalism using the power-action model: discovering political implementation.

Communications Strategy, as any strategy formulated into a paper document, is a collection of 3rd order power-actions that should be implemented on 1st order (i.e., by actual statements, content reviews, sign-off meetings, and so on). Application of *Communications Strategy* in Alpha showed how powerful pre-designed and well-designed communication is.

Monitoring end-users. Technology Acceptance Model as attitude labels

End-users' competence, attitude, and confidence towards new banking systems were monitored at different stages of the systems roll-out with questionnaires administered by Alpha as explained in research methodology. The special *Learning Evaluation* policy was developed based on Kirkpatrick Model that was as sophisticated as any research framework.

Manipulation with units of analysis and their chunking is a political feature of evaluation. For example, Technology Acceptance Model (Bagozzi et al. 1992; Davis 1989) prescribes measurement of usefulness (for practice) and ease of use (in terms of effort of end-users). Companies would rather assess more intangible "confidence" and "attitude". It is possible to create such things through their very assessment. Then it is possible to report about "certain level of confidence" that is reinforcing. The feedback on systems roll-out was sought from super-users who had more confidence and better attitude to the systems by virtue of their role of system promoters. "Branch" was used as a unit of assessment. Simple scales were used: red, amber, and green were the levels of competence and positive, ambivalent, and negative were the levels of attitude. The simple institutionalized metrics labelled end-users.

> *...amber users [were having] some computer skills and eminently trainable, while red users [were supposed to] already have difficulties with existing systems (Learning Evaluation).*

The monitoring was justified by the aim of better learning. Studying end-users helped in preventing resistance, and the data obtained was used in order to review communications, redistribute training, and report a success.

Intensive and expensive training

> *If users can see the change as something to be inflicted on them, then no amount of clever software or training will make them feel anything other than resentful towards it. (Communications Strategy)*

However intensive and expensive programme was laid down in *Learning Strategy and Plan* and involved preparation of training materials in addition to the on-line business process material, 5 permanent learning centres including one at the headquarters, as well as 15 trainers and 29 support people travelling across the branch network for the roll-out of with the budget of over £300,000. Such training required considerable IT resources including complete emulation of remote branches in the learning centres.

> *Training and support [for systems roll-out] is not a cheap thing. 29 business people worked as experts, full-time support work for up to 3 months, cars, mobiles, 10 full days of dedicated training...payment to cover training time. (Training and Communications Team Leader)*

The training programme involved disturbance to branches, responsibility-taking by end-users, and action by executives on releasing and compensating staffs for proper training.

> *Critical Success Factors:*
>
> *Business targets and personal objectives will be aligned to the overriding priority of a successful migration [to the new systems], thereby facilitating both the release of resources into training and support roles, and the release of people for the migration training itself.*
>
> *Branch Responsibilities:*
>
> *Release for off-site training, coaching sessions, and self-study guaranteed and facilitated, and relief cover organised.*
>
> *Objectives, targets and reward systems re-aligned to migration success criteria over the appropriate periods, top to bottom through the operational line. ...the salary supplement or allowance (including an adjustment for lost incentive earnings) and overtime limits for the Trainers and Support people (AlphaCoreIS project Learning Strategy and Plan)*

Thorough planning, resources for implementation, learning scenarios, sequencing of workshops, strategies for different training of different user groups and selecting super-users, frequent reviews all indicate incremental political delivery.

Monthly meetings of implementation team [that coordinated activities between IS development, training, IT support, sales, and branch people]...when systems went live they were weekly and even daily. (Training and Communications Team Leader)

After intensive training starter, there was a continuous programme of self-study and learning support.

Self-study is not just left alone, but controlled. [Branch] Managers asked to have plan for self-study of their employees and ensure that it is actually taking place as well as providing somebody to substitute at workplace for the time of study. ... [IT-Operations and Business Support managers are] responsible for ensuring that training will not be misused by managers for upskilling, reskilling or changing jobs for workers. (Training and Communications Team Leader)

The very precision, thoroughness, and costs make communication and training power-actions. Quality of communication and training was a non-random function of deliberate and targeted jobs. Investment in learning is always a political issue. The evidence from Alpha showed that the business organisation avoid over-spending on training and also avoid over-training, because powerful end-users "cause more problems."

(vii) Limiting end-user reputation for IT expertise: job roles, short cuts, and back doors in systems (3rd for 1st order)

The resource of acceptable reputation is not equal to expertise itself (Proposition 1.7). If an end-user advances in his or her knowledge on systems, he or she gains actual power resource of expertise at 1st and 2nd orders, which might or might not be formally accepted to use on 3rd or 1st order. Use of actual expertise might be limited by systems configuration or by formal and informal policies. Limiting end-user reputation for IT expertise is a latent positional interest of IT professionals, because it congeals patterns of technology use sooner and contributes to the scarcity of IT resources.

(a) Limiting end-user reputation contributes to the leading role by IT professionals in IT governance and strategic decision premises, as particularly identified by the outcomes that are feasible for IT professionals, autonomy to self-organise, and ability to negotiate their own price (the IT function is only resource-dependent on the firm). Basically all political practices of IT support are in recursive linkage with limitation of end-users reputation.

Powerful end-users... can be quite destructive, because other people know they're very good, if they don't like it [systems], it must be something wrong with it... it spreads. (Training and Communications Team Leader)

(b) Limiting end-user reputation contributes to the actual stabilisation of systems. Integrity

of the IT infrastructure benefits from such limitation considerably. Comprehensive software has various ways of getting the same outcome. Therefore stabilisation requires that end-users were able to perform only a limited range of operations within the systems (for integrity of infrastructure) and within business processes (for not interfering with others' jobs). Here, the same set of practices addresses the issues of stabilisation and disjoint.

> *They find ways around things as well—cleanest way relates to the integrity of operations rather than shorter way—and we know that they will eventually find shorter way [laughing]. Everybody knows, they will find shortcuts. There are screens...we haven't trained anybody on, because we think it's dangerous. (Training and Communications Team Leader)*

(c) Limiting end-user reputation contributes to information (systems) security. Whilst some applications expertise are blocked with job roles configured into the systems, not everything is regulated with access permissions, user profiles, privileges, rights and denials, security settings and such, because security settings are as sophisticated as business functionality part of systems, they might make systems slow-running, and might not be flexible enough.

> *Although, I think, they do have ways, security, permissions to den, they must have chosen not to do that, because there are a lot of people and piece of work to produce security metrics. ...Something is limited with permissions and something is not. Job roles defined within the systems are average approximations from actual job roles and there are usually less of them [less of system profiles than of actual job roles]. (IS implementation Manager)*

For Alpha's end-users from both the headquarters and branches, training in the new systems was performed by other super-users rather than IT professionals and limited to job roles. No infrastructural training was provided about underlying technology (e.g., IT platforms or database engines). No advanced users from outside of the core IT function (Systems Operation Support) were accepted for working with technologies at deeper levels of technological architecture, except with some software development environments, such as Visual Basic. Even for changing a data set, system developers of AlphaCoreIS project needed to request people from SOS division.

IT professionals did not elaborate on technological expertise during support interactions with end-users. But in Alpha case, there was no overt evidence that IT professionals NEEDED to conceal their knowledge in order to create the scarcity of IT expertise.

(i) How IT is politicised feasibly: the power-action model for IT (domain I)

The structural, economic, institutional, intelligence, communicative, reputation and other practices with political component presented form institutional praxis that is expectable from any IT function. Those practices do not go beyond "routine politics of life" as people from different positions get things done by means at hand and within their bounded rationality. Those practices do not seem not relate to particular coalitions. Those practices are diverse, yet it is possible to arrange them in compact way in a matrix (Table 6.2), using the power-action model (Table 1.2) as an epistemological ordering tool, which implies that positioning the elements in matrix is not arbitrary and to be explored.

Table 6.2 Matrix of the practices of IT support arranged by the power-action model

Power-action arenas	Information strategy process and policy (with variations to IT, IS, and IM strategies)	Technochange implementation (information systems and business processes)	Operations of the IT function (computer environments, systems configuration, and IT infrastructure)
Power consumers	Top management	Business side of the federalised IT function	The mass of end-users
3rd order (signification, legitimation and decision premises) 3.1 Membership, significant position 3.2. Consensus—legitimacy 3.3. Decision premises with their economic consequences for resource allocation	3.1.1 Membership in a steering committees on corporate strategy, product dev., or IT 3.2.1 Setting the frame of agreement 3.3.1 Decision premises on long-term 'strategy': criteria for software selection	3.1.2 Membership in a task force on a business process or operational issue 3.2.2. Commitment procedures: sign-offs, user acceptance tests 3.3.2 Decision premises on 'complexity management'	3.3.3 Decision premises 'IT economising': levels and terms of service, measures

2nd order (operations with reputation and organisational structure) 2.1 Reputation 2.2 Restructuring 2.3 Resource allocation	2.1.1 Reputation for influencing strategy 2.2.1 Hard restructuring: liaisons, teams, and autonomous-ambidextrous units and large projects 2.3.1 Generous long-term IT budgets, yet scarcities of resources	2.1.2 Reputation for knowledge of workflow-business processes 2.2.2 Business processes and operational policies themselves 2.3.2 Expensive software development and management information delivery. Lack of funding, as resources are taken out by the core IT "teams" and training	2.1.3 Reputation for IT expertise and knowledge of systems 2.2.3 Amorphous and hidden work organization of the IT function 2.3.3 Expensive IT human resources and expensive skills gained over long-term by learning-by-doing
1st order (action, immediate confirmation of reputation, etc) 1.1 Boundary control 1.2 Negotiation—political implementation 1.3 Actions with computer systems 1.4 Knowledge control	1.1.1 Access to top management 1.1.2 Ownership of relationships with vendors	1.2.1 Immediate routine politics of negotiation of business processes 1.2.2 Configuration of proprietary systems 1.2.3 Intense communication and training	1.3.1 Configuration of computer environments of operation systems and databases (infrastructural) 1.3.2 Special management information and strategic IT-controlling: *different quality of service to different users* 1.4.1 Limiting IT knowledge flows

(Organisational Levels and Causality: with Precision for Power) In Table 6.2 organisational levels appear twofold: first, with the power-action arenas defined by different logics (p. 238), specifically, IS strategy—top management, business processes—middle management, and IS implementation—professionals and end-users) of top managers, IT professionals, and systems; and second, with the orders of power (e.g., 3rd order authorisation is typically performed by top management, whilst 1st order

configuration of banking systems is done by professionals and consumed by end-users). This shows that *there are different sources to organisational levels*, whilst the contingency-structure approach self-referentially presupposes only causality of rational authority. Most of the practices discussed form yet another kind of causality, specifically, horizontal institutional praxis that works "regardless" of vertical causality, for example, "2.1.3 Reputation for IT expertise" is valuable in IT strategy-making as well as in routine IT operations and formulation of business processes. This can serve as a support to the unified framework of the four stages of emergence (p. 39, Chapter 1) that proposes that horizontal causality of networks and groups emerges before vertical causality of hierarchies (Lichtenstein and McKelvey 2004). Finally, in Table 6.2 the vertical diagonal patterns are possible, yet it is necessary to make some conclusions on strategising by IT professionals from the matrix before introducing those diagonal patterns that clarify how power works in technology management.

Patterns of Pareto Dynamics behind actual practices of IT-politics

Most of the study of practices of IT support revolves around the discussion of policy and many operations with the several stable shared simple decision premises for technochange presented in Table 4.1 that set the context of economising and complexity management.

Proposition 6.3 (Preference for 3rd order in technology management) Contrary to attributed "technical mindset" and seemingly closed culture, technology management was based upon intensive 3rd order dynamics of power-actions with decision premises, even at operational and practice levels (upper right).

Proposition 6.3 is unexpected in comparison to IT professionals' technical mindset and possession of powerful tools for configuring flexible system. Yet there are decision premises and stabilisation of technology with pre-designed policies and communications. Such preference for the 3rd order power-actions concurs with the paradox of the strength of power: even if the actions of system configuration have immediate strong effect, decision premises legitimised by the top managers are more durable. It is difficult to gain stable power just out of operations with technology that are easily reversible and strongly dependent on few long-term decisions by the top managers. IT-politics in Alpha shows that, however implicitly, IT people knew power patterns in their practical action.

The major 3rd order features of IT-politics in Alpha started in the practices of hiding of internal structure and job allocation within the IT function and continued through the whole story of control over decision-making on actual computer systems, levels of IT delivery, and information strategy with the practices of institutionalised criteria and

process for software selection, evaluation of the levels of IT support by IT professionals themselves, transferring the responsibility of systems development to business functions and the responsibility for systems stability to the mass of end-users, and deliberate intelligence with communication strategy, monitoring end-users and intensive training when that was necessary in order to secure the smooth roll-out of the new systems. The IT professionals were exploiting what Pfeffer (1992) calls *strategic use of information*: interpretation from an advantageous viewpoint, selective use of information, and appearance of rationality and success – such influence is practically safest.

Proposition 6.4 (Lack of possibility for strategy) 3rd order IT strategizing and technochange actions have limited reference to 1st order power-actions with technology (lower left).

Proposition 6.4 shows the gap between information strategy and its implementation as reflected in the practices of distortion of decision premises and institutionalised criteria and process for software selection as well as the works of the paradox of the strength of power that points out discontinuity among 1st order of the grassroots operations with technology that are rather reversible, 2nd order of power resources, and 3rd order of decision premises upon several of which organisation technology is dependent (Proposition 1.4).

Table 6.2 Matrix of the practices of IT support arranged by the power-action represents epistemological ordering coded in Table 1.2. The non-casual intertwined power laws relations among the orders of power are patterns or lack of thereof that the practices located on the diagonals of the matrix form:

1st order power-actions of operations with technology are weakly linked with 3rd order of several stable IT decision premises: the cause-effect linkage along the diagonal between lower left and upper right of the matrix does not hold, which concurs with Proposition 6.4 above. Both lower left and upper right parts of the spectrum of power-actions are under-populated with actual practices. The pattern here, if one exists, is indirect: there is no considerable political process, but there are authorisations and commitments through sign-offs and restructuring originated by top managers (e.g., "from lower left corner to upper left corner to upper right corner with impact of the middle"). The weakness and indirectness of that cause-effect linkage is the problem of distortion of decision premises and the paradox of the strength of power.

The flow of power-actions through the buffers and pockets of 2nd order (e.g., structures, coalitions, and reputations) contributes to nonlinearity of how a business requirement emerges out of the accumulation of various small needs. These initial small needs are oriented to different goals and formulated in different logics. Therefore, the emerged business imperative is resolved discontinuously (Proposition 1.6).

As IT professionals prefer 3rd order power-actions, yet perform many uniformed operations with technology of 1st order: the cause-effect linkage along the diagonal between lower right and upper left of the matrix does hold and covers the areas of most intense power use, which concurs with Proposition 6.3 above. Both lower right and upper left parts of the spectrum of power-actions are populated with actual practices. This strong cause-effect linkage forms the special case of "several strong decision premises with many easily reversible but laborious technological operations," explained below using more specified estimations and the power law heuristic of complexity science.

The power law of information technology management

If the spectrum represented with Table 6.2 is taken as Cartesian coordinates with horizontal axe X for the amount of power-actions and vertical axe Y for "strength" of power-action, then the diagonal linkage between upper left and lower right resembles the power law distribution, which is the logarithmic representation of Pareto distribution. This power law between the amount and strength is classic in complexity studies.

The axe Y represents "the strength of power" in the sense defined by the initial considerations of proportion among the orders of the power-action. It is normal that the application of such formal heuristic as the power law is limited by conditions and specifications that are continued after the following additional empirical evidence for the heuristic:

(1st order) The practical indications of complexity of the comprehensive banking systems indicated 640 updates and about 1,000 software flaws recorded over two years. Delivery of the IT infrastructure for business use required 14 types of computer environments of about 5,000 settings each for business-as-usual and 15 types of computer environment for software development, testing and training. Computer environment has complex equivalence to a job role. Here, there are three to four thousands authorised and registered actions with technology.

(2nd order) AlphaCoreIS technochange worked with 60 business processes and 20-30 changes to organisational structure, depending on how to count actual but not formal teams within the IT function and virtual positions. Operations with reputation are reflected in redefinition of standardised job roles (e.g., who has access-authorisation to do what in the systems), such reputation-in-action also reflects responsibility. Here, there are up to two hundreds distinct structural operations registered in documents (e.g., creation and termination of unit, and change in financial allocations, such as release of lump sum to the IT function based upon the long-term investment plan).

(3rd order) Decision premises and sign-off procedures were several. Sign-off meetings are registered in documents. Up to twenty decision premises were found through juxtaposition of interviews and documents. Such approximation nature of psychological measures always raises the discussion about their validity. This analysis used the definition of several stable shared simple decision premises (literalism) as well as Table 1.1 Questions for testing power through commitment and irreversibility (probability-based approach to power).

The formalisation of the complex spectrum of power uses and diverse practices of IT delivery with a plain heuristic is a simplifying generalisation. Nonetheless, it shows that at some level the power law defines the spectrum of power uses, which uses are specified by the power-action model.

The power law heuristic is valuable for its linkages to the studies of complex adaptive systems and, more recently, scale-free networks that make organisational change appear to have both incremental and discontinuous sides simultaneously and the same dynamics responsible for "large" and "small" events which work only if they match with the pattern. The ideas of Pareto Dynamics of Strategic Adaptation: process management and incrementalism with examples of their applications in the areas from technology management to emotional labour tackle that patterned organisational change.

The power law helps to be aware that, discontinuous technological change or strategic decision emerges in non-causal manner, even if all organisational agents follow their logical programmes.

Complex power resources out of scarce IT services (2nd order)

IT is a key limited resource to be appropriated only to where it is needed most in terms of

business case... not servicing all but providing right capability... users are resource. (IT top manager)

This quote is example of decision premise that makes IT top managers effective in their positions, because even financial institutions have a limited resources to spend on diverse IT expertise because of the expense of IT human resources and their development. Only 5 specialists of Alpha received training from IBM on IT-infrastructural knowledge of AS/400 platform, DB/2 database engine, and Websphere application development tools. Skills with these technologies also require gradual learning-by-doing over long term and involve path dependence[47], both are generic instances of Pareto dynamics. Who receives which training was a political issue within the core IT function. IT managers used "natural involvement" criterion, so that they controlled expertise and reputation (Proposition 1.7).

The gate-keeping function of SOS Division for releasing software to production mode was a source of power. The special team on release management performed assessment about whether to become responsible for running the software at certain quality levels, on which conditions, and with what end-user responsibilities.

Timely provision of computer environments for business-owned systems development and other job roles required considerable coordination of different IT specialists within the core IT function, which was a crucial ability to trade. Provision of systems configuration was the most cited "source of frustration" for both IT and business people. Provision of customised management information was yet another power resource on which IT professionals capitalised.

These examples show how mining power out of IT resources is indirect and complex. Each power resource was a pattern of its own created with using emergent circumstances and embedded dependencies in self-referent ways that lock-in proprietary expertise, decision premises, and operational priorities to the ways and means of IT professionals.

Advanced politics: provision of IT services as trade on intra-firm markets

IT people are becoming supporting cast rather than stars. Peter Drucker (2000)

Au contraire, Alpha's IT professionals were custodians rather than servants, who traded with those who had necessary resources to exchange. Groups who had nothing to offer on the power exchange received not nearly the same priority and quality of IT services. The

style of IT politics in Alpha and heterogeneous levels of provision of IT services can be defined as trading on intra-firm markets (Malone 2004; Earl and Sampler 1998). At the level of organisational units and functions, a market coordinated IT delivery: IT resources had identifiable cost structures and scarcities and were exchanged for funding or intangible resources of support to IT function (Appendix 8). The concept of an intra-firm market invites resource-based view (Pfeffer and Salancik 1978). Interdependence analysis shows to what degree the IT function is "the organisation inside the organisation" with its own hidden internal structure and autonomy in task prioritisation and proactive effort to manage the environmental conditions of its existence, such as decision premises; the only strong dependence of the IT function upon the organisation is resource dependence.

An intra-firm market is a means to deal with intensified politics, because the market denominates a great deal of political interaction to few parameters open to all participants at all times (e.g., prices and trade volumes). The market also establishes thresholds for getting power in and out of sources and viability rules for uses of power. Intra-company negotiation is softer than formal contractual and transactional relations, because it is surrounded by governance mechanisms that constrain opportunism and subject to common frames of strategic intent, such as balanced scorecard, strategy documents, and the like.

In the case of Alpha, the intra-firm market is a compact metaphor that captures features of IT delivery. In some companies, such as Hewlett Packard, such IT resources as capacity of data banks and time of specialists are literally traded using special software, which is a case of automated institutionalised politics. Automation provides "instant institutionalisation" that is effective immediately. Institutional theory is yet to discover new horizons, for example, the new forms of institutionalisation go together with the paradox of the strength of power: the immediate impact of an automated institution is compensated by its unpredictable duration.

(ii) IT and business: limited interdependence (domain II)

Interdependence for management information: selling manageability

Strategic IT-controlling is a term for management control systems in a financial institution. It is strategic because it, first, serves reconciliation of institutionalised and professionalised relations among entire business functions of finance, risk management, banking operations

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[47] People acquire IT skills with a strange gap in their ability to learn: up to fifty times (Markus 2000).

and, second, addresses the issue of timely and appropriate reporting to the regulators who legitimise the functioning of the financial institution.

Financial software's highly configurable controls mark the industry's high institutionalization. Although software has abundance of functionality to enable controls, the actual controls in Alpha were automated in differed ways: automated controls when human involvement is required only in the case of exception, semi-automated controls when human check of systems' output is routine, and management information provision when humans create customised reports. These ways of controlling affected the relations among organisational functions as shown in Table 6.3.

Table 6.3 Management information and dependence on the IT function

Business function	*Management information (MI) dependence upon the IT function*
Risk management and regulatory compliance	Considerably dependent for timely and consistently reporting to regulators. Preference for automatic business controls: attention to exceptions or risks.
Business operations (customer service, call, and transaction processing centres)	Significantly dependent for the variety of customised MI. Preference for combined and manual business controls (i.e., manual re-check of documentation generated by systems): attention to efficiency and improvement.
Sales (branch network)	Prepares its own local MI and CRM information in independent, distributed, and varied ways, typically through putting information from the banking systems and own data into Microsoft Excel spreadsheets kept locally, for example, such was done for tracing sales and productivity as well as for calling up customers with certain offers. This is a short description of technology-in-practice. Natural Preference for manual business controls: workers enter and use local data themselves.
Finance	Prepares its own MI in relatively independent way and keeps its systems proprietary (e.g., treasury, access to equity markets, etc). Preference for kinds of business controls was not established by the researcher, but expected to be combined: abundance of financial data is produced automatically, yet some of it requires intensive analysis in order to make decisions.

The IT function of a financial institution sells controlling capability, thus, integration and manageability of the organisation. IT professionals themselves are not legitimately responsible for controlling capability, they are only custodians who can trade but not use it. Applying the power-action model: immediate access to information (1st order) provides NEITHER immediate change in power resources and access to networks in which those resources could be exploited (2nd order) NOR control over decision premises (3rd order).

Quality provision of management information and IT-controlling can be framed as either manageability trade or responsibility of the IT function. The dependence of centralised banking operations upon controls was the strongest, so that the core IT function had two units in charge of technical and analytical support for management information provision in addition to several in-house software development initiatives. However, *the IT function takes deliberate effort for limiting its responsibility that limits its power sources*, such as the freedom of autonomy and internal regrouping, selection of who to provide what quality of service, and selling the scarce capability.

Risk management

The relationship between the IT function and the risk management and regulatory compliance function in a financial institution is special and reciprocal. First, Alpha's IT function was in a non-negotiable position of helping the compliance department to meet the regulatory requirements and semi-automatic reporting through EDIs. The IT function happened to support the risk management agenda and logics, for example, through developing automated checks. So that, for money laundering, investment fraud, cash loss prevention, investigation procedures, and other financial risk controls, Alpha claimed to be more advanced than some large investment banks. Second, all policies including business processes and IT service levels went through the compliance department for approval. In fact, the business case and funding for AlphaCoreIS project were grounded in the need of meeting regulatory requirements, especially from new European institutions.

> *We set up operational risk frameworks, formalise risk management, help line managers to identify risks, keeping and reviewing risk registers, sometimes escalate risks... and ensure that risk owners are aware of their risks, but we do not own risks. (Director for Compliance and Operational Risk)*

Alpha's risk registers for the large information systems implementation presented an interesting mix of risks that might be characterised as broad and remote from actual circumstances and risks there were precisely relevant. Because the risks of IS projects and banking operations were owned by their managers, the role of risk management function

was one of pointing out and helping to deliberate. The intensification of risk-based politics (Proposition 1.9) was met with loosening risk controls over IT and relying upon natural political interaction.

IT function in the headquarters-branch relation and institutionalised conflict

The conflict between the headquarters and the workforce in branches is an institutional one; therefore, the state of affairs in such conflict reflects the degree of integration of the firm (Chatterjee et al. 2002). The conflict persists by virtue of participants' separation in organisation space, including pay structures and power bases. Branches possess proprietary customer knowledge and relations, whereas headquarters possesses the infrastructure and economies of scale for operations. The interests of the headquarters are manageability of branches (e.g., adherence to policy of business processes and performance of CRM initiatives from the centre, such as targeted marketing campaigns) and good sales results that involved the shift from service to sales culture and stricter performance measurement. The branch staffs were not unionised and relied upon their power base of knowing a local customer in order to get their autonomy and perform their job as they deemed fit.

Operational efficiency and "complexity management" inclinations of the several stable shared simple decision premises for technochange were the practices foreclosing yet contributing to the latent conflict between the headquarters and branches, for example, centralisation of the processing of complex tasks and formation of centralised knowledge-intensive operational cores, the double-bind of discouragement from seeking advanced support and limitation of end-users expertise and reputation for it.

Alpha's IT function treated the end-users from the headquarters and branches differently which did not ease the institutional conflict. Basic desktop support to branches was outsourced. The business processes of both IT and Business Operations "Support" were different for the head office and branches. The headquarters' business experts were less subject to the learning and reputation "controls" imposed by the IT function. The following dialogue between the researcher (R) and Training and Communications Team Leader (T) is illustrative about the difference in IT support[48]:

R: They might be confident in the system per se, but not in its stability.

T: Stability issues are not such a problem in head office, they can be attended to much more easily.

R: [Making a conclusion from data] In branches, confidence dynamics was undermined just by instability of the system?

T: [Branches] Once the training was finished, we provided support... unfortunately through experience of having to live with the system that gets down and freezes, when they've got a big queue – that seriously fails what they think of it... cost them to lose confidence. They don't have back up of support, they're small teams. They may or may not have a green-rated user within the team [super-user]... some branches may have more than one, some branches may not have any. They just don't have fallback, they don't have a safety net, as here in the head office. They're isolated.

T: [Head Office] If Contact Centre gets major problems, we can get 10 people up there in 2 minutes.

R: In their positions, they are perhaps more restrained from contacting IT helpdesk?

T: Yes. I think a lot of problems that we're having is more do with distributed network operations. The head office does not encounter as many stability issues as branches used to... not the same problems. ... They can start having more faith... we haven't got that very... not even after 9 months, we still not have a break, they still cannot rely on system. Not as bad as it was.

T: In long term we have more difficulties with branch people, in short term we have more difficulty with head office people.

Whilst some reasons for such difference in treatment are as natural as geographical remoteness and different lines of authority, other reasons were political. On the intra-firm market, end-users in branches are poor customers of IT resources, because their power sources are disparate, they cannot pay through transferring funds to the corporate IT budget, and they are unorganised population with low impact upon the top management.

The economics of IT support and banking operations, particularly decision premises for removal of complexity from branch operations, did not empower the frontline branch workforce who experienced stretch under improved IT-controlling, incapacitation in their ability with the systems, and no incentives for development. The software and business processes were configured centrally, and end-users were left without incentives for feedback. Yet the disturbance, costs, and learning of new systems were carried out by the mass of end-users in branches. In such case, *gains from IT were proportional to quality and exploitation of human resources*.

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[48] The dialogue refers to the questionnaires on competence, confidence, and attitude towards the systems.

Interdependence patterns for politics of IT delivery

The interdependence between IT and other functions is describable with interdependence patterns-use of power proposed in Table 1.5 , with a view that interdependence is a condition for frequency and kind of power-action (Proposition 1.8).

Pooled task interdependence was between the IT function and the mass of end-users in branches. For this pattern there were few power considerations indeed. This pooled pattern was deliberately maintained with the practices of limiting end-user participation and buffering from the mass of end-users. IT-politics seem to be deliberately applied in order to prevent intensification of already active political interaction.

Sequential task interdependence was between the IT professionals who provided core infrastructural services and business operations with their in-house software developers who needed those services or customised management information. This pattern has clearly asymmetrical power distribution, which the IT function exploited, for example, in the practice of business ownership for systems development and application.

Reciprocal task interdependence was between the IT professionals and initiators of approved IT task requests. This pattern was balanced at the micro level and both sides adjusted mutually and directly; once the task was authorised, middle management levels were by-passed (see Appendix 7). Indeed, within the established frame of interdependence, micro-level interactions tend to be balanced and performed through mutual adjustment and well-formed healthy politics (Proposition 2.1).

The IT function has significant share of received *task* interdependence. However, the function itself does not require significant *information* input in order to do its work. The only source of dependence of the IT function were *resources*, because the IT function receives its funding from the firm and does not generate income directly, as it was the case with the federalised but in-house IT function in Alpha. Thus, the general interdependence pattern between IT and business is *reciprocal interdependence at micro levels and independence on strategic level.* IT managers do report to corporate executives, but IT policy and its decision premises show the high levels of autonomy of the IT function. The factors external to the IT function have small effect upon its internal task prioritisation.

The structure of this section on Relations between IT and other business functions points

out that the variation of IT delivery to various intra-firm customers served as governance arrangement for conflict foreclosure and decision premises management. Two latent institutional conflicts were addressed, specifically, between the headquarters and branches as well as between the functions of risk management-compliance and banking operations.

(iii) Timely subtle, unobtrusive, and self-referent IT support (domain III)

This section renders a summary perspective on the practices of IT delivery using Domain III characteristics of the effective power process.

Timing and frequency. Information systems projects by the virtue of their duration are always at risk of loosing attention from top executives as well as the broader organisation. The typical time spans for IT decisions, taken from Alpha case and industry practices are offered in Table 6.4.

Table 6.4 Typical time spans for IT decisions

Class of decisions	*Time span*
Core professional information systems (e.g., banking systems)	More than several years
Standardised software (e.g., office package)	More than several years, but such software has new versions annually
IT infrastructure	Up to years
IT operational plans	Months
IT service conditions	Yearly
IT strategy	Unidentified

One can notice that the top corporate and IT management exercised direct decision-making over the areas with longer time span. Their decisions are not put under review for long time, which contributes to developing irreversible consequences. The decisions of the shorter time span were left to line business (e.g., practice of ownership of software applications). Some of the strong decisions about IT can be resolved on discontinuous basis only, and organisations fall into traps of terminating many initiatives and making software change decisions simultaneously, which is a mix of logical and remedial incrementalism or simply "garbage can decision model" and which contribute to the lack of strategic direction for information systems implementation.

Regular and at certain stages high frequencies of review and management meetings were registered for review of IT policies, communications and presentation of IT issues and

training. These processes were well designed and regularly reviewed after their units of delivery were implemented, just as incrementalism approach prescribes. The frequency was managed in order to achieve optimal impact upon the mass of end-users as well as coordination of the federalised AlphaCoreIS project.

Subtlety and latency. This work puts together a methodology for studying practices that identifies "routine politics of life" exercised through prioritisation, negotiation, and commitment. Politics appears as embedded into routine actions that are not conventionally regarded as political. Yet, *it is possible to achieve a political outcome through regularly tuned non-political activity and distributed action*, as this collection of practices of IT support shows. The subtlety of the politics by Alpha's IT function was the most evident in the practices of setting service boundaries and IT delivery standards that are logical, yet their wording proposed considerable shift of responsibility for stable systems to end-users and getting convenient ways of incentives to the IT function. The control over decision premises is commonly subtle and unobtrusive use of power, and the IT function prefers this way (Proposition 6.3).

Recursion and self-reference. Operations with decision premises are inherently recursive and multi-layered. The ideas of self-reference of power processes are helpful for comprehension of how the federalised IT function arrives at decisions, how IT service levels are defined and evaluated by the IT professionals themselves and how 1st and 3rd order power-actions converged in limitation of end-user incentives for participation in IT governance, again, those end-users were not overtly discouraged but disinterested at deeper level.

IT managers, especially if they are in charge of strategic aspects will be advantaged, if they realise the self-reference of the processes that they use. IT delivery in Alpha was the double sided push and pull process. From one side, the IT professionals limited their responsibility and designed their "public relations" with special communications. From the other side, the IT function discouraged end-users from participation in IT governance and seeking extensive IT support at deeper levels by the means of inconvenient procedure and attention of senior managers. Such a political system was effective but at the risk of drifting the organisation from its technological operational grassroots: simply, many business benefits of banking software were just not realised.

(iv) Conclusion: meeting the lack of information strategy by natural incrementalism

The starting discussion of this chapter, what do IT professionals need power for, proposed several answers to why IT-politics is in place and intensive and made case for the scope and legitimacy of politics in delivery of information technology. The initial question of the research project was on appropriate ways of politics for IT professionals, partly because they need to use politics and partly because they already possess considerable and sometime asymmetrical powers. And the initial report concluded:

> *Ways of politics [for IT professionals] would certainly differ from explicit politics or public argument and would be distributed across collective action and technologies-in-practice, be subtle. Collection of practices [of IT support] might reveal excessive diversity [in delivery of services to different stakeholders]. Vladimir Diatlov (2004, EGOS)*

The appropriate question requires meta-questioning, specifically, "Appropriate to whom?" and "Appropriate for what purpose?" A brief sight reveals at least three sources of appropriateness. Firstly, unobtrusive success of IS delivery is a responsibility of the IT professionals and only from successful delivery of the whole project can the IT function build its credibility; partial success is not enough unless implementation is designed carefully incrementally, so that "each stage of implementation delivers results in a non-overlapping manner, even if no further increments are completed" (Results Driven Incrementalism methodology). Secondly, added value stored in IT can be extracted only from innovative patterns of technology use and specialisation, and such processes require active participation of various IT professionals. Thirdly, natural distribution of IT capabilities within the organisation is obscure and has scarcities and high cost bottlenecks, so that only IT professionals can guide adaptation on such landscape (see Appendix 8).

The importance of politics for IT jobs was strengthened by the study of CIOs in a sample of FTSE 500 companies by Michael Earl (Davenport et al. 2000). Managers who survived, were proactively involved in constructing shared vision, gathering ideas, building credibility and alliances, developing relationships and mutual expectations with other top managers and participating in organisational change, just as the ideas of incrementalism prescribe in some ordered way. The comment by a non-survivor speaks for itself:

> *I did not enjoy the diplomacy and politics required in a corporate role. (CIO of a large company)*

Major power source: proactive skilful agency

IT professionals have plenty of imbalances and dependencies upon them, from which to gain power. Several good examples of that are described as complex power resources out of the access to scarce IT services. Whilst local and special IT expertise is always

beneficial to its holders, it is difficult to gain power from the operations with technology above certain extent (that is low on the scale of the organisation), because such operations are very dependent upon decision premises and easily reversible, which is in accord to the paradox of the strength of power proposed (Proposition 1.4). Such consequence of disparate power sources is not inevitable, if one recognises that *the major power source for the IT professionals is their own agency*. This idea was introduced in the review of power theories for reconciliation of objective force and subjective will, iterated as a part of incrementalism modelling, and illustrated with the role of self-activation in balancing between continuity and radical change (Huy 2002, p. 35).

Whether technology is cutting edge or ordinary, simple or sophisticated, used pervasively throughout the organisation or not, comes as discontinuity or incremental update, *what matters is the proactive or reactive role* the IT function and its people take. IT professionals gain significantly from an intelligent response to each business need. They can assess appropriateness of their response by answering the questions like "Who to serve?" "For what (business) purpose to serve?" and "For what price to serve?" Besides, the market-based style of IT delivery stimulates such considerations, even if they are not explicitly stated.

Agency of IT professionals for technologies-in-use

The Practice Lens proposed how the agency of IT professionals affect technology use patterns and end-user behaviour (p. 179) making them to fit generic rules and "universal" decision premises, which includes "rapid establishment of relatively fixed technologies-in-practice" despite on-going problems in use and performance, just as it was in Alpha's branches, "influenced by corporate pressure to improve productivity, unavailability of technical support staff, and users' expectations of and preferences for stable and predictable technologies" (Orlikowski 2000, p. 411). The pressure of economies of IT support and actual unavailability of support are well discussed in the Chapter at both levels of surface observed practice and deeper decision premises.

Alpha's IT professionals were not concerned with the formation of effective technology use practices. However, they imposed boundaries upon variation of practice (e.g., with end-user responsibilities and limiting end-user participation) and affected key turnpoints of practice formation (e.g., monitoring end-users regularly and providing intensive training to boost confidence, when competence in systems is low) aiming few purposeful power-actions of 3rd order to grasp the most of consequences (Proposition 6.3). Alpha IT function

do not pass participation test that was proposed even before the elaborate modelling of power.

The AlphaCoreIS project changed structures and job roles considerably, but resistance to new systems was distorted largely because of effective politics by the IT function. The designed, incremental, and multiple-goal course achieved more than preventing resistance, specifically, technology acceptance at least in broad institutional terms. Preventive and foreclosing uses of power count as success and bear less costs of politics, yet prevention of resistance to IS projects typically grows into the programs of technochange that include the elements of business process redesign, cultural change, work practices, HR changes thereby complicating formation of strategy and blurring conventional distinctions as Lynne Markus (2004) suggested and as it happened with AlphaCoreIS project that became technochange with its own momentum.

Alpha's IT professionals developed support from their senior management and utilized corporate-wide imperatives, such as compliance to regulations. The budget of the federalised IT function and AlphaCoreIS technochange was a case of skewed distribution of considerable financial resources in the hands of several top IT managers. Overall, the position of Alpha's IT professionals was proactive: they gained power out of their politically skilful agency and exercised it upon the less organised mass of end-users. The IT top management were earnestly concerned with technology uses and acceptance, but their concentrated powers were of low reach to the grassroots of the frontline operations. The mass of IT professionals remained within the boundaries of their local efficiency and technological convenience thinking.

Lack of possibility to form any long-term information strategy

Studies of strategy in the information systems and knowledge management fields demonstrate that information technology strategy, information systems strategy, information management strategy, information resources strategy, and knowledge management strategy share the same pattern: partial strategies with are more effective than large comprehensive ones. The very complexity of strategy content and project management schedules leads to failure. These initial considerations led to formulation Pareto Dynamics for technology management and political delivery of information systems (p. 88) that propose patterns and models including incrementalism for software implementation, elements of which can be traced in various literature, for instance, the comprehensive collection of information management and strategy papers by Prentice

Hall-Financial Times (Davenport et al. 2000), most of the research by Michael Earl who targeted at IT executives (1989-2001), prophesies by Yetton (1994), and recent handbook on corporate information strategy by Applegate et al. (2003). But most of the literature presupposes some equilibrium in the form of "information strategy" of some formulated kind, whilst the formulation of strategy content, especially if based on functionality, is a very source of problem. Activity-based thinking is difficult to break through and the Practice Lens alone is not a device for such. To keep large-scale IS delivery effective, the purposeful consciousness attention is required to uphold to generative process-based management under uncertainty and deal with nonlinearities for eventual shift from incremental practice to discontinuous innovation, delusions of conventional distinctions and no strategy, and cognitive biases of IS delivery.

Other obstacles to durable strategising as planning found empirically in Alpha case were first, fragmentation of organisational processes (conceptual), fragmentation of business processes (observable), and fragmentation of activity in practice (psychological), and second, multiple centres of new projects and knowledge-intensive operational cores (e.g., sales, banking transactions processing, banking business operations support, core IT function).

In Alpha, there was no "information strategy" document, although there were partial well-formulated substitutions, such as Governance Proposal for selection of new banking systems, Communications Strategy and Learning Strategy, which concurs with the suggestions on positive impact of incrementalism upon learning AND nonlinearities and non-causal formation of strategy as a pattern of consistency in action (Mintzberg et al. 1998).

If the business wants these developments, it will cost £1-1,5 millions on top (IT manager)

It was said in July 2003 nearly at the fifth year of the project. In the due course of AlphaCoreIS technochange, considerable additional funds were released for in-house systems development and management information functionality. The information strategy formation pattern observed was hardly of strategic planning kind. The complex circumstances for strategy formation was met by the IT professionals with simplified actions and economising, specifically, hiding their internal work organisation and expenses, staying apart of coalitions, developing 3rd order "protection" by the policies, boundaries for service and relations with corporate top management, as well as separating systems development from infrastructural IT services into different cores with different

resources. Implementation of the large technochange of new banking systems changed the functions of Alpha organisation. But it was not evident that the IT function promoted or slowed particular agendas beyond its own necessities and conveniences of operation.

The industry and professions of information and communication technologies exercise institutional impact that leads to "no strategy feasible" condition. The ICT industry simply overpowers most other industries in the areas from computer manufacturing to information processing to outsourced knowledge-intensive services to consultancy (Burgelman and Grove 2004; Dunleavy 2004; Arthur 1996). In practice, this means that organisations, Alpha included, have less and less control over their own IT infrastructures and professional software as well as their costs. The ICTs industry drives increased incrementalism and discontinuity simultaneously: companies employ more and more people to work on their IT infrastructures, whilst the industry produces more and more radical technology changes.

Incrementalism of AlphaCoreIS technochange: towards strategy as pattern

> *Collection of practices [of IT support] might reveal diversity [particularly in how differently IT services are provided to different stakeholders on different occasions], but it shows that each IT job is performed in a way that leads to certain goal. Vladimir Diatlov (2004, EGOS)*

That was a conclusion of the initial report on the study. Politics mobilises fragmented practice and business processes towards goals, whilst incrementalism and process-based methodologies are ways of dealing with displacement and multiplicity of those goals. Political delivery and incremental approach together create ways in order to arrive at strategy as a pattern (Mintzberg et al. 1998).

Without explicit knowledge about either strategic incrementalism or applied results-driven incremental methodologies for IS implementation, AlphaCoreIS technochange has plenty of natural incrementalism:

> *We are taking a building block approach to the implementation. This means that you will not have to cope with all changes in one go. (Communications Strategy: messages to branch users)*

Further features of natural incrementalism in Alpha include: acceptable temporary workarounds and business processes, exploitation of the functionality of the same software in layers, sorting out software development tasks among stages with resolutions such as, "good, will wait" or "we will return when resources are in place," and special governance arrangements for the projects, such as rules dealing with problems and extended steering committee with domination of IT managers that were warranties against premature

termination in the case of initial failure. Alpha business processes were formulated with distinguishable elements of incrementalism as described in Business processes in Alpha: heterarchical content and incremental process of change (p. 192).

The distinction between core logical incrementalism and peripheral logical incrementalism is useful for sorting out the practices of political delivery of IT in Alpha. *Core logical incrementalism* appeared in incremental delivery of functionality and various subsystems over three years. This incrementalism was directly managed by the directors of AlphaCoreIS project and project management team with various registries and operational plans. *Peripheral logical incrementalism* involved stakeholder management and appeared in incremental pilots and roll-out of systems through the headquarters and branch network. This incrementalism was exercised in relations with risk management function, extensive and expensive training and communications to the mass of end-users. Key policy documents appeared for each situation of significant risk, such as software purchase, sign-off and commitment procedures were employed in order to "align" people, systems and business processes, and designed and regularly updated communication was performed in order to maintain the image of successful comprehensive banking systems implementation.

Further generic instances of Pareto dynamics in IT processes were present in Alpha, specifically, accumulation and discontinuous resolution of a business need with a strong 3rd order policy, incremental building IT infrastructure and discontinuous computer platform shift for servers from Microsoft Windows to IBM AS/400, and gradual character of learning IT. Most of the power resources of the IT professionals were created precisely in the areas of highly incremental capability building. Branch end-users demonstrated their series of 1st order "small" actions with accessing functionality which they were not supposed to access and using their own locally designed spreadsheets, which resulted in less accurate information in the central system, such instabilities were met with the strong policy of 3rd order that had limited impact but convenience to IT professionals – in terms of the research model, which is a pattern linking from Proposition 1.6 to Proposition 1.11 to Proposition 6.3.

4 An Overview: fit with Precision for Power model in multi-level depth

This Chapter 6 The Political Delivery of Information Technology and Chapter 1 Precision for Power were developed self-contained with each chapter having its own purposes. Precision for Power was developed for generic guidance of any empirical study of power. The Political Delivery of Information Technology was a project of collecting data on

actual practices of IT support. Even so, the developed Political Lens contributed to making sense of the diverse structural, economic, institutional, intelligence, communicative, reputation, and other activities of the federalised IT-Operations at the several levels of depth, first with the power-action model, second with patterns of Pareto Dynamics (e.g., incrementalism, nonlinearities and cognitive biases), third with the formal heuristic of the power law that sets the spectrum of feasible power uses, and fourth with epistemological distinctions and presuppositions of power.

The epistemological ordering of the power-action model was confirmed, because it was possible to use Table 6.2 Matrix of the practices of IT support arranged by the power-action model in order to first, uncovering multiple kinds of causality beyond authority hierarchy that were predicted by the unified framework of the four stages of emergence (p. 39, Chapter 1) and second, formalising *complexity* and *emergence* by the power law heuristic in such a way that it illuminates the feasible uses of power for technology management under the lack of strategic direction. This is a major achievement of the thesis, because even the simplistic form of the power law, the 80-20 rule, is widespread in management practice, no research known to the author achieved a sensible application of the power law to intra-firm processes (McKelvey 2004, personal communication).

Each concluding sub-section of this Chapter renders a perspective over the entire collection of practices of IT support by comparing them to the main constructs of 'the Precision for Power' model, specifically, power and interdependence patterns, domain III characteristics of the effective power process, the power-action model and power law heuristic, complex power resources, and incrementalism. The ideas of Pareto Dynamics for Technology Management including "no information strategy" condition were found useful in making sense of how diverse practices, IT policies, actions, features of software, institutionalisation, and cost structures come together in the stable operations of a bank. Application of the incrementalism model was presented at the end of this Chapter as an integrating pattern, otherwise the practices of IT support would appear 'remedial' or 'random'. The various kinds of incrementalism had their appropriate ways of application, specifically, results-driven incrementalism in building the IT infrastructure and project management of AlphaCoreIS technochange, logical incrementalism in formulating IT policy and communications to the mass of end-users, and processual incrementalism in implementing several stable decision premises that dealt with simultaneously incremental and discontinuous moves ahead of results known.

Chapter 7 Conclusions. Thinking Directions for Organisational Integration and Performance

This chapter develops recommendations for re-use of some ideas and constructs of this thesis by researchers and practitioners. Three purposes are pursued in the chapter.

First, the chapter brings together the concepts that were particularly useful in understanding empirical findings and hence, developing a valid theory. Recognition of how abstract 'organisational forms' look like in practice is of learning value in itself. Furthermore, the chapter provides recommendations of how others can use those concepts in their research. The first and second sections are particularly focused on this purpose.

Second, the chapter sketches 'lessons for management' and proposes frameworks that can be used by practitioners and hence, developing a practical theory. The lessons concern organisational design, high interdependence as an obstacle to project management of IS implementation, and functionally overloaded software as an obstacle to effective practice of software use. The lessons are offered not as step-by-step instructions but rather thinking directions that help to foreclose issues before they turn out in their radical forms. The second and third sections are focused on this purpose.

Third, the chapter combines empirical conclusions and 'thinking directions' and hence, developing a robust and interdisciplinary theory. The fourth section concludes that the reported issues and their political resolve are rooted in cognitive issues. Therefore, without a cognitive perspective, the information systems field will remain enchanted by the nominalizations of 'technology acceptance', 'resistance', 'power' or 'social construction'. Consecutively, 'strategic alignment' will never reach 'business as usual'.

1 Useful constructs for analysis of socio-technical organisational design

The selection of key research themes of this doctoral project was independent, yet, after the research model was designed in Chapter 1 and Chapter 2, the selection was discovered to match 'the key challenges to evolving organisational forms', specifically, *interdependence*, *disembodiment*, *velocity* and *power*[49]. Those challenges unfold as follows: organisations transform as they approach the threshold of high interdependence but notice it late, because

[49] Special Research Forum on New and Evolving Organizational Forms, Academy of Management Review 2001, edited by John Child and Rita McGrath.

interdependence is disjoined by advanced ICT; disembodiment challenges the idea of ownership over organisational assets; velocity shortens the acceptable lag time between stimulus and response and pressures vertical decision flows; and accountability for power diminishes in the organisation of multiple operational cores, strong professional staff periphery, weakened authority hierarchy, and yet high interdependence among them all. In such a system, discontinuous innovation by information technology joins power in shaping boundaries: organisations integrate vertically, create internal boundaries, and make their external boundaries blurred and dynamic in the face of technological change (Afuah 2001). Those key themes can be used as general guides to what the ensuing section offers as useful constructs of organisational analysis, selected as a result of this in-depth case study.

The constructs of 'multiple operational cores', 'the constant of interdependence' and 'high but disjointed interdependence' were developed by Chapter 2 in an attempt to extend structural contingency theory. Unsatisfied by that attempt, the research turned to the construct of 'new contingencies' that stem from the dynamics of highly interconnected socio-technical actor-networks where connections may be unknown to human participants. Examples of such actor-networks include IT infrastructures and arrangements of their support, large technochange projects of IS implementation, and actants of routine IT support. Each actor-network follows its own purposes self-referentially and consists of routine human behaviours, software facilities, policies and units of organisational structure. Hence, it was found useful to operate with each actor-network as a unit of analysis.

This analytical refinement helped to bring together nonlinearities of actor-network summarised form the IS literature and empirical study (p. 127, Chapter 2) and the ideas of 'the Pareto Dynamics of Strategic Adaptation' summarised from strategy and complexity literature and computer simulations (p. 88, Chapter 1). The overview through both lenses was found comparable: any organisation should keep an eye on the level of adaptability that is foreclosed by mobilisation and commitment of IT resources, from one side, mobilisation of IT human resources for serving all business (and end-user) requests is not a viable strategy, from other side, a well-built IT infrastructure that is convenient to maintain will be expensive to change. Thereby, building IT resources above *scarcity* will eat up adaptability for the future in terms of both, systems locked-in and resources spent. Then, the resolve in technology or strategy will come in a discontinuous way.

In putting the constructs developed in Chapter 2 to empirical test, Chapter 5 reviewed how common office, scheduling and e-mail software is used in 'generic coordination

practices' and how people use a share of simple facilities (e.g., spreadsheets, HTML web pages) in order to assemble crucial 'technologies of coordination' (e.g., Live On-line Business Process Material) that provided 'seamless integration' and helped to by-pass the crises of organisational growth or crises of increasing levels of requisite interdependence. Sources and outcomes of high interdependence, include 'process orientation' and other decision premises supporting the roll-out of the technochange, which was stimulated by International Comprehensive Banking Systems and involved the re-definition of business processes, sales incentives, restructuring of operations, transformation of the IT function and many more consequences of new organisational forms, as described in this section.

(i) Interdependence and power spectra

Understanding the models of 'three orders of power-action' and 'pooled, sequential and reciprocal interdependence patterns' can be facilitated with the purposeful metaphor of spectrum as follows: there is a root pattern underlying transformations from one part of the spectrum to another, in other words, the pattern explicates how the phenomenon of the same nature demonstrate certain range of difference (p. 61). This work applied the power law distribution as a heuristic that describes such root patterns of the spectrum of power and the spectrum of interdependence.[50]

For power, the power law defines the relation between frequency and strength of the power-action (Table 1.2, Chapter 1). That allowed to cluster the three kinds of such relations as 'the three orders of power-action' that have commonsense and epistemological distinctions (e.g., action, reputation for action and symbolic representation of action that can be used instead of action, as communication). This framework proved useful in mapping the practices of IT support collected empirically (Table 6.2, Chapter 6), and then the mapping revealed interesting patterns of IT-politics, such as the preference of IT managers for policies in stabilising systems and getting resources (Proposition 6.3) that is contrary to the concept of 'the technical mindset' and existence of 'institutional praxis' that shows how the same expertise it transient through organisational layers of strategy, technochange and business processes, and grassroots operations.

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[50] Heuristic is "a commonsense rule (or set of rules) intended to increase the probability of solving some problem". This definition points out at common sense and probability. Definition by WordNet, a reference system based upon psycholinguistic theories of human lexical memory. Cognitive Science Laboratory. Princeton University, http://wordnet.princeton.edu/ Accessed 24.05.05.

For interdependence, the power law defines the threshold of high interdependence as 1,000 work relations for 100 people (Proposition 2.3, p. 131, Chapter 2). That allowed to seek for 'the behaviour' of highly interdependent socio-technical systems. Chapter 5 discusses what happened with AlphaCoreIS technochange project, including the IT function, as it approached the threshold of high interdependence, particularly, it demonstrated formation of multiple operational cores, technological disjoint, new forms of coordination and limits of buffering and ambidexterity. The individual-level outcomes included an unclear meaning of work to its performers, shift from interdependence among co-workers to reliance upon systems (Proposition 5.1), and decreased reciprocity among people from different specialised groups within the same IT and operations functions.

The 'three orders of power-action' and 'pooled, sequential and reciprocal interdependence patterns' are conceptual leverage in managing organisational integration. As the case of IT-politics shown the same purpose can be achieved by policy (3rd order) or by software configuration (1st order), where each way carries its own risks, as predicted by the epistemological ordering of kinds of power exercise (Table 1.2), and each way is 'strong' and 'imperfect' in its own way. The similar cause is built into the framework of interdependence patterns (Table 2.1), if one specialises some task interdependence and pool it, then it shall be reconciled somewhere else (e.g., in complexity of software), and if reconciliation is effective, it is called 'seamless integration' that is less visible to participating agents themselves, as it happened to branch workers in Alpha.

(ii) 'Pareto thinking': politics for balancing continuity and discontinuity

This thesis presented an in-depth case of large information systems implementation in a financial institution, as a scale-free co-evolutionary dynamics with simultaneous incremental and discontinuous developments (p. 75), 'commitment layers' between strategic transitions (p. 84) and other forms of designed discontinuity (Proposition 1.5). Understanding this sort of dynamics came from both, the refinement of these ideas, named 'the Pareto Dynamics of Strategic Adaptation' (see Table 1.4, Chapter 1) and an attempt at using these ideas in order to organise the discussion of actual practices of IT support and implementation of International Comprehensive Banking Systems by Alpha in Chapter 6. The discussion was based upon the presupposition of a strong role of politics in shaping co-evolutionary change (p. 17). The presupposition proved to be effective, because this research found sensible ways of using heuristic ideas of complexity science as summarised in the overview to Chapter 6 (p. 278) as well as in this section on 'Pareto thinking'.

The e-world is highly decentralized and hard to control, but it forces organizations to become more integrated, even centralized. Rosabeth Moss-Kanter (2001, p. 96)

One main finding of the power-action analysis was realisation of how concentrated distributions of powers are, even in business organisations. The skewed Pareto Distribution was reported by others to describe distribution of power in different domains of human activity on a social level (p. 72). But it was surprising to discover how many 'small' decisions come through the top management in Alpha who operated out of several stable shared simple decision premises (p. 189). In a search for the sources for pressured decision flows and skewed distribution of powers, this research identified market requirements, discontinuous innovation by IT and related creation of intra-organisational boundaries (e.g., separation of IT infrastructure support and in-house systems development) and scarcities that were exploited by IT professionals in order to gain power (p. 263).

Pareto-shaped organisation theories

More generally to skewed distributions of power, this thesis contributes with observation, that both organisation theory and managerial practice are shaped by 'the Pareto thinking'. As demonstrated in their actions and outcomes, managers uphold the 80-20 rule, several stable decision premises for technochange management, and the Pareto efficiency principle[51]. Organisation theories demonstrate Pareto-shaped thinking in their proportioning of cause-effect between continuity and discontinuity, e.g., 'the punctuated equilibrium model of organisational change' (Romanelli and Tushman 1994), 'continuous, pulsing dynamic' of strategy process (Quinn 1980) and 'incrementalism-radicalism trade-offs' underlining any strategy (Mintzberg et al. 1998). A defined instance of 'the Pareto thinking' is the framework of 'Evolution and Revolution as Organizations Grow' (Greiner 1994, p. 11) that describes organisational growth in terms of incremental formation of coordination requirement that is followed by a radical resolution, as follows: growth through creativity creates crisis of leadership, then growth through direction – crisis of autonomy, then growth through delegation – crisis of control, then growth through coordination – crisis of red tape, then there is growth through collaboration and new forms of crises that are supposedly resolved by use of advanced software and groupware as reviewed in the beginning of Chapter 5. As a project of large IS implementation secures certain levels of autonomy and commitment, it seems to undergo those crises and balance by implementing designed radical change on the background of continuity.

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[51] Choice cannot make anyone's position considerably worse including the most resourceful and the least resourceful agents.

(iii) Qualitative multi-method and complexity heuristics

This thesis presents an example of multi-method for studying large information systems implementation that utilizes the latest advances of organisational analysis and complexity science. Whilst the call for such 'configuration analysis' is well-known there is shortage of empirical examples (Child and McGrath 2001; Mintzberg et al. 1998). The analytical Lenses and Research Methodology of present choices for generative thinking about human organisations – all are results of the careful selection, empirical test, and epistemological checks (pp. 20, 140). The Research Methodology concludes by showing how epistemology of this research is commensurable with 'a set of principles for conducting and evaluating interpretive field studies in information systems' (Klein and Myers 1999) (p. 186).

The linkages between organisation-centred qualitative information systems research and complexity science form the backbone of this configuration analysis. Their validity is based upon, first, finding empirical instances of complexity phenomena and heuristics and, second, showing how certain formal heuristics can be contextualised in empirical circumstances (e.g., see discussion on interdependence and power spectra, p. 282). In a review of complexity theory for organisational science, Anderson (1999, p. 227) called for qualitative field-based research that produces agent characteristics (e.g., ethnography), the dimensions of relationships among agents (e.g., see Figure 2.1 A map for studying interdependence) and figures of merit that govern agent's co-evolution (e.g., contingencies, institutions and decision premises). This work has been done by this project, with an initial hope to use structuration theory (Giddens 1984), its variants (DeSanctis and Poole 1994; Orlikowski 1992, 2000), and advanced qualitative data analysis in order to develop specifications for an agent-based model of some kind. However, first, that task was found beyond the scope and validity, and, second, computational simulation does not seem as promising as hybrids of heuristics and real-life data. For at least one reason. Agent-based modelling of complex adaptive systems portrays *complex organisations emerging from interaction of many agents based upon few simple rules, so that macro outcomes derive from initial rules and micro interactions*. Hence, agent-based modelling seeks to reproduce and confirm institutional phenomena. But this research discovered that precisely reverse thinking is of practical challenge, *how behaviour of an individual agent is an instance of broader phenomena and macro factors*? This was a direction pursued by this thesis in analysis of organisational design transformed by co-evolutionary dynamics of IT delivery.

2 Politics and complexity in IT delivery: organisational design implications

This research found features of organisational design that concur with the presupposition of a strong role of politics in shaping co-evolutionary change (p. 283). First, whilst it is commonly predicted that information technology makes organisations flatter with less hierarchical levels (Dewett and Jones 2001), this was not confirmed as a necessary good for innovation or a large IS implementation. Second and more specifically, the structure of Alpha's operations and IT function was found ambidextrous, federalised and hidden (i.e., ill-defined for outsiders). New units were easily created for gaining autonomy, 'ambidextrous units' stood out to the periphery under dedicated authority of corporate executives in order to manage discontinuity (O'Reilly and Tushman 2004), whilst 'time-paced semi-structures' followed incremental side of change (Brown and Eisenhardt 1997). Chapter 6 describes this range of structural means of IT-politics (p. 231). Third, from the processual discussion of practices in interviews it became clear that such seemingly artificial interdependence complexity of organisational design was created as a political vehicle[52] for differentiation of roles, reconciliation of jobs and gaining a momentum of change. Fourth, in such political projects, authority hierarchy appears as nothing more than a designed discontinuity (Proposition 1.5): a complex organisation emerges several levels and hierarchies, and top managers impose their authority hierarchy as a discontinuous solution; one method of such imposition is exactly the use of several stable shared simple decision premises. Decision premises oriented towards performance, but they do not manage all risks that such organisational design bears.

(i) Three lessons on 'powerful restructuring for effective action'

This section summarises three lessons that current modelling of organisational design by complexity scientists can offer to in order to manage interdependence under the politics and complexity in IT delivery. The lessons were known to complexity literature but not to Alpha's managers, yet this research found that managers acted as if they were aware about such lesson. This is described in Chapter 5 in discussions of interdependence pooled with various forms of technological disjoint (p. 211), technologies of coordination (p. 216), and waves of high interdependence in the lifecycle of AlphaCoreIS implementation (p. 225).

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[52] Intra-organisational boundaries (e.g., stand-alone units, hidden IT infrastructure support department, and expert units on systems configurations) and virtual positions (e.g., liaison roles, cross-project appointments, and memberships in key steering committees/project management by the same people) indicated political character of the dynamics studied.

First, one should appreciate where 'the power differential' drifts. In Alpha, the technochange of new banking systems culminated in transferring centralised banking operations to the management of the IT Director. That, the generious IT budget and successful politics show how the organisaiton becomes structured around IT issues. One common implication is the prioritisation of operational convenience over 'strategies', be they new HR policies, cultural change or market positioning.

Second, especially with large technochange projects it is normal to have many structural changes and ill-defined temporary structures along the way, as showed by the discussion of structural means of IT-politics in Alpha. Results of agent-based modelling proposed that *high-performing organisations made twice the number of internal structural changes than lower performing ones* (Lichtenstein and McKelvey 2004). And such internal structural changes of reorganization, interdepartmental coordination, promotions and transfers involve the most intense power uses (Pfeffer 1992, pp. 35-37).

Third, whilst many structural changes are necessary at some stage, it is profitable to keep moderate levels of interdependence over long-term. Again, application of complexity heuristics suggest that moderate interdependence is good for system-wide adaptation, for example, keeping internal value chain interdependencies to the levels just below the opponents is a source for strategic advantage (McKelvey 1999), or invention can be maximized by working with a large number of components that interact to an intermediate degree (Fleming and Sorenson 2001). More dynamic modelling suggests that performance increases with, first, the most rapid diffusion of information in a network (that occurs when only less than a half of agents are actively seeking information) and, second, interaction levels of the active seekers decreased over time (Carley 1996, 1998, in: Lichtenstein and McKelvey 2004). However, moderate interdependence involves frequent uses of power (Pefeffer 1992, p. 38) that in terms of 'the Precision for Power' model means the risk of politics intensification (Proposition 1.9 and Proposition 1.10), to which organisations are sensitive and seek means to prevent.

(ii) Intra-firm markets as a response to politics and new contingencies

These lessons and argument suggest: new organisational forms require conversion of politics into prices and embracement of discontinuity. Both can be achieved with 'intra-firm market', an emerging form of coordination, implementation of which can vary from a purposeful metaphor to software that enables trade. In conclusions to Chapter 6, this thesis considered empirically how advanced politics of IT delivery is a trade on the intra-firm

market (p. 264) and identified some scarcities and decision premises that govern such a trade (see Appendix 8). Even though such rules were not explicitly formal, the construct of intra-firm market facilitated understanding the allocation of IT capabilities in Alpha, in addition to a conventional analysis of budgetary procedures, in the beginning of Chapter 6 (p. 235). Business benefits of intra-firm markets include smarter resource allocation and staffing, efficient economic exchange among organisational functions and quantification of benefits, so that questions as 'How much will it cost to accelerate the given task?' become answerable and decision premises become less manipulated (Malone 2004).

Information systems literature accepts the reliance upon markets for coordination of value creation as evident, with increasing amount of B2B networks and outsourcing (Dewett and Jones 2001; Willcocks and Lacity 2000). Coordination literature converges on intra-firm markets from the works on intrapreneurship by early Bulgerman, to 'Electronic Markets and Electronic Hierarchies' (Malone et al. 1987) to recent 'Bringing the Market Inside' in Harvard Business Review (Malone 2004), to the role of increasing returns in information economy (Arthur 1994, 1996). Methodologically, markets and insides of information technology rely on many transactions that can be conceptualised as uniform and routine. This similarity opens a way for application of the same methodologies for studying both. Also, the intra-firm market approach appears similar to computational agent-based modelling (a method of complexity science) but implemented as a live social experiment (a method sought by power scholars). The qualitative methodology of this enquiry made it less commensurable with institutional economics and organisation ecology lenses. However, even one Alpha case revealed the combination of hierarchy-based and market-based coordination, which is a confusing hybrid to study with standard either qualitative or and quantitative tools and frameworks, such as structural contingency theory. That was another rationale for development of a distinctive 'practical approach for studying information technology' infused with the concepts from strategy, complexity and human cognition studies, as described in Introduction (p. 15).

(iii) Impact of new organisational form upon individual workers and practice

Chapter 4 traced cognitive and behavioural implications of 'new organisational forms'—ambidextrous, federalised and hidden structures, political projects, several hierarchies, a horizontal institutional praxis, and marked-based coordination—with simplified models of 'several stable shared simple decision premises' for technochange management (p. 189) and 'activity fragmentation' for the behaviour of branch assistants (p. 196). Both should be treated as theoretical constructs and as observable related phenomena. Activity

fragmentation represents experience at the workplace, which is a consequence of the centralised management logics represented via decision premises. The overall impact of new organisational forms is reflected by the following conclusion:

> *Although new organizational forms may enhance the possibility for self-actualization for some highly talented and fortunate individuals, their operations are corrosive for others... pushing the many down the rungs of the [Maslow's] need hierarchy toward a greater concern for security and safety. ...In today's economy, the burden that organizational flexibility imposes on the workforce is less visible, yet there are transitions to new forms of working and mounting levels of work-related stress. John Child and Rita McGrath (2001, pp. 1144-1145).*

This in-depth empirical case study discovered that, indeed, 'organisational flexibility' and better alignment between policy and practice were achieved in Alpha by means of routine politics targeting the mass of end-users (pp. 246-252). The costs and tensions born by the front-line workers in banking branches were also in place, for example, any instability of banking software added to manual re-working of transactions in a workplace that was already tightened by financial and security regulations, internal queue management standards and service levels, and face-to-face contact with a customer. 'Small' difficulties with information systems nonlinearly transformed into considerable personnel issues. After the first stages of the roll-out of new software, Alpha began to suffer from branch/operational staff turnover of nearly 25% per annum.

Activity fragmentation is also a pattern of new forms of organisational integration. Instead of training, specialisation and buffering, Alpha imbedded controls in micro-level routine operational activities, used the technologies of coordination in order to organise work in pooled ways and promoted the transfer of skills from human workers to systems – all are common outcomes of discontinuous IT innovation (Frenkel et al. 1999; Kilduff et al. 2003; Zuboff 1988) that have detrimental impact upon reciprocity among co-workers (Proposition 5.1). The interviewed branch workers in Alpha also reported these outcomes.

In a related pattern of integration, Alpha developed the Live On-line Business Process Material as a technology of coordination that was maintained centrally, updated immediately and referred to in routine work daily (p. 216). The diagrammatic and algorithmic descriptions of business processes down to step-by-step instructions on software use enabled effective coordination of the work outputs of end-users who ended up in a position of not being able to comprehend the entire Big-O of the structures, policies and systems of Alpha organisation. Such task programming of end-users ironed out the linkages between the centralised managerial logics and work organisation at the front-

line, which this research attempted to establish (Figure 1.1). Finally, Neither the task programming, nor avoidance of training in the functionality that end-users were not supposed to use, nor early congealment of use patterns prevented branch end-users from discovering backdoors and using workarounds in Alpha's banking systems in order to do their jobs as they see fit. Factors that motivated branch assistants (e.g., fulfilling needs of customers) conflicted with the centrally arranged ways of coordination. Sequentially located units had problems with transactions performed through the systems in non-specified ways. Ramifications occurred months or years later, for example, when data was to be converted or used in a CRM initiative.

These empirical findings of activity fragmentation and problems with technologies of coordination are contrary to the theoretical conclusion by Dewett and Jones (2001) that 'local action becomes less fragmented and better aligned to organisational goals and rationality'. The functional overload and constraining role of contemporary software contribute to these practice-level misfits. And the lack of cognitive competencies puts the situation into stalemate (p. 293).

3 Incrementalism and interdependence as practical guides

Before turning to a cognitive perspective upon misfit between contemporary software and 'business as usual' that is aimed at the individual level of analysis, it is useful to present incrementalism as a project management and even strategising method of implementation of functionally overloaded software 'one piece at a time'. In IS implementation, the very complexity of strategy content and project management schedules leads to failure (Davenport et al. 2000; Earl 1989; Vlasic and Yetton 2003), and practitioners seem to comprehend that by upholding to simple heuristic decision premises (e.g., 80-20 rule, step-by-step action and no key-man dependence), instead of having any traceable 'information strategy'. In order to implement the comprehensive banking systems with success, Alpha's IT and business managers utilised the elements of incrementalism, even though they were not aware about formal process-based incremental methodologies (pp. 192, 277).

(i) A review of enhanced incrementalism

In a practical extension of 'the Pareto Dynamics of Strategic Adaptation', Chapter 1 summarises how kinds of incrementalism can be used in order to understand what sort of strategy dynamics goes on (p. 77) and presents presuppositions behind incrementalism, key principles of incrementalism (p. 83) and an example of practitioners' methodology of Results-Driven Incrementalism for software implementation (p. 96) that demonstrated

dramatic performance comparing to project management based on Gant diagrams (Fichman and Moses 1998).

Furthermore, this thesis enhances incrementalism with the ideas of 'political implementation' and 'designed discontinuity', both are applied in order to prevent radical change or make it coming in acceptable forms. In organisational life, politically designed discontinuity is as common as commitment rituals, hiring and firing, and project start and termination—these power-actions are perhaps the only both strong and broadly applicable powers of top managers, as defined by the paradox of the strength of power (p. 75). Developing the presupposition of designed discontinuity (Proposition 1.5) into an element of incrementalism, this research proposed the following:

> *If naturally remedial incremental decision-making (known as 'garbage can') is countered with purposefully incremental strategies, the requisite change comes in less radical forms (p. 92)*

As it was done in the technochange of International Comprehensive Banking Systems implementation by Alpha, this pattern can be used in making purchase and roll-out decisions that involve many discontinuities, for example, moving to a new computer platform, defining which piece of functionality to implement and whose jobs to alter. Since each discontinuity is required for different purposes by different stakeholders, some dynamic guides are necessary in order to keep track and sequencing implementation of such purposes, commitments and powers.

(ii) Incrementalism and interdependence as behavioural meta-strategies

As a final enhancement, the ideas of incrementalism, interdependence and complexity are crystallised in so-called 'behavioural strategy sequences' as simple guides for action (Figure 7.1). These sequences are not merely conceptual, because they are based upon practitioner's methodologies (e.g., RDI and Cynefin), psychology of project management, and principles of operant conditioning for learning (see Appendix 3). In the sequences offered, the reader might recognise the 'stimulus-response' and Test-Operation-Test-Exit (TOTE) phenomena that are well-reported by cognitive scientists. Because these sequences are formulated in terms of process, they can be applied in different content situations, especially under uncertainty. These sequences can be identified in any organisational dynamics in order to order it into a strategic pattern. First, understanding at which stage a given initiative stands is practically useful for suggesting which (political) steps should be taken next (e.g., shall a committing procedure be initiated or credibility be sought). Further advice is available in the section on 'political implementation' (p. 85). Second, matching real-life dynamics with these sequences contributes to process management in many ways,

particularly in managing ahead of the game with certain level of guaranteed performance, before the results of discontinuous innovation with information technology are settled.

Figure 7.1 Behavioural strategy sequences: simple guides for action

(PROBE)-SENSE-(ACT)-(ANALYZE)-RESPOND	*Meta-strategy of Cynefin framework for assessment of complexity levels (p. 79)*
OPERATE-LEGITIMATE-(TEST)-COMMIT-EVALUATE-(EXIT)	*Meta-strategy of incrementalism (p. 84)*
INTERACT-CLOSE	*Meta-strategy of interdependence*

Whilst the other sequences were explained as a part of incrementalism methodology in Chapter 1, the meta-strategy of interdependence is based upon the lessons of 'powerful restructuring for effective action' (p. 285). INTERACT stage means that breeding high interdependence is acceptable and useful, even if new work relations are stochastic and not overseen by managers. Here, 'stochastic' means open information sharing within certain boundaries, specifically, not more than a half of network members should possess resources (e.g., working time and legitimised duty) to engage in work relations, as they see fit. CLOSE stage means that every interdependence and political reconciliation should be closed preferably into decisions and power resources in order to yield productivity. Otherwise, project management of IS development suffers from high interdependence and over-engineered solutions (Fichman and Moses 1999; Vlasic and Yetton 2003).

The key question of the use of the meta-strategies is *how to recognise the right time to close*? If to close early, there will be resistance and escalation on the peripheral areas (e.g., because of lack of training or management information). If to close late there will be overhead, missed opportunities and escalation on the core arena (e.g., difficulty of termination of a large 'temporary' project, which has grown into decades of teams and software packages). An answer to the timing question comes from the meta-strategy of incrementalism that sequences legitimacy as necessary before commitment, then, commitment as necessary for gaining some evidence of success, and then, implementation evidence as necessary for re-evaluation of all consequent project stages. In order to understand their stages and next actions, Alpha surveyed attitudes towards the usefulness of the new systems (p. 172), conducted business process sign-offs and user acceptance tests (p. 243), assessed readiness and competency of end-users (p. 254) and performed a range of other regular intelligence and communication practices as described in Chapter 6.

4 Towards a cognitive perspective upon strategic alignment: matching 'information technology' and 'business-as-usual'

"Awareness is the first and crucial thing," said Wanda Orlikowski about possibilities and troubles with technology in Financial Times 1999

(i) Overloaded software

Contemporary software is designed with abundance of functionality, which in part is a consequence of cognitive biases, such as 'thinking in terms of observable' and 'desire of getting all at once' (p. 94). Those biases seem to be logical but, in fact, they delay getting business benefits from software. Alpha case showed that functional overload and misfit of software solutions are not likely to be managed by consumers, for the reasons of not so much of being out of control but for being out of awareness. As a result, well-known problems occur, which this section recounts.

First, institutionalised practices of software purchase do not aid strategic alignment: the elaborated evaluation of functionality on decades of spreadsheets seems perfectly logical but, institutional and political process is prone to overlook software characteristics that take impact over mid and long terms. In the case of Alpha's purchase of International Comprehensive Banking Systems, the functionality of specific management information and regulatory reporting was lacking (in precisely the areas that managers valued) and, even decision premises aimed to adjust work organisation to the systems, there was a considerable adjustment of systems at the cost of above 1 million GBP per year (p. 241).

Second, not all functionality of a software package is eventually employed and, not all of it is profitable. Skills in sophisticated proprietary software and computer platforms are gained through learning-by-doing in incremental ways. The formal training, whether by consultancies or in-house experts, is expensive. It took up to three months for branch assistants in Alpha to gain enough skill to begin to find new banking systems useful. 'Competitive advantage' might come from the scope of operations processed more efficiently, be they banking transactions, statements printout, or configuration of operation systems on several hundreds of desktops. But, Alpha case showed that 'completive advantage' and 'core inimitable capabilities' come from better management information and simple and unexpected uses of software, for example, both of Alpha's large-scope technologies of coordination were enabled using standard and cheap office software.

Third, the mass of end-users in the large centralised operations of a service firm is not in a position to have a choice about software (p. 26), nor do end-users concern beyond their own ability to do the job (Frenkel et al. 1999; Orlikowski 1992, 2000). However, the combination of overloaded software and the issues with agency of end-users (discussed on p. 288) result into a problem situation that can be summarised by the following statements:

> *Advanced software packages typically provide hundreds or thousands of discrete features and data items that may or may not be used, and when used can behave in multiple ways. Fichman and Moses (1999, p. 4).*

> *People are purposive, knowledgeable, adaptive, and inventive agents who engage with technology in a multiplicity of ways to accomplish various and dynamic ends. When the technology does not help then achieve those ends, they abandon it, or work around it, or change it, or think about changing their ends. Wanda Orlikowski (2000, p. 423).*

In Chapter 3, this thesis developed 'a Practice Lens' as an approach for understating possible ways of contextualised technology use. The approach offers presuppositions that help to develop necessary choices (e.g., why it is useful to conceive of technology-in-practice rather then technology-in-box) (p. 174), the framework of facilities-norms-interpretative schemes (Figure 3.1) with an example of how it can be used as a consultancy tool (p. 216) and 'generic technology use patterns' as the likely ways of how end-users adopt software, depending upon their implicit beliefs (presuppositions) and explicit experiences (p. 179). These elements of Practice Lens can be used for developing selectiveness of software facilities to use and awareness of their unexpected uses. That should tackle the problem of overloaded software.

(ii) Constraining software as a tool of operant conditioning

Yet there is another problem with the overload of contemporary software. It is designed with complex architecture (e.g. on-screen interface, middleware transaction support, and database structures), most of which does not make business sense. Complexity of software at the levels of code, configuration, and data structure masks the whole hierarchies of rules, schedules of events and other *systemic sequences of behavioural stimuli*, which make contemporary software a powerful operant conditioning tool that trains certain behaviours in its human users (see Appendix 3). Operant conditioning by software joins the top management's decision premises towards changing practices rather than software, the tendency for software use to be quickly congealed in stabilised routines, and the scarcities of IT support in creating the following pattern: contemporary software constrains reality and closes alternatives to end-users. That is understandable psychological but not necessarily logical outcome. This serious constraining impact is what Methodology Note 1

implied by the statement, "information systems create and constrain choices, structure the difference between 'actual' and 'possible', and provide actionable 'institutional memory' for power" (p. 30).

(iii) Thinking directions

Cognitive biases of IS implementation, software as a tool of operational conditioning, and constraining impact of information technology upon alternative, possible ways of development are not random consequences. Technology is an external result of what first occurred as an act of mind (Grinder and DeLozier 1987, p. 185). The finding that information technology stimulates divergent thinking is one of the rare durable findings of the IS field (Dewett and Jones 2001). With the stories of unaware end-users, activity fragmentation and overloaded software, this research indicated that awareness about our own cognitive habits is a route to productivity and, the contemporary information and communication technologies run well in advance of our cognitive and relational skills.

This thesis considered political behaviour and complexity spurred by the implementation of large banking systems, identified that dynamics as 'a scale-free co-evolution with simultaneous incremental and discontinuous developments' (p. 283) and reported some patterns and practitioner's methodologies that should be useful in dealing with such dynamics. However, those solutions do not cover cognitive issues operating in several areas (e.g., beliefs of system designers, behaviour of end-users, project management, and conceptualisation of IS). Such cognitive issues are evident in the information systems literature being enchanted with 'strategic alignment', 'resistance', 'technology acceptance', 'usefulness', 'social construction' and similar nominalizations that are just reified entities. Another indicative result is inevitably single-sided advice provided by 'the right mindset for managing IT' (Bensaou and Earl 1998), 'culture of IT professionals' (Markus 2000), or 'six IT decisions your IT people shouldn't make' (Ross and Weill 2002).

Through its access to epistemology, observable practices, operant conditioning and ideas about human cognition, this research has sought another way. Such solution is not an immediate remedy or step-by-step methodology with a formal diagrammatic notation, but rather a set of cognitive skills that are equally important when conceptualising and when acting upon information technology.

Figure 7.2 Thinking directions

FROM	***TO***
Cognitive biases that seem useful but actually delay information systems delivery, e.g., software functionality descriptions, and thinking in terms of visible (e.g., facilities, activities and resources)	Guidance by goals of what to achieve by means of software. Tracing deeper level intent.
'Information strategy', 'the right mind-set for managing information technology' or 'six decisions your IT people shouldn't make'	Principles of incrementalism and behavioural strategy sequences (e.g., RDI as practitioners' methodology for software implementation). Scale-free thinking. Tracing epistemological distinctions and well-formedness

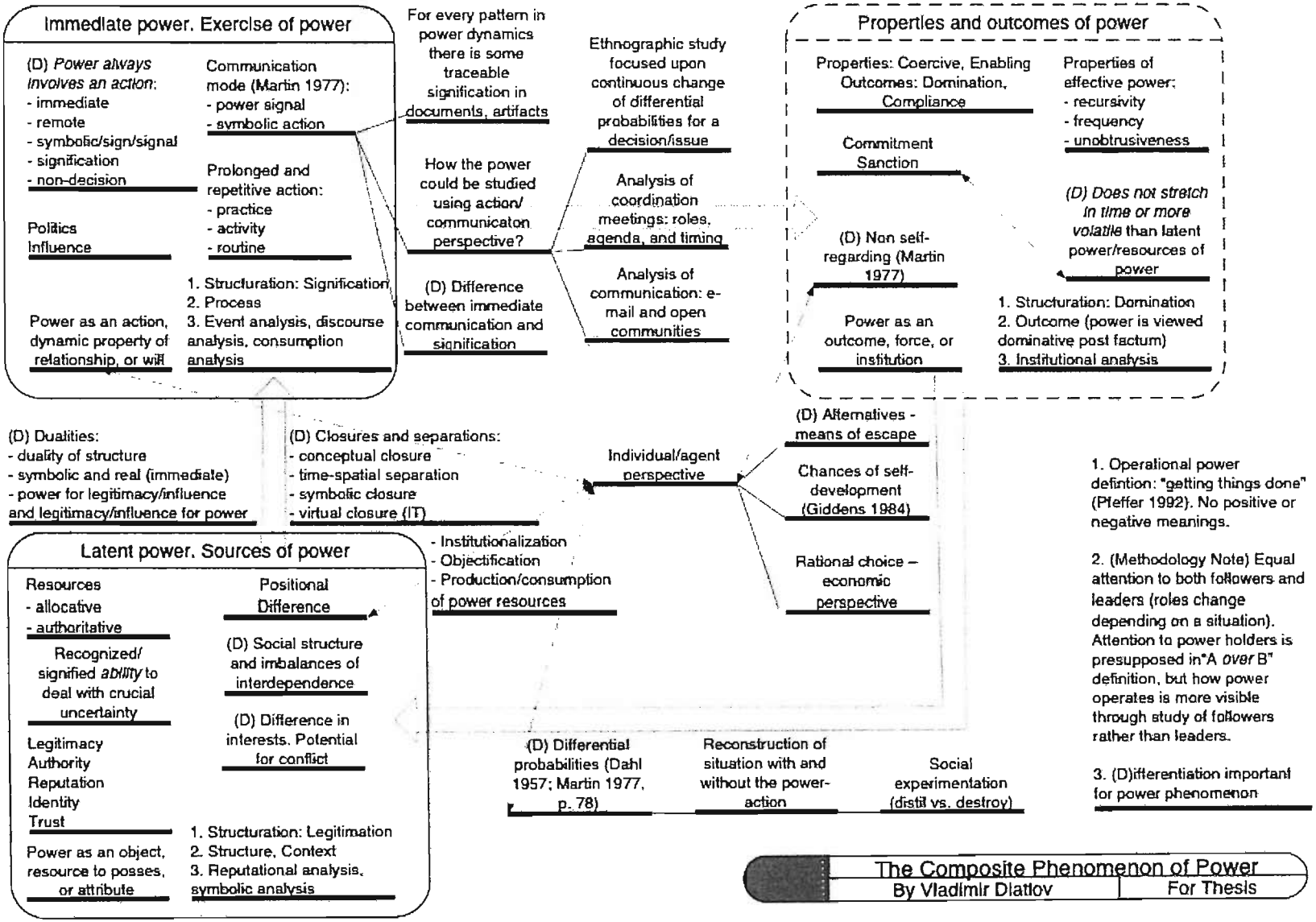
Figure 7.2 presents 'thinking directions' that came from the evolution of my own thinking about which skills and which epistemology is needed in order to arrive at understanding and logical ordering of diverse practices of a large IS implementation as well as routine IT support. Quality of that ordering can be assessed by reading the empirical chapters of this thesis and noticing sequencing of the material. These directions are not a matter of one-off conceptual acknowledgement. They are criteria for presence of skills, such as the skills of tracing intent behind visible activities or being aware of one's own model of the world.

Appendix 1. Power definitions, concepts and metaphors (a table)

Definitions, constructs, and metaphors power	*Implications*	*Authors*
Ability, influence/resistance dynamics	*Agency*	
Power as ability to cope with crucial contingency (based upon uncertainty and complexity)		March and Simon (1958), Thompson (1967)
"Power is the potential ability of one group or person to influence another within a given system"	Boundary conditions	French and Raven (1960)
"The ability of persons or groups to impose their will on others despite resistance through... a negative sanction"		Blau (1967)
"A exercises power over B when A affects B in a manner contrary to B's interests" (where interests are defined as what men would want if they were given the choice, not what they actually do want)	Probability implied	Lukes (1974, 2005)
A has power over B to the extent that he can get B to do something that B would not otherwise do	Probability and power-as-catalyst implied	Dahl (1957, 1968)
Probability and difference		
Power is the probability that one actor within a social relationship will be in a position to carry out his own will despite resistance, regardless of the basis on which this probably rests.	Probability stated	Weber (1947)
A's power over a, with respect to the response x, by means of w, is M $M\left(A/a : w,x\right) = P\left(a,x/A,w\right) - P\left(a,x/A,\overline{w}\right) = P_1 - P_2$ P1 – opportunity cost/probability with a power action/signal, P2 – opportunity cost/probability without a power action/signal. If there is no difference in probabilities of action with or without intervention (P1=P2) then there is no power relation (M=0)	Differential probability equation	Dahl (1957, p. 205)
A cause		Martin (1977)
The capability to make difference... to capacity to achieve outcomes... being able to do otherwise	Goal attainment implied	Giddens (1984, pp. 14, 257-8)
Mobilization		
Goal attainment and mobilisation of support		Martin (1977)
"Nothing less and nothing more" than mobilisation of bias		Giddens (1984, p. 15)

Getting things done	Unobtrusiveness	Pfeffer (1992)
Communication		
A specific form of communication flow		Buckley (1967)
Type of information flow which symbolizes non-self-regarding action for the recipient		Martin (1977)
A specific mode (or signal) of communication		Martin (1977)
Relation, property of relation		
"The important difference between power and authority consists in the fact that whereas power is essentially tied to the personality of individuals, authority is always associated with social positions or roles... power is merely a factual relation, authority is legitimate relation"	Contingent property of an individual, different from authority	Dahrendorf (1959)
"A specific type of relation between objects, persons and groups"		Martin (1977, p.36)
"A property of relationship, not of the individuals in that relationship"	Interdependence	Martin (1977, p.39)
"Power shall be attributed to relationship rather than subjects"	Interdependence	Hatch (1997)
"Inherent in social relations." "Power acquires a volatile form embedded in two-way reciprocal constraints."	Subtlety	Foucault (1983)
System resource	*Boundary conditions*	*Parsons (1969)*
"Transported on to a societal level, power may be seen as a generalized means for the achievement of collective goals, instead of satisfaction of limited, sectional interests."		Martin (1977, p. 37)
A situation rather than a variable		Mackenzie (1986)
A medium for freedom and creation	Medium or infrastructure	Foucault (1983)
"Power is not, as such, an obstacle to freedom or emancipation but is their very medium – although it would be foolish... to ignore its constraining properties." The existence of power presumes structures of domination whereby operational power "flows smoothly" in processes of social reproduction and is "unseen"	Medium Subtlety, domination.	Giddens (1984, pp. 257-8)

Appendix 2. The composite phenomenon of power: three epistemological domains (a framework)



Appendix 3. Power Modelling: Stochastic Apparatus and Operant Conditioning

This study formalised the findings of power studies and organisational behaviour into heuristics of distribution of various kinds of power use in relation to their strength. Based upon such heuristics, the *stochastic apparatus* for analysis of power has been developed, as summarised in Table Appendix 3 below. The apparatus provides an embedded model in which the power-action or power-signal is specified as "exponential oscillation" that is found to resemble Poisson distribution. On higher level, sequences and stand-alone random power-actions contribute to power relations and the case of a balanced relation (interdependence) is represented with Laplace distribution. Then, there is some discontinuity between power-actions and power relations (and the sequences of both) but the overall distribution of power in the organisation resembles Pareto Distribution, which has intriguing empirical confirmations of power resources distributed according to Pareto distribution in various domains of human activity. These probability distributions are embedded *conceptually*, *formally logically* by induction from one another, and *mathematically*: Poisson distribution is a general form of exponential oscillation, Laplace distribution is a general form of (or simply double) Poisson distribution, and Pareto distribution is even more general form of all those probability functions (or simply all distributions that have mathematical power operation in their formulae). The embeddedness reflects complexity, recursivity (self-reference), and autopoiesis of power.

Pareto distribution appears as a convenient heuristic that covers a fair range of patterns of power at once, specifically, skewed power distribution of the organisation, getting power out of power (e.g., recursivity), quick depletion of power resources in the case of failure, acceptable frequencies of "strong" and "weak" power-actions, and perhaps most importantly, non-causal pattern between incrementalism and discontinuity. In general, Pareto Dynamics contributes to a resolution between most *recent values* (Markov process) and *initial conditions* (deterministic chaos) through designed discontinuity (Proposition 1.5) as described in the initial formalisation of stochastic patterns of power and confirmed by the presence of political layer in the meta-strategy of incrementalism. [53]

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[53] An interesting evidence for design of discontinuity comes from stock markets, where crisis is good for certain players OR crisis is viewed positively by financial regulators as a means to making the market "healthy". In stock markets as well as in the organizations there is a class of special expectations and worries felt closer to discontinuity, although participants from within the situation tend appreciate that that situation was peculiar to crisis only retroactively.

Table Appendix 3. Probability distributions for stochastic analysis of power

Power-action *Condition: consequential on its own and communicative*	Needs to be successful and strong in order to be effective with different senses of "strength", e.g., resourceful, committing, consequential, irreversible, durable, or strategic. Exponential oscillation of the power-action and Poisson distribution. $p = \frac{1}{t} e^{-\frac{1}{t}}$ and $\lambda e^{-\lambda x}$
Power relation *Condition: interdependence*	Sequences and flows of power actions that comprise a relation. Parameters: frequency, mean, and independent variable. Harmonization to interdependence as a well-formedness for a social relation. Low skewness of probability function—symmetry of interdependence. Laplace distribution: more appropriate for industrial relations rather than normalised (Gauss) distribution. $\frac{1}{2b} e^{\frac{-\lvert x-\mu \rvert}{b}}$
Power distribution (power law distribution) *Condition: boundaries defined (e.g., group, organization)*	Patterns and distributions of power-actions and power relations. Parameters: frequent action is required to maintain both individual power and collective power infrastructure, AND distribution needs to be harmonised (i.e., because of interdependence) but heavy tailed (i.e., some agents control much more power resources than others). Skewed of probability function—asymmetry of distribution of formal and informal powers in the organization. Pareto distribution: characterizes a system with high interactivity of its components—appropriate for analysis outcomes of high interdependence, peer pressure, and intensified institutionalised politics. Signature of complexity. $\frac{ab^a}{x^{a+1}}$

The predicting powers of these stochastic tools shall be treated carefully. The distributions contribute to prediction of power dynamics in the sense of "what next choices are feasible for parties involved." But the function of those distributions is to map the landscape of power-actions, sequences of signals, relations, and cross-level patterns – exploration of possibility through the structures of choice, subjective experience, and social boundaries

(Kurtz and Snowden 2003).[54] If the landscape is described with precision, then *prediction emerges as a by-product of possibility exploration.*

(Pareto Dynamics: from probability to frequencies and sequences of operant conditioning) Anchoring power into the future, and testing power by its acceptable frequencies and potential consequences through looking from the perspective of the future invite *psychological and behavioural considerations.* Whilst the necessary enquiry was done and literature reviewed, the results were excluded from the thesis, which did not prevent the thesis's text from benefiting from the finding.

The patterns of actions offered by the power-action model are sequences of operant conditioning: a specifically arranged process aimed at learning and maintenance of desired behaviour (Skinner 1968, 1971). The power-action model proposes high frequency of systematic communicative and purposefully erroneous power monitoring in order to make power processes effective through maintenance of desired behaviour through reminding. Strong but low frequency power-actions have high the risk of exploitation of power resources. The closed pattern from operant conditioning is Premack principle (or "grandma's rule"): access to the preferred activity initiated by agents (that is typically of high frequency) is contingent on compliance required from agents (that is typically of low frequently). Overall, high frequency activity and change in frequency patterns can be systematically exploited in order to entrain and reinforce behaviour desired.

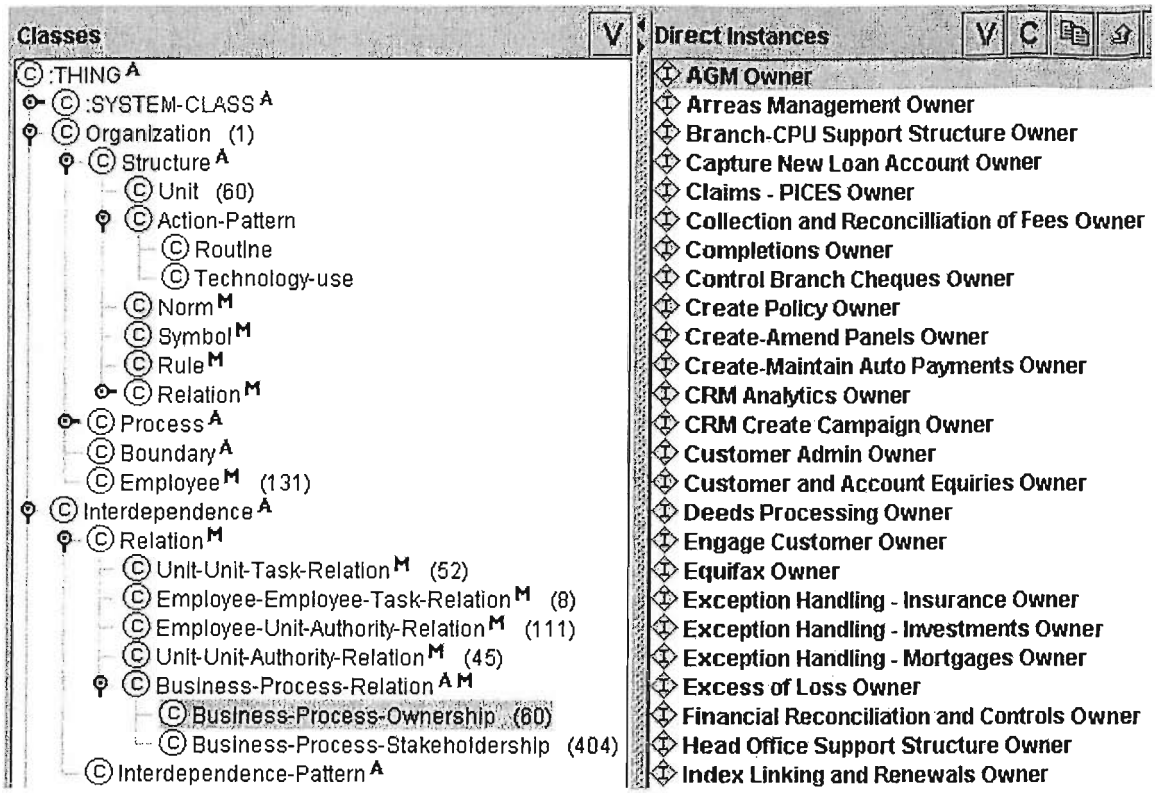
The special effectiveness of Results Driven Incrementalism comes from its inclusion of *psychology of project management and timing and sequencing effects*, which relate to operant conditioning. First observation, effort intensifies closer to a deadline or milestone and, interestingly, at the midpoint of the project. Second observation, work tends to expand to fill all the time available, rather than the task being completed early. Progress depends on the awareness of time, sequences of activities, and deadlines (process), rather than absolute amount of work (content). These findings were reported for significantly different teams and contexts (Gersick 1988; Potok and Vouk 1997). Every project has milestones and deadlines, and even their duration can be appropriate for incrementalism. However, such milestones tend to be abstract, task-oriented, and aimed at control purposes, for

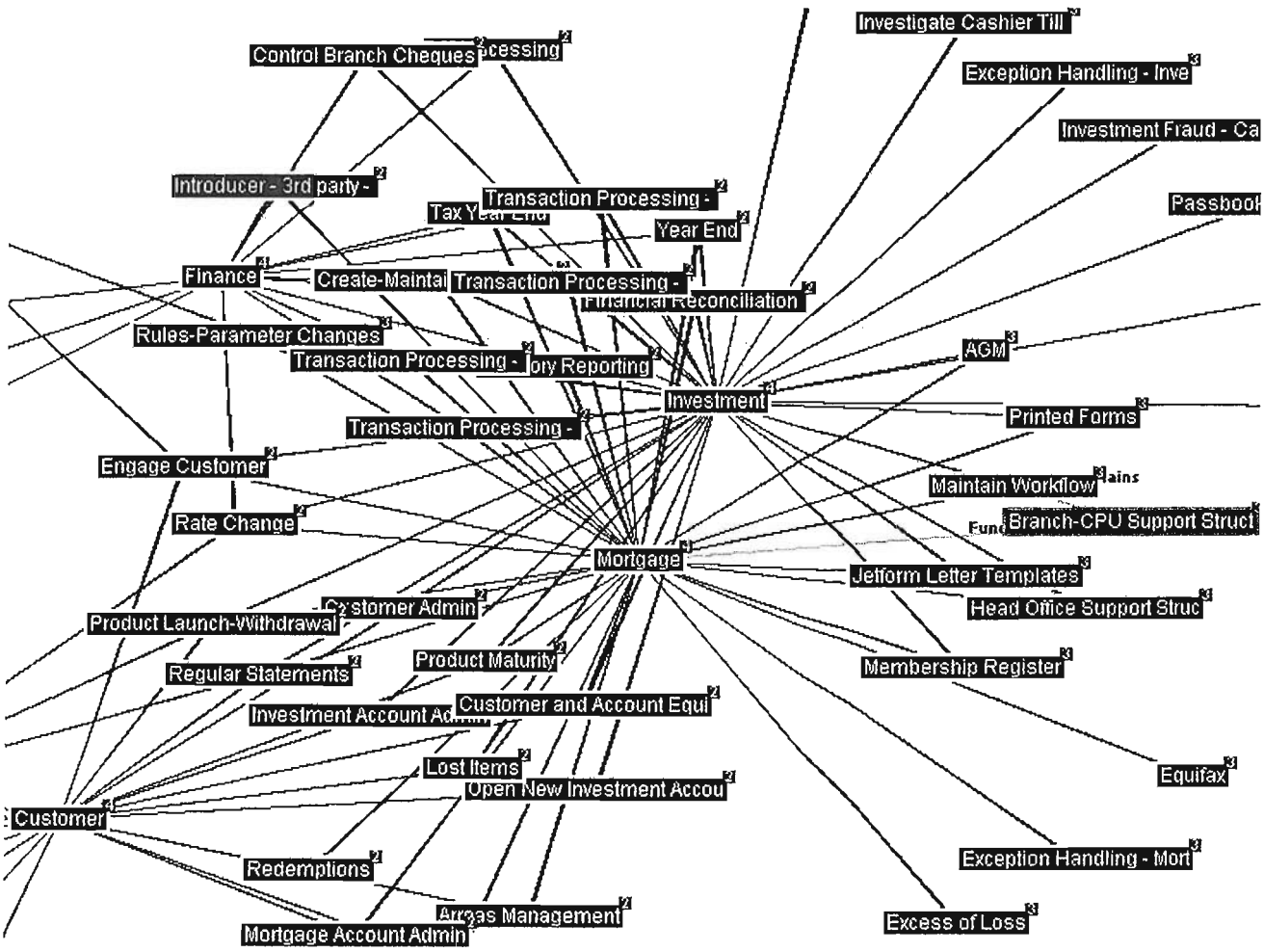
[54] Thinking in terms of restrictive conditions is epistemologically useful (Bateson 1988).

example, they might measure functionality or some output delivered, which shifts it back to function-based approach.

Whilst both Stochastic Apparatus and Operant Conditioning are only initially applied in the thesis, they helped formulating the ideas of Getting control over probability – Getting Things Done, Power as special communication: strongly probable consequences, purposeful mistakes, sequences and multi-level depth, Results-driven incrementalism for (political) IS implementation and Reconciliation of innovative variation: (emotional) balancing between continuity and radical change in the research model of Precision for Power presented in Chapter 1.

Appendix 4. Interdependence analysis with Protégé software: ontology structure and a snapshot from dynamic browsing business processes





Appendix 5. Interdependence as predictor of priority (ANOVA)

The simple model below presents multiple linear regression with digital categorical variables (High/Low). The model represents *priority of business process implementation as a function of user interaction, impact-risk, and number of stakeholders* defined for each business process. A business process has high user interaction, when most of the employees in use that business process in most of their servicing the customer.

User interaction and perceived risk determine task priorities of business process redefinition and according change in software (interdependence observed from practice). Amount of stakeholders assigned to the business process is not correlated with priority and slightly correlated with perceived risk (perceived interdependence by management).

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23.436	3	7.812	2.276E+16	0.000
	Residual	0.00035		0.000		
	Total	23.43638				

a. Predictors: (Constant), Stakeholders, User Interaction, Impact/ Risk
b. Dependent Variable: Priority_Reverse

Coefficients(a)

Model		Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.000	0.000		1.076E+08	0.000
	User Interaction	2.000	0.000	0.783	1.982E+08	0.000
	Impact/ Risk	1.000	0.000	0.643	1.606E+08	0.000
	Stakeholders	0.000	0.000	0.000	5.630E-09	1.000

a. Dependent Variable: Priority_Reverse

Correlations

		Priority_Reverse	User Interaction	Impact/ Risk	Stakeholders
Pearson Correlation	Priority_Reverse	1.000	0.766	0.623	-0.004
	User Interaction	0.766	1.000	-0.026	-0.243
	Impact/ Risk	0.623	-0.026	1.000	0.291
	Stakeholders	-0.004	-0.243	0.291	1.000
Sig. (1-tailed)	Priority_Reverse	.	0.000	0.000	0.491
	User Interaction	0.000	.	0.437	0.068
	Impact/ Risk	0.000	0.437	.	0.036
	Stakeholders	0.491	0.068	0.036	.
N	[All]	39	39	39	39

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.750	1	13.750	5.253E+01	0.000
	Residual	9.68637		0.262		
	Total	23.43638				

a. Predictors: (Constant), User Interaction
b. Dependent Variable: Priority_Reverse

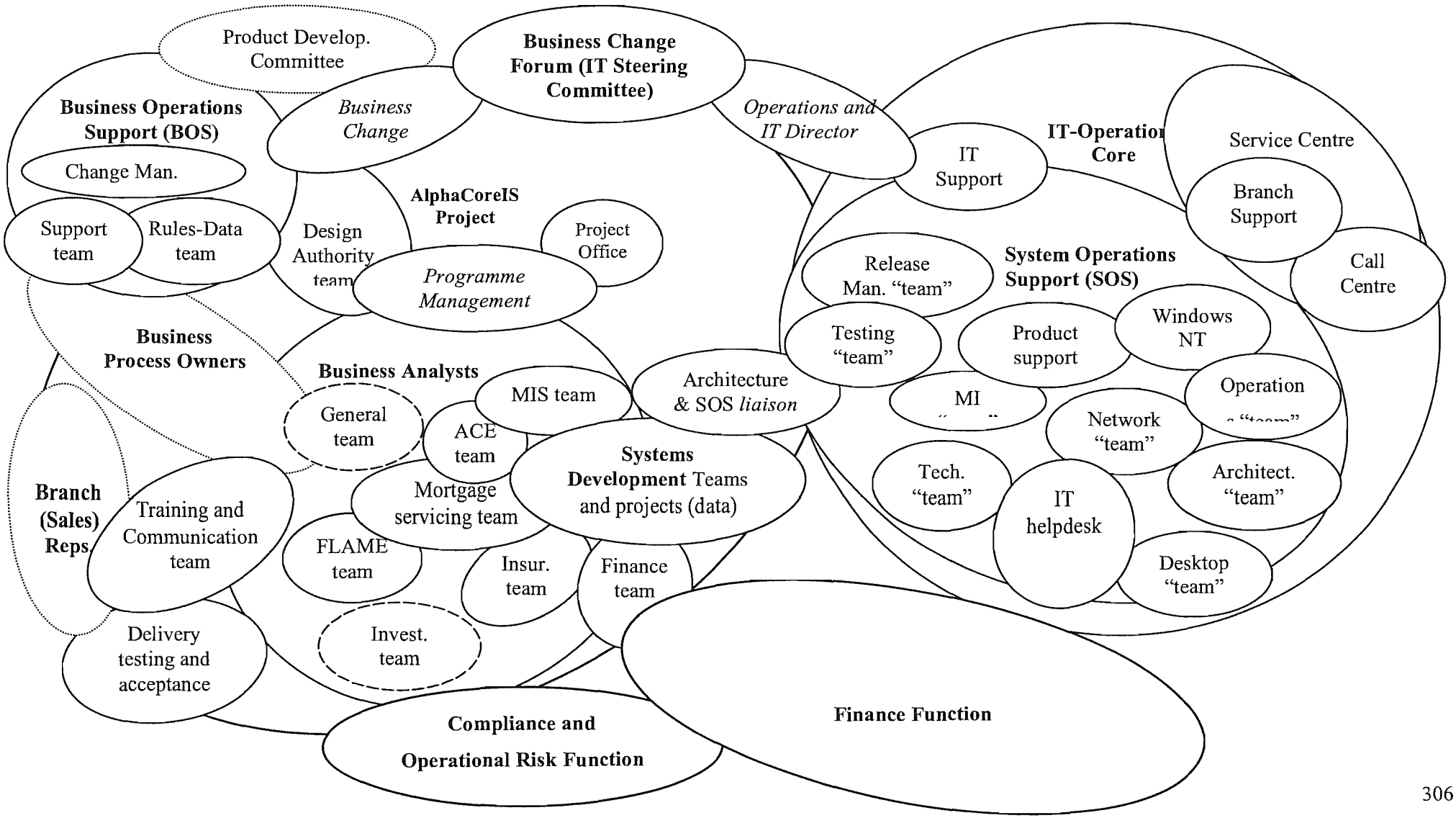
ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.087	1	9.087	2.343E+01	0.000
	Residual	14.34937		0.388		
	Total	23.43638				

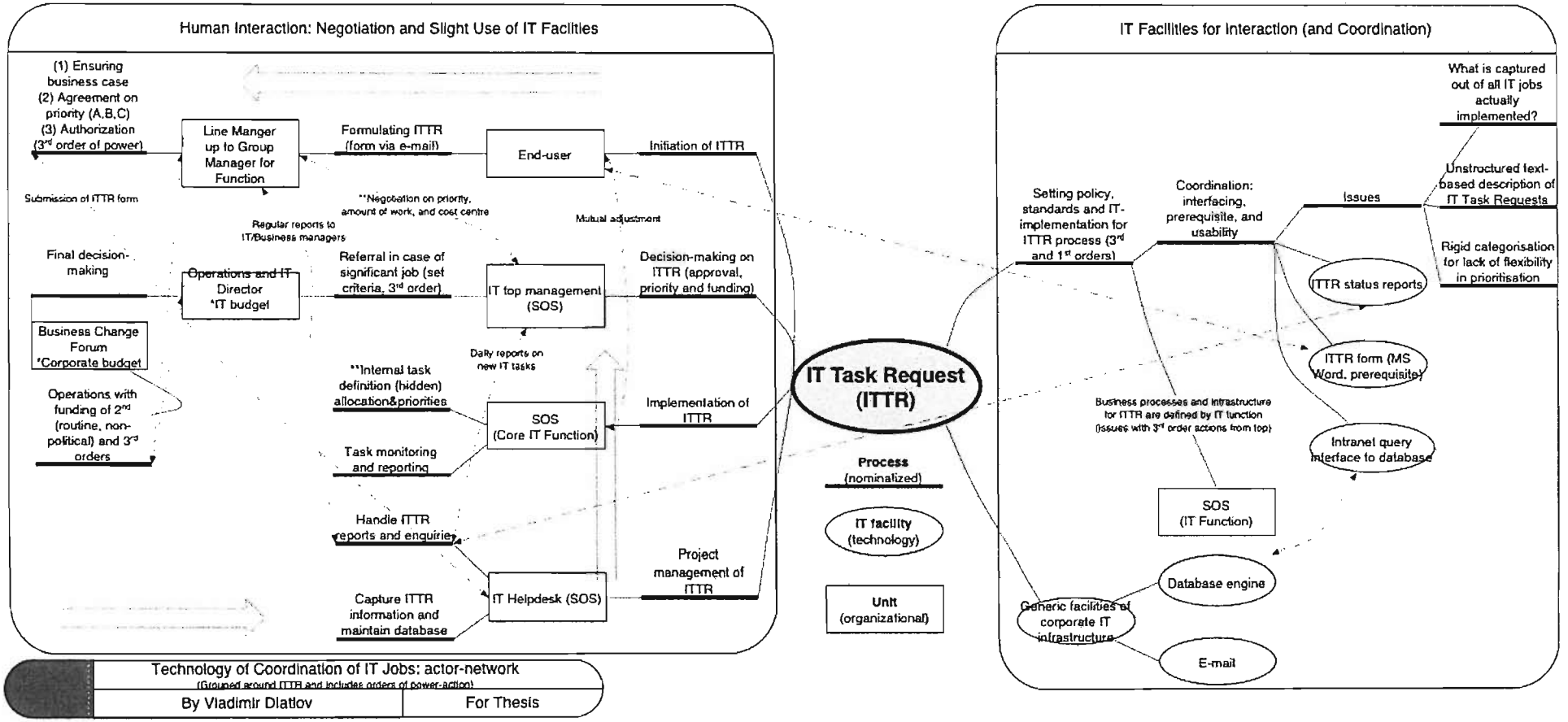
a. Predictors: (Constant), Impact/ Risk
b. Dependent Variable: Priority_Reverse

The excellent coefficient of significance and ultimately small residual deviation can be explained by the small number of business processes (N). The data and variables of analysis were defined and assigned by Alpha's project management team themselves; the regression was run on Microsoft Excel spreadsheet provided by the company.

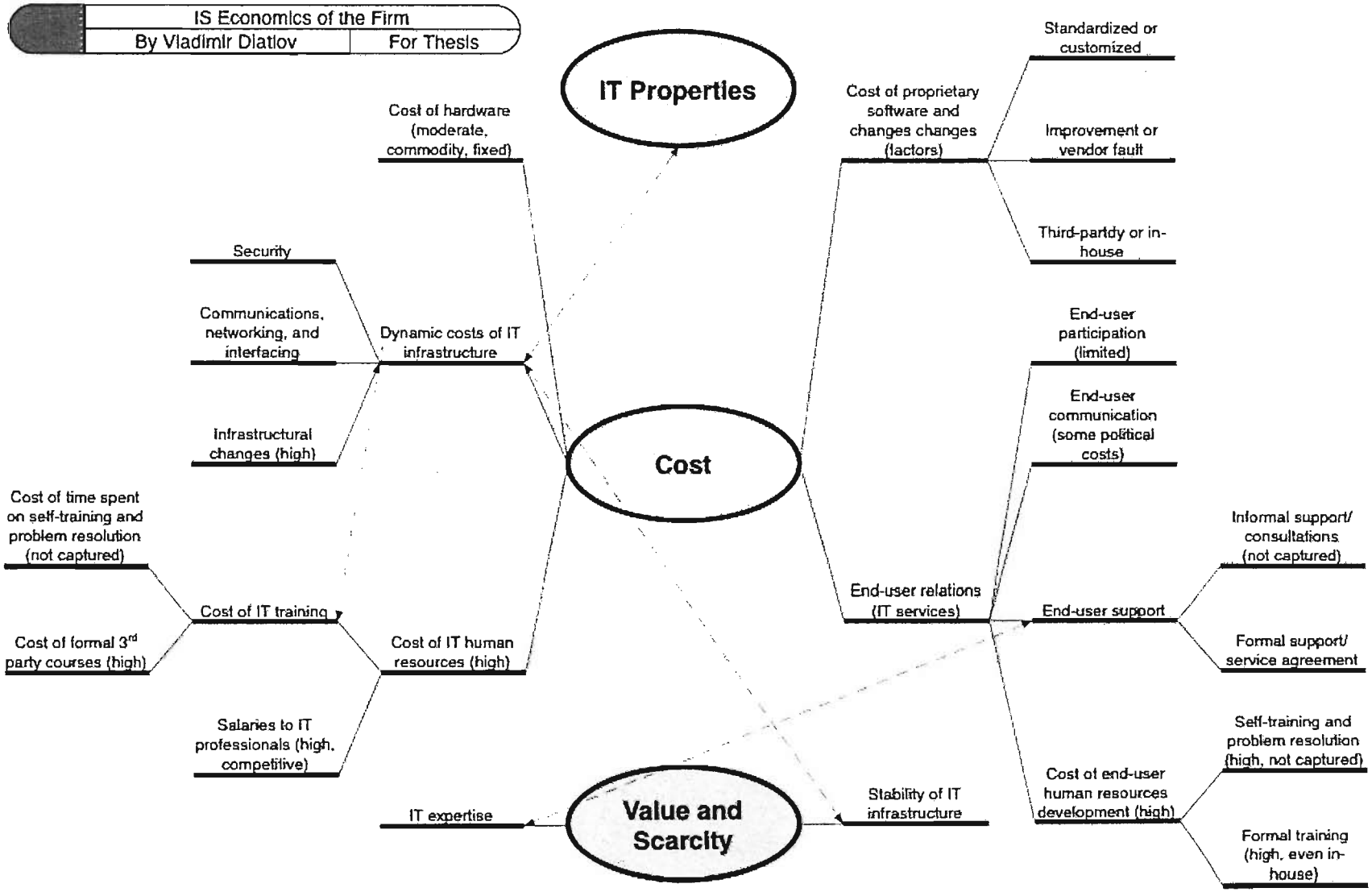
Appendix 6. Federalised IT-Operations of Alpha organisation (a clustered organigram)



Appendix 7. Technology of Coordination Case: IT task requests database and coordinating actant (an actor-network)



Appendix 8. Information systems economics of firm: an illustration with Alpha organisation (a framework)



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