

Webscience, 'social machines' and principles for re-designing theories of agency: a prolegomenon

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ABSTRACT

This paper argues that the advent of the WWW and the principles now developing for the move 'social machines' has posed serious challenges to traditional social theory. In particular, it is argued that the concept of social machines and the forms of distributed agency they imply amplify 'deep flaws' in the underlying principles of current agency theories that make empirical work using such frameworks 'undecidable'. The occasioning of social machines and the WWW here are examined for the ways in which the traditional models of agency, involving reflexivity/skill dynamics, can be dismantled and new principles for re-designed agency theory posed. One key problem and three re-design principles are identified.

Categories and Subject Descriptors

H.5.3 [Group and Organizational Models]: Theory and Models; Sociology, Social Theory, Problems of Agency

General Terms

Human Factors, Theory

Keywords

Agency, social theory, social machines, distributed agency

1. INTRODUCTION AND BACKGROUND

The evolution of the Internet has led to an urgent need for a step change in our understanding of human practices and their engagement with and through the World Wide Web (WWW). The key word here is 'engagement'. Until the advent of the WWW social theory has had a tendency to view the relationship between technology and social life either in broadly structural or agential terms. The tendency of structural approaches is to develop models of causative or correlative effects arising from the interplay between organizations of human actors and their technologies. The tendency of agential approaches is to consign productive practices analytically to human actors and object-passivity to machines. These tendencies are inherent in the 'DNA' of social theory itself. It is such a powerful inheritance that

most theoretical frameworks, and empirical studies based on them, generally produce an account that hovers at some point along a continuum between social determinism and technological determinism.

According to Rose et al (2005) very influential frameworks that have tried to eschew social theoretical divisions between structure and agency, such as Giddens' (1984) Structuration theory and Latour's (2005) actor network theory (ANT), have failed to convince, especially in empirical investigations, that analysis can move beyond a social-technological determinist continuum. This is the case despite ANT aiming specifically for a 'flat' theory

where the object of investigation is a distributed 'assemblage' of objects and actants. Agency is properly ascribed to the assemblage, rather than divisible human actors within it. This is an attractive framework for Webscience given a notional view of it. Giddens also had attempted to dissolve structure into an account of practices as undertaken by human actors whose relationship to technology is as to types of action-dependent 'resources'. Technologies here can include machines as well as the technology of writing (see Giddens, 1981). Human engagement with these 'technologies-as-resources' is viewed in structuration theory as a kind of Piagetian (Piaget, 1970) accommodation-assimilation process. From Piaget's theories of child development Giddens (1984) speculated that the manner in which human practices both shape and are shaped by the non-human material that surrounds it, provided an archetype for practice conceived as a *duality of structure*. The latter is Giddens' version of social theoretical 'flatness'. The duality of structure hypothesis enables us to create a framework for understanding human-technology engagement as a process of the mutual elaboration and structuring of human actors and their technological environment. At first sight this too is attractive as a social theoretical account for Webscience as it might provide a sophisticated response to the challenges posed by Hendler and Berners-Lee (2009) in their vision of WWW-based 'interacting social machines'. In this vision the development of the WWW is posed as a challenge to the Artificial Intelligence (AI) community as we move from the Semantic Web to the more human-machine 'interweaved' arrangement of Social Machines. Developing 'social machines' along the AI model has clear parallels with the structuration theory framework. The shaping and re-shaping of social machines through AI methodologies, we are tempted to think, is precisely parallel to Piaget's (accommodation-assimilation) vision of human transformational capacity combined with human transformability in the context of external objects. Objects are re-patterned by the practices that operate on them; in the AI context the pattern is specifically an interactive program. We can also find changes in human actors who adapt to changing external patterns and arrangements of objects. Exactly the same

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principles apply to machine behaviours, and we have seen machines learning to act in real-time through the use of dynamic programming (e.g. Barto et al, 1995). What is troubling about developing theory in this way is that there is nothing in such frameworks that: (i) enables us to distinguish AI or WWW as objects from any other type of object or technology; (ii) we are required to develop accounts of human-intelligent systems' processes based on categories of agency developed in relation to pre-intelligent systems; and, (iii) we leave ourselves without a social theoretical register for understanding how fundamentally new systems correlate with social change.

The contention here is that while social theories, for sociological purposes, are routinely heavily challenged by the empirical contexts to which they are applied, the application of social theories to the WWW show up deeper flaws. That is to say, sociological research challenges aspects of theory, but with the advent of the WWW we are seeing problems in its *underlying principles*. The WWW, because it amplifies profound gaps in theory requires us to radically re-think the fundamentals of theory, particularly those connected with the concept of agency. The task of this paper is to briefly posit the nature of the issues and identify one fundamental principle of social theory that requires redesign in the light of WWW developments. The following section elaborates further on the character of the problem.

2. SOCIAL MACHINES' CHALLENGE TO SOCIAL THEORY

2.1 The Problem of Undecidability

Computer scientists and mathematicians working on Turing's problems are long familiar with the problem of undecidability, where it is not possible to construct a single algorithm, given a defined complexity, to admit of a yes/no solution. In social theory a similar problem now arises. The kinds of analytical complexity given us by the social-WWW nexus seem to be of a qualitatively different kind of 'order' than previous social-technology complexes (cf. Gane, 2004). Attempts to make comparisons between pre- and post-new technologies using current social theories leave interpretations of data undecided (Vass, 2008; 2012) as to the impact of technology on social issues. This has less to do with problems connected with how social theories provide analytical frameworks mappable to methodological categories than it has to do with the fundamental definition of agency and how we define the 'unit of action' in social theory. This has been a long term issue in sociology since Parsons (1949) attempted to solve the problem of definition of 'the act' in his seminal work *The Structure of Social Action*. Recent adaptations of his ideas for life in the twenty-first century (e.g. Fox et al, 2005) hardly mention the impact of new technologies because the latter is not seen as challenging the fundamental premises of definition. In recent sociological work such as that of Urry (2000, 2007), attempts are made to construct Web and technology friendly concepts of information and activity 'flows'. Such concepts appear to offer the basis of a social theoretical narrative that can accommodate the necessarily 'distributed' character of agency under conditions given us by the WWW (cf. Malsch, 2001, Vass, 2012). The concept of 'flow' is rooted in Parsons' original schema and is called 'flow' by way of marking how far social change has impacted on the contexts of human activity since 'more stable' periods in modernity. In other words, the concept of flow and how human activities, resources, communication systems, forms of mobility etc. can be described

by it refer to the same definitions of action established by Parsons. If this were not the case it would be very difficult to define exactly 'what' flows'. Ironically, recent Parsonian critical work (e.g. Bortolini, 2007) argues that when Parsons first conceived of definitions of agency and 'the act' as a unit of analysis he was already thinking of action as a kind of flow to which the new category could be applied. The consequence of all this for theories that adopt Urry's line is that when examining any human-social-technical complex it is not possible to analytically demonstrate the impact of a technology as implying any kind of qualitative social change. Similarly, there is no way of being able to distinguish qualitatively between any type of technology or object that comes into the purview of the human agent be it a hammer, a crossbow, a hair-dryer or an AI-driven aircraft flight control system. Urry's analyses of the impact of new technologies and the way in which agency is said to be modified within the 'new' complexes they form, I suggest, are entirely 'undecidable'. Clearly, being able to make distinctions between such objects and their role in broader complexes is key to responding to the Webscience agenda of Social Machines such as understanding: 'what forces govern the birth, evolution and demise of social machines?' and 'Can the operation, function and output of social machines be described or identified in terms of a finite set of "social primitives" comprised of both computational and social functions?' (WWW2013).

2.2 The Source of the Problem

The theoretical challenges posed by the advent of social machines as stated above impact centrally on social theories of agency just as the challenge to AI posed by Hendler and Berners-Lee (2009) targets the forms that social-machine interactions that can be imagined and developed. The problem of such 'inter-actions' is that they are *by origin* types of distributed agency. As Malsch (2001) and Rammert (2008) argue social theory must ask 'where is the action?' and conclude that we must develop understanding of distributed agency to answer this. The WWW and social machines we can anticipate create a qualitative step change in the basis of agency itself since, as I suggest, systems are now produced which are by origin distributed. Potentially this represents a paradigm shift in the development of the cybernetic imagination which should inaugurate a new framework for understanding agency (cf. Webber and Vass, 2010).

The old framework that leads to undecidability with regard to agency and change is predicated on the manner in which AI, cognitive science and social theory formalize an entirely notional analysis of action based on a polarity between, what are always taken to be, two kinds of sub-actions. These sub-actions are characterized slightly differently in different disciplines: cognition-automation (Pask, 1961); reflexivity-skill (Giddens, 1984); schemata-habit repertoire (Bourdieu, 1990). My own term for each of these polarities adapted for social theoretical purposes is Hermeneutic-Embodied (H-E). In practice, our definition of the act as a unit of analysis, our understanding of the 'order' produced by acts, and our means of investigating the perceived produced order of events has been dependent always on distinguishing the hermeneutic (problem-solving, thought-requiring) events from the automated, routinized or skilled aspects of events. This polarity has survived through social theory since before Parsons. The problem is its deployment cannot tell us anything about the difference between distributed and undistributed agency. If we take the example of a distributed complex such as flying an Airbus to Tenerife (Rammert, 2008) we can identify and plot on a map the distribution of hermeneutical

events within systems' AI programs, human actors problem-solving in various geographically dispersed locations, together with automated elements from bureaucratic procedures in air traffic control through to on board electronic controls of fuel delivery to the aircraft's engines. However, there is nothing we can say in our description of the 'order' and 'sequencing' produced by this that allows us to create any benchmarks for distinguishing this order from one created by ostensibly *undistributed* events.

This limitation, I suggest below, is derivable entirely from the limitations inherent in the H-E model itself.

3. PROLEGOMENON FOR THE RE-DESIGN OF SOCIAL THEORIES OF AGENCY

From the identification of the problem in section 2 we may now proceed to identify how the standard principle underlying the relationship of agency to social orders may begin to be dismantled in the light of the manner in which the WWW forces us to re-imagine agency. The following three points provide a prolegomenon to supersede the limitations identified above and provide revised principles of theory design for distributed agency.

Firstly, within the H-E framework the definition of complexity is already defined by what are categorized as hermeneutic and what embodied moments of interactions. So two co-located actors where one is giving the other verbal instructions in how to tie shoe-laces is a non-complex undistributed event. Whereas geographically separated musicians collaborating in real time and editing music online via the WWW suggests complexity and distributed agency. Interestingly the situation of learning to tie shoe-laces is practically the more difficult task than organizing and performing a jam on the Web. What H-E based models are not capable of grasping is the relation *between H and E*, reflexivity and skill etc.. It is always assumed in social theoretical models that H somehow articulates E and produces order: that ideologies, cognitive events structure routine while the latter provides material for cognition to adapt to.

Secondly, when engaged with different kinds of empirical contexts we can identify qualitatively different kinds and levels of H and E than available in the Parsonian-inflected models social theory habitually uses. For example, Kristeva (1981) has distinguished between levels and types of embodied/routinized activity; and Billig (2005) identifies qualitatively different aspects of socially produced styles of cognition and reflexivity. We must imagine that in a world of distributed-agentic events there is more to examine in terms of what exactly is distributed than simple H-E models allow.

Thirdly, if we 'split the H-E atom' and identify more sub-atomic features of social-technological complexes than hitherto imagined we are in a better position to understand what kinds of *strategies of coherence* are available to constitute and elaborate the constellation of events and objects that make up any complex. I suggest that an analysis of *sub-H-E* features of interaction would

give us a grasp of how social change takes place through alterations to the more definable strategies of coherence that are applied to events by human and technological agents.

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