UNIVERSITY OF SOUTHAMPTON

FACULTY OF PHYSICAL SCIENCES AND ENGINEERING

School of Electronics and Computer Science

Enterprise Mobility and Social Media Analytics as Leverage for Corporate Knowledge Management

by

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A Thesis submitted in partial fulfilment of the requirements
for the Award of a PhD Degree

February 2018

UNIVERSITY OF SOUTHAMPTON

ABSTRACT

FACULTY OF PHYSICAL SCIENCES AND ENGINEERING
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Doctor of Philosophy

ENTERPRISE MOBILITY AND SOCIAL MEDIA ANALYTICS AS LEVERAGE FOR CORPORATE KNOWLEDGE MANAGEMENT

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Research has shown that Knowledge Management (KM), as a field of practice and study, gained momentum from the rise of the World Wide Web (Web) in the 1990s. With the extant growth of the Web into a full scale social space and the emergence of Social Media (SM) platforms like Twitter, the hierarchical boundaries within the organisation are broken down and a lateral flow of information is created. As socio-technical platforms, social media are regarded as social machines that are co-constituted by humans and technology to facilitate the social processes of knowledge sharing. These processes are enabled by the ordinary social interaction and communication flow that exists within a corporate organisation. In recent years, these social interactions have been phenomenally facilitated by the increased use of social media (SM) as well as the consumerisation and adoption of mobile devices within the workplace. Apart from the exponential increase in the amount of potentially insightful data being generated, this trend has created some tension between KM and SM in which SM is perceived as a new trend that threatens the sustainability of KM as a viable field of practice. There is a division between scholars who question the value of KM within the current socio-technical trends, given that KM has previously suffered an image problem in the past, and those who argue for these new socio-technical trends as an extension of knowledge management. To address this dilemma, this work presents ***EMSoD*** — A Framework for repositioning KM within the current socio-technical trends of ***E****nterprise* ***M****obility and* ***So****cial (media)* ***D****ata*. The framework highlights the cyclical interaction between the process of tacit to explicit knowledge conversion, knowledge discovery from either – or a combination of – public social media data and data from corporate social media within a managed platform. At the core of this framework is KM value to organisations, for which a measurement mechanism is also devised in this thesis. Also presented in this thesis is a granular study of the impact of enterprise mobility on employee engagement as a function of their usage satisfaction from mobile devices and social applications.

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Declaration of Authorship

I, Christopher Adetunji, declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research on:

Enterprise Mobility and Social Media Analytic as Leverage for Corporate Knowledge Management

I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University;
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- Where I have consulted the published work of others, this is always clearly attributed;
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- Parts of this work have been published as:

  — Adetunji, C. and Carr, L. (2016). Knowledge Discovery from Social Media Data: A Case of Public Twitter Data for SMEs. In: 8th International Conference on Information, Process and Knowledge Management (eKnow), (c), 2016, Venice: IARIA XPS Press, p.119125.

  — Adetunji, C. and Carr, L. (2017). EMSoD A Conceptual Social Framework that Delivers KM Values to Corporate Organizations. International Journal on Advances in Software, 9 (3&4), p.303 - 321.

Signed: _____

Date: _____

Acknowledgements

I give glory to God almighty, in whom I live, I move and have my being; and, without whose grace, provision and sustenance, I wouldn't have been able to complete this PhD research project.

Although, it's been an arduous journey, the experience has been altogether worthwhile. In retrospect, I wouldn't have been able to commence on the journey at all, had Drs Lisa Harris and Thanassis Tiropanis not considered and recommended my application. Prof Leslie Carr, an erudite scholar of impeccable credentials who, throughout what I call my *apprenticeship*, rigorously drilled out the best in me, and for whose insightful supervision and support this project has not remained a pipe dream, I am forever grateful. Dr Gary Wills, following my upgrade viva, meticulously provided me with very meaningful expert feedback by which I was guided on to the *motorway* of speedy completion. I thank you sincerely for your incredibly exceptional manner of addressing, motivating and believing in me and my work.

A numerous number of academic, research, and administrative staff within the Web and Internet Science (WAIS) lab have been tremendously helpful directly and/or indirectly. These include all my survey participants and especially Brigitte Mayne-Reed, who helped in recruiting them. I must thank Drs Yvonne Howard, Simon Hettrick, Charlie Hargood, Ramine Tinati, Steven Crouch, Rikki Prince and Priyanka Singh. Also, Dr. Tope Omitola, Adriana Wilde, John Robinson, Christopher Gutteridge, Nicola Need, Ola Oluwasuji, Jane Morgan, Claire Wyatt, and a host of others, too numerous to mention. I cannot but mention Gunawan Budiprasetyo, with whom I shared an office space, with whom I've regularly burnt the midnight oil, and with whom I've sometimes *visited* Indonesia without having to leave the office. Also of notable mention are some external resource persons like Ms Laura Spooner, whose professional advice helped during my survey design, and Mr Henrik Holgerson, who facilitated access to the case study organisation used in this research.

To my very own jewel of inestimable value who granted me the *sabbatical* away from home whilst shouldering the upkeep and other responsibilities at home, thank you so very much, Bukola, for your relentless support and for being such a wonderful woman of valour. And, my two lovely angels of the BP Crew — Jesse and Michelle — ♫ *How can we not* ♪ *talk about family* ♩ *when family's* ♪ *all that we got?* ♫, thank you for rocking my world! Now, we *gat* to get *doin* our *thang* again...

for
Toluwani & Ogooluwa

Chapter 1

Introduction

The consumerisation of mobile devices has driven the popularity of social media and created a class of personalised Web-based information applications. This has impacted the strictly-controlled world of corporate IT services, creating an agenda of Enterprise Mobility that is implemented by employee-owned devices adapted for company use and/or company-owned devices that support personal use. Consequently, an enormous amount of rapid and varied data is being produced by social applications embedded in the workplace, potentially available for organisations insights, using techniques of Big Data Analytics (Zikopoulos *et al.*, 2012; Lamont, 2012), largely because Web social networks like Twitter and Facebook have made social networks tangible sources of realistic big data (Cuzzocrea, 2014). These trends and concepts can be understood by the study of Social Machines as a unified model for social/computing processes (Burégio *et al.*, 2013). Essentially, Social Machines are abstract systems in which humans do the creative work and machines do the [computational] administration (Berners-Lee and Fischetti, 2000). Based on this premise, Shadbolt (2013) presents a vision of the Social Machine as Knowledge Acquisition systems. This research is therefore focused on how to exploit the socio-technical convergence of Enterprise Mobility and Social Data Analytics for knowledge capture and sharing, with the aim of developing a model knowledge social machine that helps Knowledge Management (KM) deliver value to corporate organisations.

KM within organisations has traditionally been through a top-down, process approach (Ford and Mason, 2013a, 7); (Turban *et al.*, 2011b) which precludes employees from collaborating and/or participating in the process of generating and sharing valuable knowledge that is relevant for the organisations competitive advantage. In making KM a part of everyone's job (Davenport and Prusak, 1998, 107), the top-down approach to KM is being broken down by current and emerging Web technologies like microblogs (e.g., Twitter), social media/networking (e.g. YouTube/Facebook), and multimedia chat platforms (e.g. Skype) (Razmerita *et al.*, 2014). These are pervasive technologies, and are most profound in their capabilities to, in the words of Mark Weiser of Xerox Lab

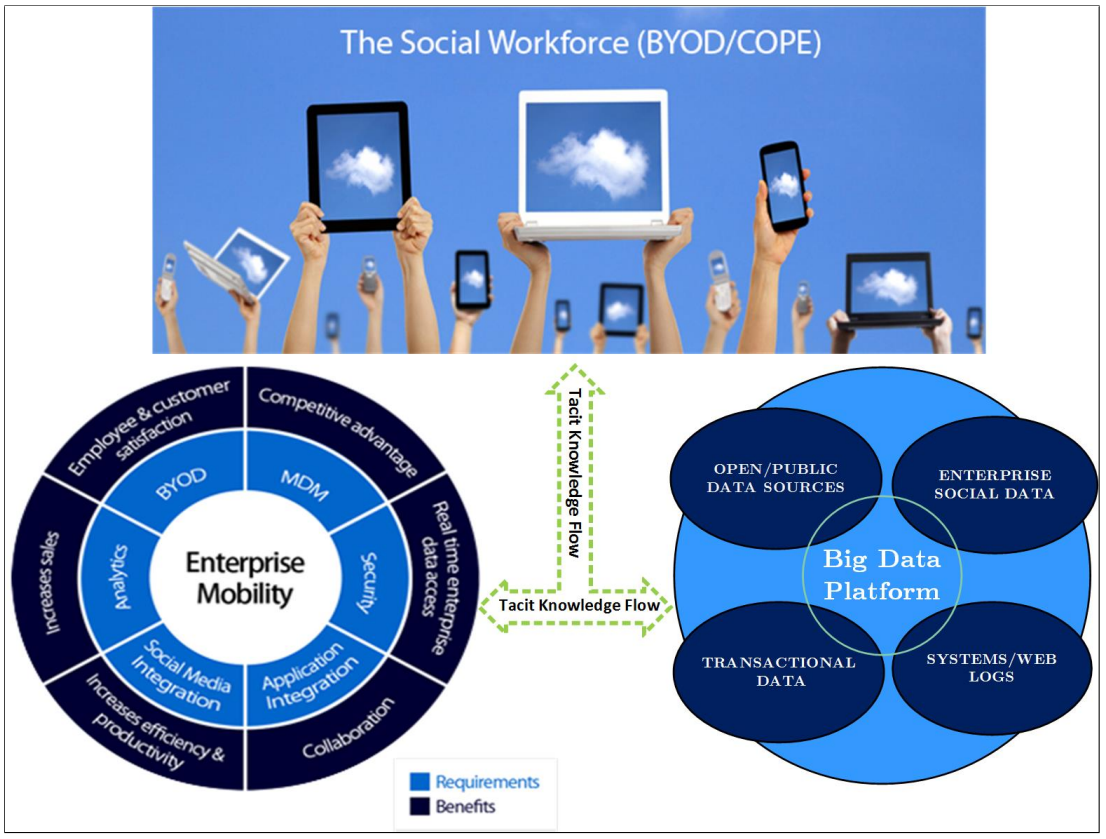

FIGURE 1.1: Tacit Knowledge Flow (Adapted from Google Images)

(Sorensen, 2011), weave themselves into the fabrics of everyday life until they are indistinguishable from it, thanks to the ubiquity (and consumerisation) of mobile devices like tablets and smart phones. In recent times, these devices have woven themselves around us in so much so that employees are impulsively using them to keep in touch with friends and families even while at work. Many organisations have therefore, already subscribed to the theory and practice of enterprise mobility on the grounds that, allowing employees to access corporate systems and data over these devices — a policy known as Bring Your Own Devices (BYOD) — enhances productivity while also helping to maintain work and life balances (Sørensen *et al.*, 2008). It also enhances knowledge sharing within the organization in its capacity for fostering discussions over documents and thereby enabling organisations to build social environment or communities of practice necessary for facilitating the sharing of tacit knowledge (Davenport and Prusak, 1998; Zikopoulos *et al.*, 2012, p.26).

Tacit knowledge is usually in the domain of subjective, cognitive and experiential learning; it is highly personal and difficult to formalise (Turban *et al.*, 2011a, p.478), which is why Polanyi (2009) classifies tacit knowledge as one class of knowledge for which we cannot tell as much as we know. How then do we capture and/or engineer this tacit knowledge being inadvertently generated by employees in the enterprise mobility and social media space? This research attempts answering this question from a big social

data perspective, drawing insights from the literature, and, using a conceptual social framework - ***EMSoD***. Moreover, a vision of a knowledge social machine is encapsulated in this framework, which leverages the flow of tacit knowledge on existing social interactions within the boundary of the organisation as defined by its enterprise mobility strategies. This social machine has the organisations workforce as its user base, using their own devices (BYOD) or using the company-owned devices that have been personally enabled for them (COPE). The social machine produces company-relevant insights and knowledge as output, taking its input from a combination of internal data (enterprise social media, transactional data, system/web logs, etc.) and open/public data, together with the active participation of the employees, in the process of knowledge management. This vision is illustrated in Figure 1.1 and elaborated upon in the conceptual framework presented in Chapter 4

Also, to gain a better insight into the organisation's knowledge, this work explores exploitation of the collective intelligence of the organisation within the spectra of enterprise mobility and enterprise social network for organisational insights.

1.1 Research Motivation and Problem Space

The traditional top-down approach to KM mentioned in the introduction above has also resulted in KM becoming a lacklustre concept, considering the perceived lack of maturity and the general state of apathy in the field, as evidenced in a recent Knowledge Management Observatory survey referenced by Griffiths and Moon (2011) and the 2015 follow up of same report (Griffiths *et al.*, 2015). This research attempts to explore how these innovative technological trends of mobility and social media analytics can be exploited for rejuvenating the concept and practice of KM (Delic and Riley, 2009).

There is hardly any sector in which organisations have not embarked on a Knowledge Management programme or project to improve on their organisation practice; research has shown that knowledge-oriented management has a significant influence on performance, in spite of the image problem suffered by KM due to its overselling by vendors and consultants in the 1990s (Bolisani and Handzic, 2015).

To shake off this image problem and to douse the perceived tension between KM and social media by which some scholars question the continued relevance of KM in spite of a persistent social media ascendancy (Ford and Mason, 2013b), participants in a recent massive survey into the future of KM by the Global Knowledge Research Network (GKRN - Network of Researchers sharing an interest in undertaking joint research on knowledge management) published in Bolisani and Handzic (2015), regard social software as an advancement of the KM field. The research suggestion in this regard, places clear emphasis on the economic, organisational and human context factors related to

the use and implementation of this new social software technologies. This organisational and human context factor is what culminated in the concept of Enterprise Social Networking, also referred to as Enterprise 2.0 (or E2.0, for short). Although, some of the proponents of Knowledge Management were initially hostile towards the new concept of E2.0 as propagated by McAfee (2006), describing it as a new wine in an old bottle, Davenport (2008) for one, concluded in a Harvard Business Review's blog post that,

> 'If E2.0 can give KM a mid-life kicker, so much the better. If a new set of technologies can bring about a knowledge-sharing culture, more power to them. Knowledge Management was getting a little tired anyway.'

These new sets of technologies that can bring about a knowledge sharing culture has been found in social media and their social networking capabilities, as enabled and popularised by the consumerisation of mobile devices. KM can therefore, be repositioned within these innovative technological trends of enterprise mobility and social media analytics, which can be exploited for rejuvenating the concept and practice of KM, in consonance with Delic and Riley (2009)'s assertion that,

> 'The field of knowledge management, having passed several hypes and disappointments, has yet another chance of reappearing in totally new technological and social circumstances.'

In essence, rather than considering Social Media as a pervasive trend that threatens the concept and practice of Knowledge Management, this study aims at finding a fusion between the two. Such fusion as brings about a knowledge sharing culture and thereby help in rejuvenating the concept and practice of Knowledge Management altogether.

The overarching issue recognised in the GKRN research mentioned above is the challenge for KM in being able to deliver measurable value for businesses. The conceptual social framework (see Section 4.3) presented in this research places the value proposition of KM at the centre of organisational knowledge management processes. To the best of this researcher's knowledge, this is the first framework of its kind that seeks to use the convergence of enterprise mobility and social (media) data as leverage for corporate knowledge management in such a way that corporate organisations can derive KM value from the synergy. Also, this framework not only helps in delivering KM value to corporate organisations, it also serves to answer the research question of an appropriate framework for such a task, as posed in the Extended Research Question (ERQ 1) in Section 1.2.1. Meanwhile, this framework has not been arrived at on the fly. The core elements of the framework have emanated from a rigorous review of relevant literature, the process of which is described in Section 4.2.

1.2 Research Question

Based on the research motivation and a thematic review of literature that cuts across Chapter 2 and the Conceptual Framework proposed in Chapter 4, some key points emerge: That KM, which gained momentum through the rise of the Web in the 1990s, has now grown to a full-blown social space, as powered by social media platforms like Twitter. Social media has broken down the hierarchical boundaries within the corporate organisation, creating a lateral flow of information. This facilitates knowledge sharing, which is underpinned by the ordinary social interaction within the organisation, enabled by the consumerisation of mobile devices and applications.

This trend has resulted in an exponential increase in the volume of varied data and the speed at which they are generated. This data is potentially rich in insightful knowledge for the competitive advantage of corporate organisations. Also, this trend has created a perceived tension between KM & social media (SM) in which SM is seen as threatening the continued relevance of KM as a management function. The debate is polarised between scholars who question the continued relevance of KM within the current socio-technical trends on one hand, and those who see SM as an extension of KM. However, no proposed modalities for integrating SM as an extension of KM. Also, KM still suffers from the image problem of the past in which it is criticised for a want of measurable value.

This research therefore, sets out to answer an overarching formative question of how social media platforms like Twitter can deliver measurable value to corporate organisation:

> "How Can Social Media Platforms like Twitter Deliver Knowledge Management Value to Corporate Organisations?"

1.2.1 Extended Research Question (ERQ)

In an attempt to discover the best approach at deriving KM value from the convergence of KM and SM, the overarching research question is extended to finding an appropriate framework that helps in re-positioning KM within the current trend of enterprise mobility and social media in such a way that corporate organisations derive value from the synergy(*ERQ* 1). Secondly, the National Audits Office, which is the office from which Government's expenditures are held accountable to Parliament, defines *Value for Money* as the optimal use of resources to achieve an intended outcome. So, what intended outcomes from an investment in social media-oriented initiative can KM value be measured by? (*ERQ* 2). The research question is also extended to cover how social media — as resources, coupled with the mobile social applications and devices that power them — serve as leverage to achieve the intended outcomes (*ERQ* 3).

Basically, the Extended Research Question is stated as follows:

ERQ 1. What is an appropriate social framework for delivering KM values?

ERQ 2. What are the intended outcomes from social media by which KM values can be measured?

ERQ 3. What are the impacts of mobile devices and social applications on employee engagement?

1.3 Research Aims and Objectives

This research is mainly aimed at studying the convergence of enterprise mobility and social media trends with a view to exploring how enterprise mobility and social media trends can be exploited for knowledge management value that enhances the competitive advantage of corporate organisations.

In achieving this aim, the research proceeds on the basis of the following specific objectives:

1. To analyse prevalent themes in KM literature in order to develop an appropriate framework for deriving KM value from social media
2. To conduct a primary empirical inquiry that investigates the potential discovery from social media data, of insightful domain knowledge that propels an organisation's competitive advantage.
3. To establish the parameters and the mechanism for measuring KM value derived from the framework.
4. To collect and analyse primary data through survey for gaining a general overview on the impact of mobile devices and mobile (social) applications on employee engagement.
5. To make recommendations that potentially empowers corporate organisations and Knowledge Management practitioners on the systematic utilisation of findings from this research for the derivation of KM value and enhancement of competitive advantage.

1.4 Research Contribution/Publications

In redressing the image problem faced by Knowledge Management (KM) and its criticism for a lack of measurable value, this research has delivered ***EMSoD*** — ***E****nterprise*

***M**obility and **So**cial **D**ata* — as an appropriate conceptual social framework for delivering KM value to corporate organisations. KM value is measured in terms of the *actionable knowledge* discoverable from an abundance of social media data available to an organisation, as well as the level of *employee engagement* facilitated by social applications and the mobile devices that power them.

Meanwhile, the significance of this research is not only in its delivery of the ***EMSoD*** social framework for delivering KM value but also in the devising of a measurement mechanism by which both parameters of KM value — *actionable knowledge* and *employee engagement* — can be measured. To the best of this researcher's knowledge, this is the first attempt at devising a measurement mechanism for KM value, and one that satisfies both academic and business concerns, given that businesses are increasingly being faced with a need to justify KM investments in terms of normalised quantitative measures while developing a case for returns on such investments.

Moreover, the opportunity to harness actionable knowledge and insights from social media data for the strategic competitive advantage of corporate enterprises is not being exploited by small and medium-scale enterprises (SMEs) as much as it is by larger enterprises. This is due in part, to a self imposed exclusion by SMEs themselves, as I have observed. That is, self imposed exclusion borne out of consideration for cost and the question of relevance. This research has demonstrated, through a systematic, cost-effective approach to knowledge discovery from social media data, how any enterprise of any size — even the small and the medium scaled ones — can exploit social media data for its strategic competitive advantage, and this is regardless if its presence or participation on social media.

Meanwhile, in relation to the above, the research contribution includes the publications outlined in Section 1.4.1

1.4.1 Research Publications

1.4.1.1 Journal Article

Adetunji and Carr (2016a). EMSoD — A conceptual social framework that delivers KM values to corporate organisations, Int. J. Adv. Softw., vol. 9, no. 3&4, pp. 304–322, Dec. 2016.

Abstract — As social software is becoming increasingly disruptive to organisational structures and processes, Knowledge Management (KM) initiatives that have hitherto taken the form of a 'knowledge repository' now need redefining. With the emergence of Social Media (SM) platforms like Twitter, the hierarchical boundaries within the organisation are broken down and a lateral flow of information is created. This has created a peculiar kind of tension between KM and SM, in which one is perceived as

threatening the continued relevance of the other. Particularly, with the advances of social media and social software, KM is more in need of delivering measurable value to corporate organisations, if it is to remain relevant in the strategic planning and positioning of organisations. In view of this, this paper presents EMSoD — Enterprise Mobility and Social Data — a conceptual social framework which mediates between KM and SM to deliver actionable knowledge and employee engagement. Meanwhile, given that the main objective of this research is in the delivery of KM value to corporate organisations, this paper devises some mechanisms for measuring actionable knowledge and employee engagement, both as parameters of KM value.

1.4.1.2 Conference Paper

Adetunji and Carr (2016b). Knowledge discovery from social media data: a case of public twitter data for SMEs, in eKNOW 2016, The Eighth International Conference on Information, Process, and Knowledge Management, 2016, pp. 119125.

Abstract — Making sense of social media data is increasingly becoming a subject of concern to corporate organisations. It is therefore, no coincidence that the subject of Knowledge Identification and Discovery is currently receiving a huge attention within industry and academia. Research has shown that there is an enormous wealth of actionable knowledge to be gained from social media data for organisations strategic competitive advantage. However, this opportunity is not being harnessed by Small and Medium-sized Enterprises (SMEs) as much as it is by larger enterprises. This is due, in part, to a misconception that social media is not that relevant to SMEs as much as it is to larger corporations. This paper presents a qualitative exploratory study, which attempts to show that social media can be mined for organisational knowledge that is relevant to the strategic competitive advantage of SMEs. A case of a medium-sized enterprise, which is previously without a significant social media presence, is explored with regards to how public Twitter data is exploited to discover actionable knowledge that propels the enterprises strategic competitive advantage.

1.5 Research Theme and Structure

Themed with Sociam — the theory and practice of Social Machines (http://sociam.org) — a secondary aim of this research is to conceptualise a model knowledge social machine as a contributory effort towards the theory and practice of social machines, a ground breaking research project pioneered by leading researchers and academics at the University of Southampton and across the UK. Studying the implications of Enterprise Mobility and Social Data Analytics on KM can be understood by the study of Social Machines as a unified model for social/computing processes (Burégio *et al.*, 2013). In

chapter 2 therefore, this work presents an understanding of current knowledge-oriented Web technologies vis-a-vis the social machine paradigm (See Chapter 2.6). A comparative study of current Web technologies within the context of knowledge elicitation and sharing help in identifying gaps in the theory and practice of social machines that this research's social knowledge machine vision will fulfil. Then, the work focuses on the emerging trends of Big (Social) Data Analytics and Enterprise Mobility (COPE and BYOD) as functions of Enterprise Social Networking. The former serves as a parameter for measuring knowledge extraction while the later serves to measure knowledge sharing. This takes a cursory look at the value and impact of integrating knowledge sources (Wimmer *et al.*, 2013) while linking social, open and enterprise data (Omitola *et al.*, 2014). The aim of this review was to identify the gap that exists within the current status of Knowledge Management. This has helped in establishing a conceptual framework to resolve the research motivation and problem space described above.

The rest of the thesis develops in this fashion: The research methodology is presented in Chapters 3 while the conceptual framework — with its core elements — is presented in Chapter 4. Meanwhile, Chapter 5 is relatively bulky, not only because it contains the substance of this research work, which is its findings, but also because it enunciates the data-driven process of arriving at Knowledge Management Value (KMV) and its measurement parameters of actionable knowledge and an engaged workforce. The thesis also contains a section (Chapter 6) wholly dedicated to the analysis and findings from a survey questionnaire, which highlights the major impacts of enterprise mobility — in terms of mobile devices and mobile applications — on employee engagement and knowledge sharing. Chapter 7 summarises and concludes the thesis with some recommendations for corporate organisations as well as suggestions for future direction towards which this work could be extended. The chapter also discusses some assumptions that guide the research while acknowledging its limitations.

Chapter 2

Literature Review

This chapter provides a contextual background to this research as it explores the literature that has culminated in an understanding of *enterprise mobility, social media* and *knowledge management*. An understanding of these concepts would help in appreciating how enterprise mobility could serve as leverage for corporate knowledge management. As this research is under the auspices of the Web Science Institute of the School of Electronics and Computer Science, this chapter begins with an attempt to create an understanding of the role of the Web in the evolution and development of knowledge management as a management function.

2.1 Web Science and Knowledge Management

James Hendler, Nigel Shadbolt *et al.* (2008) and Hall *et al.* (2006) describe Web Science as an interdisciplinary field of studies concerned with the study of large-scale socio-technical systems, such as the World Wide Web. They suggest the study of the Web as distinct entity of its own, having its own protocol, infrastructure, algorithms and architectural principles, positing that this would help in understanding some of the technical and social challenges that must be overcome in order to keep the Web growing, and understand its continued social impact. Essentially, Web Science attempts to create an understanding of how the Web benefits the human race (Web Science Institute — University of Southampton).

As such, the Web was instrumental to the birth of Knowledge Management in the 1990s when consultants found that they could leverage the organisation's knowledge on Internet technologies, using the Intranet to share and connect document and information across their various sites (Koenig, 2012). Now that the Web has grown into a full scale social space, with social media being the most conspicuous face of the Web, Knowledge Management on the social Web can be understood through the theory and practice of

social machines, which is the main thrust of Web Science as a field of study (Tiropanis *et al.*, 2015).

2.2 What is Knowledge Management?

According to Koenig (2012), Davenport's (1994) definition of Knowledge Management as "the process of capturing, distributing, and effectively using knowledge", is still the widely quoted definition while, a few years later, Gartner Group (A global research and advisory company) expanded the definition as follows:

> "Knowledge management is a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all of an enterprise's information assets. These assets may include databases, documents, policies, procedures, and previously uncaptured expertise and experience in individual workers"

The above definitions purport that knowledge is always tangible in nature. This arises from the view of knowledge in terms of the distinction between *data* and *information* wherein, *data* is considered as raw facts, figures and/or symbols while *information* is the meaning derived when data is processed (Ackoff, 1999). The distinction between data, information, knowledge and wisdom is often modelled with the the wisdom hierarchy (Rowley, 2007), which highlights the progression from data to wisdom, as represented by the DIKW pyramid in Figure 2.1.

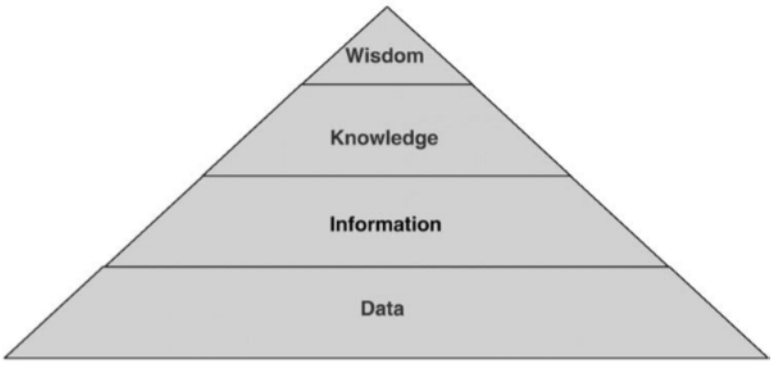

FIGURE 2.1: The DIKW Pyramid. Source: (Rowley, 2007)

The proportional significance of each element of the pyramid in (see Figure 2.1) in relation to the one below it, is captured in Ackoff's (1999) assertion that,

1. An ounce of information is worth a pound of data.
2. An ounce of knowledge is worth a pound of information.

3. An ounce of understanding is worth a pound of knowledge.

Knowledge Management is essential, not only because of the worth of *knowledge* in comparison to *information*, but also because knowledge is considered the most important resource for an organisation's competitive advantage, according to the knowledge based view (KBV) of the organisation (McIver and Wang, 2016; Vanini and Bochert, 2014; Kirsimarja and Aino, 2004).

However, there are other perspectives of KM that define it, not only in terms of its tangibility as evident in the distinction between data, information and knowledge, but also in terms of its tacit dimension. One of the definitions that encapsulate these perspectives is the one advanced by Alavi (1999):

> "A System and organisationally specified process of acquiring, organising and communicating both tacit and explicit knowledge of employees so that other employees can use it to be more effective and productive in their own work"

Alavi's (1999) definition is more all-encompassing as it recognises the tacit dimension (Polanyi, 2009) of knowledge, which makes knowledge actionable piece of information that is possessed in the minds of individuals, making it difficult to formalise and externalise. Social media helps in the spontaneous externalisation of thoughts even on the spur of the moment (Ziko-2012). This places this research in perspectives, as it explores how this social media capability can be harnessed in the realisation of the tacit to explicit knowledge conversion, which is one of the major challenges of KM. This is in consonance with McDermott's (1999) assertion that "the art of professional practice is to turn information into solution".

Tacit knowledge, as identified in Alavi's (1999) definition of KM, is not as easy as *explicit* knowledge to codify, document and circulate by way of sharing. Tacit knowledge is usually in the subjective domain of cognitive and experiential learning (Turban *et al.*, 2011a, p.478). There is necessarily a spiral interaction between the processes of socialisation, internalisation, externalisation and combination through which tacit knowledge can be rendered explicit (Nonaka and Takeuchi, 1995).

For this research, Knowledge Management's efforts are not limited to 'knowledge of employees', as this seems to be a limitation set by the Alavi's (1999) definition. KM is regarded as connoting all organisational efforts at managing and integrating all sorts of knowledge that are relevant to the organisation's prosperity. These include environmental knowledge, knowledge of competition, knowledge of customers, knowledge of products and, of course, knowledge held by employees.

2.3 The Current State of KM

In an attempt to ascertain the current state of KM, it is pertinent to profile a brief background into its evolution and development, as enabled through the advances in Web technologies.

Wiig (1997) uses Treacy and Wieserma's (1993) model to illustrate an evolutionary perspective of Knowledge Management by observing how economic focus has shifted over time: during the Industrial Revolution of the 18th/19th century and Information Revolution of the 20th century, economic focus was on operational excellence. Having presented a 20-year time-line of the evolution of Knowledge Management, Wiig (1997) posits that the 21st century marks the advent of the Knowledge Revolution where focus has now shifted towards how well knowledge and other intellectual assets are brought to bear as differentiating competitive factors for organisations. He predicts the future of KM from four perspectives, which are, (i) the extent of KM as a continuous management initiative; (ii) the scope of efforts that will be undertaken to manage knowledge; (iii) the speed of evolution of KM methods and practices; (iv) the availability and sophistication of KM tools and technological infrastructure

Gaines (2013) observes that prediction about future directions [of KM] are often incorrect. He however describes the Internet as an "essential extension of our selves, providing multimedia memory expansion, instant access to a dynamic corpus of knowledge well beyond our capabilities to assimilate and store, and instant communication with our social networks". This highlights the significance of social networks in the current state of KM even as participants in a recent massive survey into the future of KM by the Global Knowledge Research Network (GKRN) regard social software as an advancement of the KM field (Bolisani and Handzic, 2015).

Vanini and Bochert (2014) use the concept of knowledge management maturity in an attempt to determine what level of KM maturity is effective and efficient for a company. They conducted an exploratory study, which shows that the practical applicability of KM maturity models is still limited, as evidenced in their conclusion that none of the companies they surveyed could be categorised as having a high KM maturity level despite their multiple uses of KM tools. This perceived lack of maturity in the field, is evidenced in a Knowledge Management Observatory referenced in Delic and Riley (2009), which made Delic and Riley (2009) posit that the field of KM, having passed several hypes and disappointments... has yet another chance of reappearing in totally new technological and social circumstances.

As stated earlier, the 21st century marks the advent of the Knowledge Revolution, which is usually referred to as the Knowledge Economy (Powell and Snellman, 2004; Drucker, 1969). Intrinsic in this knowledge economy is a horizontal flow of knowledge, which is facilitated by the new technological and social circumstances occasioned by social

media and the technical Web infrastructure that powers them. For example, (Delic and Riley, 2009, p.50) describe the computing infrastructure which hosts the blogosphere... as a new form of 'knowledge management' which "looks like a big social agglomeration providing a kind of *collective intelligence*".

The above description of social software as a new form of knowledge management, coupled with Mcafee's (2006) and Davenport's (2008) position on the same topic, has heightened the debate and the tension (see Section 2.4) between KM and social media (Ford and Mason, 2013a; Bradley and McDonald, 2011); and the best attempt to resolve this tension yet is in the GKRN survey where participants regard social media as an advancement of Knowledge Management.

Meanwhile, how did we arrive at this current state of KM where social software is polemically entwined with KM? Succinctly, this can be attributed to the advent and growth of the World Wide Web (the Web).

The Web has played a pivotal role in shaping the current state of KM. Carr *et al.* (2010) chronicles the evolution of humans' attempt to manage knowledge and information flow from the traditional Press of Reuters in the 1850s through the commencement of the exploitation of the Web for commerce and academy from the 1990s, as detailed in Table 2.1. Also, between the year 2000 and 2006, the Engineering and Physical Sciences Research Council (EPSRC) funded the Advanced Knowledge Technologies (AKT), which is a collaborative project between internationally recognised research groups at the Universities of Southampton, Aberdeen, Edinburgh, Sheffield and the Open University (AKT Project). AKT was aimed at understanding the best integrative approach at tackling the challenges of knowledge creation and acquisition, modelling and representation, storage and retrieval, use and re-use, publication and maintenance. By the very nature of its aims, it can be deduced that the project defined the challenges of KM only in terms of explicit knowledge and from the perspective of Information Technology, and thus, attempted a technological solution. However, this research establishes in Section 2.2 that the art of rendering tacit knowledge explicit is one of the challenges of knowledge management, which an IT-only solution cannot deliver (McDermott, 1999). There is need for a holistic approach by which both the human and technological approaches are integrated. The synchronous interactivity and user-generated content provision on the current social Web is a partial fulfilment of this need.

While Wiig (1997) describes 1989 as the year that marks the commencement of internal efforts to manage knowledge by several management consulting firms (e.g. PWC), Gaines (2013) acknowledges the invention of the Web by Tim Berners-Lee in the same year as a source of significant impetus for the acquisition of knowledge, thereby creating a huge information overload that was quickly tamed through Google's indexing technologies (Langville and Meyer, 2006, as cited in Gaines, 2013).

TABLE 2.1: Historical Information Sharing Technologies

Sponsor	System	Scope	Date	Important Properties
Press	Reuters	Professional, centralised	1850	Fast access to news & stock information (originally carrier pigeon and subsequently telegraph)
Private Institution	Mundaneum	Public, centralised	1910	Extended a library with indexing technology (the library card) and remote query via telephone
Military	Memex	Scholarly, individual, centralised	1945	Helping scientists and technologists to cross discipline boundaries.
Media*	Xanadu	Public, decentralised	1960s	Organising personal ideas and the universal literature; focused on DRM and author reimbursement
Media	Teletext	Public, national, centralised	1976	Broadcast information services, linked, not participative
Government	Minitel	Public, national, centralised	1982	Interactive commercial services and information
Academy (CS & HEP)	FTP / Archie / Anarchie	Public, decentralised	1985	Downloading software and PostScript documents to hard drives for printing on LaserWriters.
Commerce	Hypercard, HyperTIES	Private, centralised	1988	Personal applications, sometimes tied to multimedia resources on CDROMs / video disks
Academy (HEP)	WWW	Public, global, decentralised	1990	Document exchange. Universal naming, linking, interoperability. Open and participative but no writing or indexing.
Academy (CS)	Microcosm	Private, centralised	1990	Sophisticated linking and openness for personal information stores.
Academy (CS)	HyperG	Public, centralised	1990	Alternative to Web (and subsequently an extension to Web) with support for writing, indexing and consistency management.
Commerce	AOL, CompuServ	Public, centralised	1990	Dialup access to (closed) email, forums, chat rooms and information resources.

(Adapted from Carr *et al.* (2010))

Apart from the information overload that heralds its advent, the Web provides an avenue for social software and social networking to thrive. It can be said that the same Web infrastructure, which gave rise to the image problem suffered by KM due to its overselling by vendors and consultants in the 1990s (Bolisani and Handzic, 2015), also provides a platform in social software and social networking for KM to be rejuvenated.

Therefore, as stated in Section 2.2, it can be inferred from the above that the upsurge in KM as a field of practice and study in the 1990s, was occasioned by the rise of the Web at about the same time. Now that the Web has grown into a full scale social space, the reappearance of KM on the social Web can be understood through the theory and practice of social machines, which is the main thrust of Web Science as a field of study (Tiropanis *et al.*, 2015).. With social media being the most conspicuous face of the Web in recent times, understanding the current state of KM from a Web Science perspective would help in placing this research in perspective as this would help in appreciating the potentials in using social media and mobile (social) applications as leverage for corporate knowledge management.

2.4 The Perceived Tension between KM and Social Media

This section attempts to place the perceived tension between knowledge management and social media mentioned in Section 2.3, in perspective. In their "Multilevel Perspective of Tensions Between Knowledge Management and Social Media", Ford and Mason (2013a) conclude that social media and knowledge management are complementary rather than being in conflict, with the later being a major organisational trend that leads to the former. However, they agree that social media amplify the tension between the organisational and individual levels of the organisation, with regards to the ownership and control of knowledge.

The question of ownership and control of knowledge is pertinent as a result of the heightened security threats posed by the technologies that power social media. As such, an organisation's perception of these security threats is impacted by its perception of knowledge. According to Väyrynen et al (2013), as cited by Ford and Mason (2013b), "if an organisation views knowledge as something it owns, then it will perceive social media as a greater security threat than if the organisation views knowledge as housed by the people". Väyrynen et al, therefore, conclude that the challenges of information security, reputation and management faced by organisations, are amplified by social media trends. This, they say, is as a result of the blurred line between private and professional identities, coupled with the speed of information distribution on social media.

Giving an example of how viral events and double-filter process inherent in social media [can] alter the linear knowledge process often portrayed by knowledge management models, Hemsley and Mason (2013) reflect on how the process of knowledge creation and operations within knowledge-based enterprises are challenged by the capabilities inherent in social media.

The tension created by the question of ownership, control and reputation concern (Ford and Mason, 2013a; Väyrynen *et al.*, 2013) notwithstanding, Ford and Mason (2013b) acknowledge the work of authors like Hemsley and Mason (2013) and Jarrahi and Sawyer (2013) who agree on the fact that social media amplifies the potential benefits of increased innovation and faster knowledge transfer, especially when leveraged on social networks.

What Ford and Mason (2013b) fail to highlight in their report is the fact that the added benefits in social media is largely in the comparison between modern social media and traditional social media, like the telephone and email, as highlighted by Jarrahi and Sawyer (2013), who conclude that modern social media compete with each other for attention as much as they compete with traditional media.

In accordance with the perceived tension and potential benefits, Ford and Mason (2013b) pose some questions, among which is:

> "How do organisations determine when/if it is acceptable to use social media at work and for work purposes?"

This question is explored further in this thesis, in the survey on *occupational use of mobile phones and applications* as presented in Chapter 6. Also in this thesis, a conceptual framework is developed, which mediates between knowledge management and social media, with knowledge management value at its core. The conceptual framework is presented in Chapter 4.3.

2.5 Knowledge Web Technologies

Organisations' Knowledge has traditionally been in form of Lessons Learnt from projects, knowledge maps, policies and procedures as well as best practices, all stacked away as documents and folders. This is evident in a study aimed at facilitating new knowledge creation and obtaining KM maturity, in which Arling and Chun (2011) found that databases consisting of documents previously siloed in folders and file cabinets, do make up some of the earliest attempts at knowledge management in the study's case study organisation. In recent years however, Web technologies are largely being used in the form of Knowledge Management Systems (Alotaibi *et al.*, 2013) as well as a range of Knowledge Management Instruments (KMI) (Peinl, 2011). Prevailing knowledge Web technologies include, chiefly, those which emphasise and broaden the vision of computer interoperability empowered by knowledge: *semantic Web.* With the growth and emergence of abstract social machines on the Web (Smart and Shadbolt, 2014), there arises the need for domain-specific search. In the medical domain for example, an approximate search result on the best treatment for a disease cannot be sufficient. Accuracy, precision and an up to date search result is critical(Schreiber, 2013). In as much as Semantic Web (OWL/RDF) and linked data technologies are paving the way for domain-specific search, they can also provide the means for knowledge representation and reasoning and enable further support for [abstract] social machines (Tiropanis *et al.*, 2015) upon which this research is themed.

Social media has been adopted in organisations to support both the personal and collective processes of managing knowledge (Razmerita *et al.*, 2014). They are a sort of social machines that facilitate human interactions on the Web. Essentially, they include tools and software platforms that enable humans to participate in the social process of content and knowledge generation, collaboration and knowledge sharing. Social media trends began with the rise of so-called Web 2.0, in which sites became sophisticated apps and content-management platforms designed to facilitate the creation and sharing of user-generated data and content (Kleek and O'Hara, 2013). They include social sharing and networking tools like Facebook, Twitter, blogs, wikis and forums (Ford and Mason, 2013b; McAfee, 2006; Guy *et al.*, 2013; Sousa *et al.*, 2010). In addition,

Smart and Shadbolt (2014, p.2) identify mySpace, Ushahidi, Galaxy Zoo, reCaptcha and Wikipedia as social software exemplars of social machines. Facebook is essentially a social networking tool in that it provides a platform for people of the same or similar interest to gravitate over their interests and/or relationships. Blogs are used by individuals or groups to maintain conversation with an audience wherein the audience responds through questions or comments. While many people use content management systems like Joomla or Wordpress platforms to implement their blogs, others use ready-made blogging platforms like Blogger and/or micro blogging platforms like Twitter. Forums allow any member to initiate a discussion or a support request while any other member could respond. Despite the advances in social media as the world knew it about half a decade ago, forums and message boards were probably the most common platform for questions and answers about products and brands (Falls, 2012).

Social interaction software includes a wide range of communication tools, often based on Internet technologies (e.g., instant messaging, text chats, forums, virtual worlds, and social media). The concept of social software arose from the terms groupware and computer-supported collaborative work (CSCW) both of which denote software that facilitate and support group interactions (Haefliger *et al.*, 2011). As hinted earlier, social media is built on the ideological and technological foundations of Web 2.0, a platform for social interaction, communication, and collaboration that allows the creation and exchange of user-generated contents (Kaplan and Haenlein, 2010; Sankar and Bouchard, 2009; O'Reilly, 2005). Technological foundations and infrastructure notwithstanding, knowledge creation and sharing may not be achieved without a level of interaction among the human participants in the social process of knowledge creation (Soto-Acosta *et al.*, 2013). Such interaction, despite the prevalence of social media, is extremely personal in as much as knowledge is created, processed, applied, and exchanged by individuals whose contribution to knowledge repositories, and participation in the collective process, is often individually motivated (Razmerita *et al.*, 2014; Böhringer and Richter, 2009; Kleek and O'Hara, 2013). The collective involvement of multiple individuals as active participants with technology, in the social process of Knowledge Management, offers an opportunity for the holistic approach mentioned earlier in Section 2.3; and, it is the thesis in the theory and practice of social machines, which Tiropanis *et al.* (2015) describe as the main thrust of Web Science.

This individual participation in the social interaction is strengthened by the practice and concept of social bookmarking, folksonomies/hashtags, which is discussed further in Chapter Section 4.3.3, Item No. 2.

2.6 The Social Machine Paradigm

Shadbolt *et al.* (2013) describe social machines as "current socio-technical systems which

exploit large-scale interaction of humans with machines". They (Shadbolt et al) drew comparisons between traditional machines that were 'programmed by programmers' and 'used by users', and social machines in which the users are no more just mere users but mutually important participants in the functionality of the system through their contributions borne out of their intrinsic motivations (Böhringer and Richter, 2009).

The paradigm shift towards social machines has emanated from the rise of the *social web*, which refers to the range of web technologies, services and resources that are aimed at fostering collaboration and social interactions. These are social networking sites like Facebook, social media sites like YouTube and microblogging sites like Twitter (Smart and Shadbolt, 2014). The pervasiveness of these social web technologies has led Tinati and Carr (2012) to create an understanding of how social machines are enabling humans and technologies to interact and shape each other. So, does this mean there were no human interactions with previous computational machines that existed before the Web? Tinati and Carr (2012) assert that it was actually the pre-existing human interaction that helped in "gaining more of an understanding of what it will take to achieve the dream of collaboration through shared knowledge..." thus exploiting the platform and power of the Web to create 'abstract social machines' with computational input, through what Berners-Lee and Fischetti (2000) describe as "processes in which people do the creative work and machine does the administration".

In as much as pre-Web computational machines would require users' consent in downloading and installing software and even using their CPU and network bandwidth, they were regarded as some sort of social machines by Tinati and Carr (2012). This could have resulted in an over-simplification of the social machine, given that, in that regard, the Turing machine (Weisstein, 2017) could also be regarded as a social machine as it requires human efforts to operate. They were however, quick to inform that social machines exist in different scales ranging from those which harness the collective problem solving capabilities of humans to perform computational hard processes (lightweight) to those that exist as a result of interactions between human creativity and technological capabilities in a mutually reinforcing relationship (heavyweight). The heavyweight approach helps in understanding social machines as those Web technologies that facilitate information sharing by individuals while having a ripple effect on methods of knowledge transfer and the society at large (Carr *et al.*, 2010), rather than studying every Web technology from a social machine perspective.

In order to prevent a hasty generalisation of every Web technology as social machine, the literature abounds with a plethora of attempts to drive home the specificity of the characteristic of a particular Web technology that qualifies such technology as social machine. Tinati and Carr (2012) posits that "any task that requires the co-constitutional involvement of humans and technologies is a form of social machine". Smart and Shadbolt (2014) extends this co-constitutional involvement with the notion of "active human participation" as being critically important to what makes a Web technology a social

machine. In this case, the involvement of multiple human individuals facilitates the involvement of many social machines in the realisation of 'social processes' defined by interaction, communication and relationships between human individuals. Such realisation fosters employee engagement and knowledge sharing in a corporate environment and thus can be classified as knowledge social machines.

The initial insight into social machines arise from the statement made by Berners-Lee and Fischetti (2000) in their book, 'Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web':

> "Real life is and must be full of all kinds of social constraint - the very processes from which society arises. Computers can help if we use them to create abstract social machines on the Web: processes in which the people do the creative work and the machine does the administration."

The above statement has hitherto been used as definition of social machine and has also been subject to critical evaluation by scholars in its limitation. It can be argued that Berners-Lee and Fischetti (2000) do not attempt to define social machine but explain a concept that gives rise to the birth of social machines. However, Smart *et al.* (2014) discountenanced this classification and characterisation of social machines solely on the basis of the distinction in the contributions of each element, i.e, the human element and the machine element, as per their creative and administrative contributions, respectively. They argue that functions of creativity and administration are intertwined and can be interchanged between the human and the machine participants in the social process, e.g., where Wikipedia bots do the creative work (purportedly meant for humans) and where humans do the tagging that helps in sorting Flicker's pictures, an administrative task purportedly meant for machines, in accordance with Berners-Lee and Fischetti's (2000) statement above. They (Smart *et al.*, 2014) conclude that "a perspective that seeks to limit the kinds of roles that can be performed by human and machine elements, and which additionally seeks to impose a strict (and rather artificial) boundary on where particular processes need to take place, risks blinding us to many of the opportunities that the Web provides...". They have therefore defined social machines as:

> "Web-based socio-technical systems in which the human and technological elements play the role of participant machinery with respect to the mechanistic realisation of system-level processes".

The above working definition of social machine provides a clearer understanding of the concept as it highlights the features or conditions that qualify particular systems or processes as social machine. That is, they are essentially socio-technical systems as they involve the participation of both human and technological components. Secondly, they are Web-based systems. Although the authors (Smart *et al.*, 2014) do not rule

out the possibility of social machines that are independent of the Web (e.g, clocks), the focus of this study is on Web-based social machines. Also, social machines involve the participation of multiple individuals as opposed to a 'Web-extended mind' onto which individuals can offload cognition (Carr and Harnad, 2011). Nonetheless, these multiple individuals are comprised of personal entities for whom an enhanced autonomy, offered through technological support, would promote a more adaptive, flexible and robust social fabric. Maintaining this personal autonomy in the midst of a cloud of multiple individuals has been addressed by Kleek and O'Hara (2013) in their work, "The Future of Social is Personal: The Potential of the Personal Data Store".

Furthermore, an insight into social machines can be gained when one is confronted with a process that calls for a theoretical explanation of the contributions of multiple individuals and Web-based technology as as joint participants in the realisation of such process (Smart *et al.*, 2014). It can therefore be inferred that a social machine facilitates a social process.

Meanwhile, while Burégio *et al.* (2013) see the concept of social machine as an auspicious paradigm to deal with the complexity of the new emerging Web around us, Hendler and Berners-Lee (2010) are concerned with the challenges of developing technologies that allow user communities to construct, share and adapt social machines so that successful models can evolve through trials, use and refinement. Such technologies are better understood from the social machine paradigm; and, surmounting the challenges in developing them requires, first and foremost, an appropriate conceptual framework.

As indicated in Chapter 1.5, this research studies the convergence of enterprise mobility and social (media) data analytic and its implication on KM, which can be understood from the study of social machines as a unified model for social/computing processes (Burégio *et al.*, 2013). This research also culminates in a conceptual model (see Chapter 4.5) that helps in fullling the aim of developing a data model for knowledge social machine, which would help Knowledge Management (KM) deliver value to corporate organisations.

2.7 Employee Engagement and Knowledge Sharing

It is important at this juncture, to be reminded of the need for a knowledge social machine framework, which is to foster the social process of knowledge sharing, a process that can be fuelled by employee engagement.

2.7.1 Employee Engagement

From the foregoing section, it can be seen how a social machine defines the active participation of humans with technology towards the realisation of a social process. In an

organisational context, the *humans* are the employees whose active participation is a function of their engagement. A recent survey of Management Tools and Trends (Bain, 2015) presented in Table 2.2 positions Employee Engagement Survey among the top 10 Management tools for the second year running (2012 & 2014). Employee engagement is measured in terms of employees' involvement and enthusiasm about the organisation and their work. These surveys help organisations identify and build upon the strengths and talents of their workforce to gain competitive advantage. This is based on the premises that an intellectually motivated workforce would result in improved business performance and increased customer satisfaction. To remain intellectually motivated therefore, employees must assume the role of mutually important participants - as machines - in the functionality of the knowledge sharing system through their contributions which are, according to Böhringer and Richter (2009), borne out of their intrinsic motivations, as stated earlier in the discussion on the social machine paradigm in Section 2.6.

TABLE 2.2: Bain & Company's Top 10 Management Tools

	2000	**2006**	**2010**	**2012**	**2014**
1	Strategic Planning	Strategi Planning	Benchmarking	Strategic Planning	CRM
2	Mission & Vision Statement	CRM	Strategic Planning	CRM	Benchmarking
3	Benchmarking	Customer Segmentation	Mission & Vision Statement	Employee Engagement Surveys	Employee Engagement Surveys
4	Outsourcing	Benchmarking	CRM	Benchmarking	Strategic Planning
5	Customer Satisfaction	Mission & Vision Statement	Outsourcing	Balanced Scorecards	Outsourcing
6	Growth Strategies	Core Competencies	Balanced Scorecards	Core Competencies	Balanced Scorecards
7	Strategic Alliances	Outsourcing	Change Management	Outsourcing	Mission & Vision Statement
8	Pay-for-Performance	Business Process Reengineering	Core Competencies	Change Management	Supply Chain Management
9	Customer Segmentation	Scenario & Contingency Planning	Strategic Alliances	Supply Chain Management	Change Management
10	Core Competencies	Knowledge Management	Customer Segmentation	Mission & Vision Statement	Customer Segmentation

(Adapted from: Management Tools & Trends (Bain, 2015))

It is evident from the positioning of Employee Engagement Surveys (3rd on the list of top 10) that organisations are now paying more attention to their employees' motivation which can be measured through their engagement with the organisation's products, services, tools and activities. As mentioned earlier, Kumar *et al.* (2014) conducted empirical research that positions employee engagement as a top business priority given

that researchers have demonstrated that, having a highly engaged workforce not only maximises a company's investment in human capital and improves productivity, but it can also significantly reduce costs (such as cost of employee turnover) which directly impacts the bottom line. It is staggering to note from this research finding that despite 71% of company executives who rank employee engagement as very important to achieving overall organisational success, only 24% of them can affirm that employees in their organisations are highly engaged. Thus, in an organisational setting, the utilisation of social networking for knowledge sharing and as a source of knowledge elicitation can be influenced and measured by employees' engagement which is underscored by the Enterprise Mobility policies of Bring Your Own Device (BYOD) and/or Company-Owned devices that are Personally-Enabled (COPE).

There is, therefore, no disconnect between this finding and the findings of King *et al.* (2002) which position the issue of motivation as one of the top ten most important issues in Knowledge Management. The question is how to motivate individuals employees to participate in the social process of knowledge sharing, owing to the correlation between employee motivation and the culture of knowledge sharing within the organisation (Connelly *et al.*, 2013). In this research, Employee Engagement emerges as one of the parameters for measuring KM values (see Chapter 5.6).

2.7.2 Knowledge Sharing

"Knowledge sharing allows workers to avoid 're-inventing the wheel'; they can learn from others' experiences and improve their own performance as a result", is how Connelly *et al.* (2013) summarise the many benefits of knowledge sharing to organisations. Despite its benefits, knowledge sharing is intrinsically difficult for knowledge workers. This is due, in part, to a perception of erosion of their own competitiveness and also the time pressure they are subjected to. A test scenario for a study (Connelly *et al.*, 2013) was set at a group of 444 undergraduates who were tasked with Mathematical problem-solving exercise while being faced with request for knowledge sharing from colleagues. The authors conclude with an expectation that the feeling of being too busy to share knowledge with colleagues will increase proportionately with an increase in organisations' demand for staff productivity in less time. They (the authors), however, affirmed that one of the limitations to this study rests in the fact that a Mathematical problem-solving exercise requires explicit knowledge which can be easily captured and replicated verbally. They suggest further work to integrate tacit knowledge sharing with the sharing of explicit knowledge. Tacit knowledge is discussed further in Chapter 4.3.2 as one of the core elements of the conceptual framework output from this research.

Unlike explicit knowledge, in which we are aware of and can describe in words how we are able to do what we are doing (Carr and Harnad, 2011), tacit knowledge is usually in the domain of subjective, cognitive and experiential learning; it is highly personal and

difficult to formalise (Turban *et al.*, 2011a, p.478). More so, as opposed to the process (top-down) approach, the practice approach assumes that a huge amount of organisational knowledge is tacit in nature and, therefore, rather than build formal systems to manage knowledge, organisations should build social environments or communities of practice necessary to facilitate the sharing of tacit knowledge. This presupposes that organisations need to shift their attention from documents to discussions (Davenport and Prusak, 1998, p.106). It is quite possible for an employee or a subject matter expert to share tacit knowledge by expressing his/her feelings, thoughts and experiences while carrying out, or having just performed, certain tasks. This is enhanced by the advent of the social media, which makes it possible for anyone to express their sentiments within the spur of the moment (Zikopoulos *et al.*, 2012, p.26). This is even without being confined to a set location, especially with over five billion mobile subscriptions that enable a vast majority of the world's population to communicate on the go, nowadays when the world is witnessing a major shift to mobility as the main technological focus of IT development as a new network structure and as a facilitator of business activities (Kietzmann *et al.*, 2013).

How then do we capture and/or engineer this tacit knowledge being inadvertently generated by employees in the enterprise mobility and social media space? This would help in answering the question of how social media is delivering KM value to corporate organisations

This work tends to view an organisation's knowledge within the social media space as an encapsulation of the organisation's Enterprise Mobility strategy. Knowledge encapsulation is a simple but powerful form of knowledge restructuring, which involves gradually building a structure that connects fragmented knowledge items (Littlejohn and Margaryan, 2013). It must not be taken for granted that the organisation's knowledge largely resides in its people. This can be viewed as fragmented knowledge items that make up the organisation's collective intelligence. As these fragments of knowledge are being created, regenerated, shared and re-used by individual employees within the social media space, and empowered by the readily available mobile devices as stated earlier, it becomes expedient for the organisation to capture and manage this flow of knowledge if it must count as intellectual capital for the organisation's competitive advantage. If not captured and managed, employees own their knowledge and can take it away with them when they leave the organisation (Drucker, 1994). The exponential growth in the data being generated by the social processes of knowledge exchange has given rise to the concept and study of Big Data Analytic. This PhD research is therefore exploring the use of Big Data Analytic in an attempt to mechanistically build a model knowledge social machine on the enterprise mobility platform that supports the social processes of knowledge capture and knowledge sharing, in such a way as it allows tacit knowledge to flow seamlessly, as illustrated with Figure 1.1 in Chapter 1. In that model (Figure 1.1), the corporate knowledge management system is no longer a mere knowledge base as it

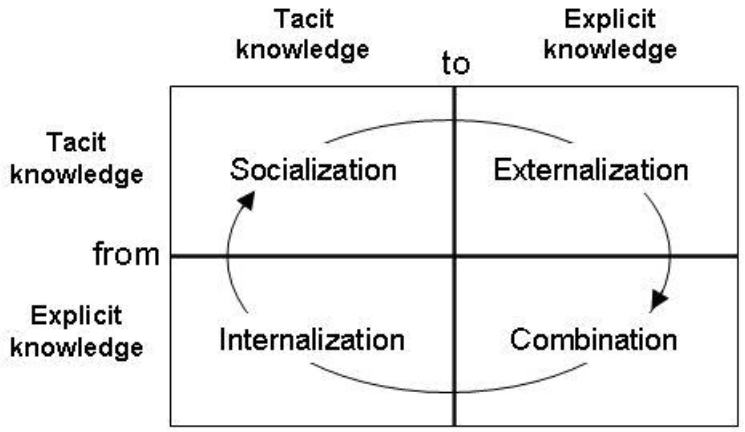

FIGURE 2.2: Nonaka's Model of Knowledge Conversion (Nonaka and Takeuchi, 1995)

were, but an amalgamation of the active participation of a truly engaged workforce with the social processes of knowledge acquisition, sharing and management. Such is a model that is believed to utilise a combination of Web technologies with human participation to support the realisation of Nonaka and Takeuchi's (1995) four modes of spiralling knowledge generation:

1. Socialisation mode, which is the exchange of tacit knowledge among members [of a community who in this case, are employees of an enterprise] through their social interactions and shared experiences.
2. Externalisation mode, which is the translation of tacit knowledge into explicit knowledge through models, concepts, metaphors, analogies, stories, etc.
3. Combination mode, which is the generation of new and explicit knowledge by combining and bundling together different bodies of explicit knowledge.
4. Internalization mode, which is the creation of new tacit knowledge from explicit knowledge.

All of the conversion modes in Figure 2.2 are highly intertwined and interdependent, as described by Haslinda and Sarinah (2009). The spiralling relationship between them can be facilitated by the affordances of enterprise mobility which would help in rendering tacit knowledge explicit.

2.8 Enterprise Mobility

> "*The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it*"
> (Mark Weiser of Xerox Lab, as cited by Sorensen (2011))

from

2.8.1 A Synoptic View

With regards to the image problem suffered by KM in the 1990s, there has been a concerted effort by KM consultants and academics, since the 2000s, to explore how the growing trends of enterprise mobility — as manifest in the surge in mobile devices and applications — can be exploited for corporate Knowledge Management (Bolisani and Handzic, 2015). This is evident in Knowledge Management literature, which abounds with issues and concerns about Enterprise Mobility. For this research, about 160 knowledge management literature materials published between 2004 and 2016 were analysed. Analysing documents in this way helps in arriving at research outputs without data collection (Seuring and Müller, 2008). The analysed publications include books, book sections, conference papers, journal articles reports, thesis and web pages. The term, 'mobilization' - with variants of *mobile, mobility, mobilise* - is topmost in the list of Top 50 most frequently used words in these KM literature. This word frequency is represented in a word cloud in Figure 2.3. The method of document analysis of KM literature resulting in this synoptic view is described in Section 2.8.2

2.8.2 Document Analysis of Knowledge Management Literature

1. Having decided on *Enterprise Knowledge Management* as the Web Science research perspective for this research (see Section 2.1, a search of Google Scholar was conducted, with the exact phrase, "Knowledge Management", and either "enterprise" or "organisation" in the title of the article. The search was made to return publications from 2004 to 2016. However, considering that this search was conducted in January, 2016, there was laterally no 2016 publication contained in the search results. Meanwhile, over a thousand search results were returned.

2. Based on their accessibility either through the availability of PDF or URL links, a few of the documents were selected and imported over to Mendeley — the preferred bibliographic reference management tool for this researcher — where the articles were read, reviewed and had annotations placed on the go.

3. In a bid to analyse and synthesise the findings from these various papers, NVivo — a qualitative data analysis package — was employed. The reference library was imported from Mendeley into NVivo as a RIS (Research Information Systems) file format. RIS is a file format for portability across bibliographic referencing platforms.

4. Using the Source Classification feature of NVivo, 160 documents were classified according to their types, as seen in Table 2.3:

TABLE 2.3: Document Types of KM Literature

Document Type	No. of Items
Book	2
Book section	6
Conference paper	45
Journal article	82
Web page	12
Technical reports	13
Total	160

FIGURE 2.3: A Word cloud for 'Mobilisation' from the literature

5. An *NVivo memo* was created from abstracts, keywords and annotations.

6. Finally, a query was run on the memo sources, for word frequency. The word, 'mobilisation', with variants like 'mobility', mobile, etc., emerged as most frequently used word, as shown in the word cloud.

The process of document analysis described above has not only helped in shaping the research's title and topic, is has also served as an initial input in the development of the conceptual framework presented in Chapter 4.

With so much interest around the concept of enterprise mobility as presented by the word, 'mobilization' and its derivatives within knowledge management literature, it becomes pertinent to attempt an explanation of what enterprise mobility actually entails. This explanation is also for the purpose of disambiguation from the contextual usage of the term 'social mobility', economic mobility, etc., within the humanities and social sciences.

2.8.3 What is Enterprise Mobility?

Enterprise Mobility has been defined as "the use of mobile Information Technology (IT) for the accomplishment, coordination and management of organisational activities" (Sorensen, 2011). It is a growing trend that defines collaboration at work while helping employees maintain work and life balances, using mobile information technology that are built on current technological innovations like Apple's IOS and its range of iPhones and iPads; Google's Android and its range of smart phones and tablets; Skype and its ability to enable communications on the go; even with over five billion mobile subscriptions supporting an approximate 80% of the world's populations (Sorensen, 2011; Kietzmann *et al.*, 2013).

The consumerisation of IT has led to a plethora of mobile devices like laptops, Web-enabled tablets and smart phones which have all become incredibly affordable, in accordance with Moore's Law, which guides the exponential cost and simplified design advantage that results from continually 'cramming' more capabilities and functionality on to Integrated Circuits (Moore, 1998). With these devices, not only are employees able to access their emails and browse the Internet on the go, they are also able to access the organisation's tools and resources necessary to perform their work without having to be glued to a desk at an office location. Also, using these devices, employees are able to access and interact with their own networks of friends and family (work and life balance). In recent times, these technologies have woven themselves around us in so much so that using them for keeping in touch with family/friends becomes an impulsive reflex action even while at work (Chang *et al.*, 2014). Many organisations have therefore, subscribed to the theory that, allowing employees to access corporate systems and data over these devices (BYOD) enhances productivity (Microsoft, 2015). Also, it can be suggested that allowing employees to access a network of corporate resources and discussions over similar social networks within the enterprise would promote employees' engagement with the corporate data, Knowledge Management System and, more importantly with colleagues, in as much as the organisation's knowledge largely resides in its people (Griffiths and Moon, 2011). Has this trend truly promoted engagement and productivity and to what extent? This is the basis for the third extended research question (ERQ.3) in Section 1.2.1

2.8.4 Enterprise Mobility Management Strategies

Organisations have either a choice between — or a fusion of — two basic options for their enterprise mobility implementation:

1. Bring Your Own Device (BYOD).

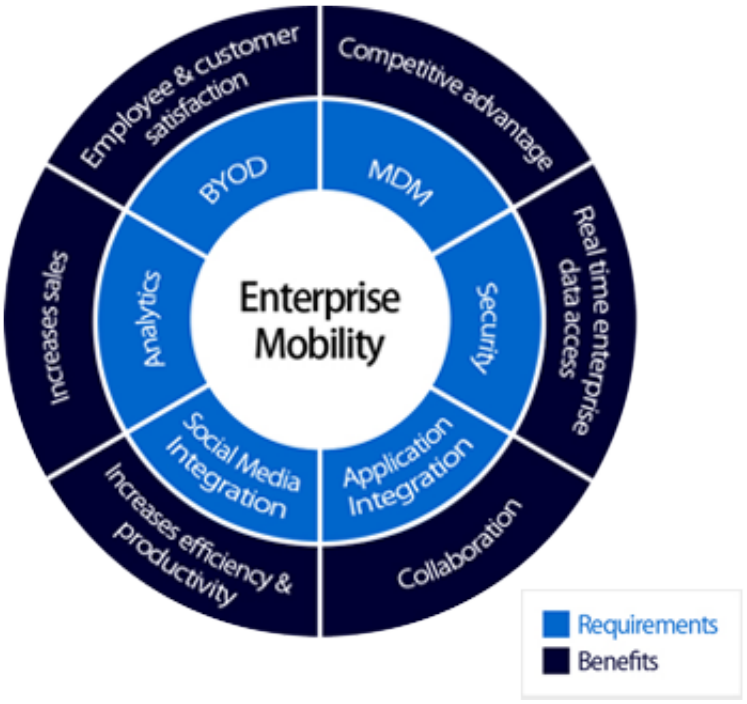

FIGURE 2.4: Enterprise Mobility. [Source: Banafa (2014)]

.

This covers mobile devices owned by the employee and can be used for work or personal use at any location. The choice of the brand, functionality, installed apps are entirely that of the employee (Armando *et al.*, 2013). Driven by the financial pressure imposed on schools by the funding cuts by Governments, for example, schools managements are increasingly adopting BYOD as it eliminates the cost of funding on technological equipment, like computers, for individual students (Stavert, 2013). When these devices are allowed to be used to access the corporate data from anywhere the employee may be located, it exposes the organisation to the risk of compromise of the privacy and security of its corporate data. Also, because there are as many different devices as there are employees, the organisation is faced with the challenge of how to integrate these disparate devices into a platform for ease of support and interoperability.

2. Company-Owned Personally-Enabled Devices (COPE).

   This is also known as 'Choose Your Own Device (CYOD)'. These are pre-approved devices normally owned by the company and can be used anywhere by employees. In most cases, the company maintains the device and controls the applications that are installed on them, in which case, they are strictly for business purposes. Sometimes, employees are given options from a list of approved devices (Scott, 2013) and can also use them for personal purposes with their own choice of apps (especially for games and social networking) that are not for work purposes. Security and privacy of corporate data is therefore, a concern here, and this is discussed briefly, next.

As can be inferred from the foregoing, there are risks and challenges associated with enterprise mobility giving rise to organisational concern, as evident with the National Health Service (NHS) (Hitchcock, 2012). However, this research contends that portraying an organisational lag on the basis of these concerns may make the organisation lose sight of the benefits inherent in enterprise mobility. With the fulfilment of BYOD, social integration, analytics, mobile apps and security, enterprise mobility offers the benefits as illustrated in Figure 2.4. Regardless of the concerns about privacy, security, cost and complexity, a successful organisation should resolve the mobility challenge with an integrated solution that would help them weigh the risks and opportunities presented by mobility and social networks thereby, devising the means of exploiting this trend to promote collaboration and knowledge sharing in such a way that mitigates against the risks and maximises the opportunities. This is where Enterprise Mobility Management, integrated into the vision of knowledge social machine, tends to bridge the gap between traditional knowledge management and current/emerging Web trends and technologies. It ultimately helps in delivering the promise of Knowledge Management. This promise includes real-time enterprise data access, seamless collaboration and knowledge sharing, knowledge capture, storage, reuse and preservation, all aimed at preserving and exploiting the organisation's intellectual capital for enhanced performance, efficiency and productivity leading to a strategic competitive advantage that ultimately impacts profitability.

Enterprise Mobility Management thus becomes the cynosure around which people, technology, processes and environment revolves, as illustrated in Figure 2.5.

2.8.5 Privacy and Security

It is mentioned in Section 2.8.4 that the issue of privacy and security of corporate data, when accessible from heterogeneous devices and from any location, is becoming a growing concern to organisations when considering the implementation of an enterprise mobility policy. When one considers the fact that the kind of security threats of cybercrimes through brute force attacks, SQL injection, etc., are now also becoming rampant threats on mobile devices as they were on personal computers (Vorakulpipat, 2014), one cannot but forgive an organisational lag that is based on restraint. Moreover, if organisational knowledge, or core 'trade secrets', can be so easily replicated by another organisation, such knowledge will sooner than later lose its value as a constituent of the organisation's intellectual capital. Meanwhile, the privacy of corporate data can easily be compromised through the liberalisation of organisational hierarchical structure to accommodate the flow of tacit knowledge over an enterprise mobility agenda. What are the actual privacy and security risks and issues involved in the adoption of enterprise mobility? To what extent have these risks constitute a threat to corporate organisations? and, what are the

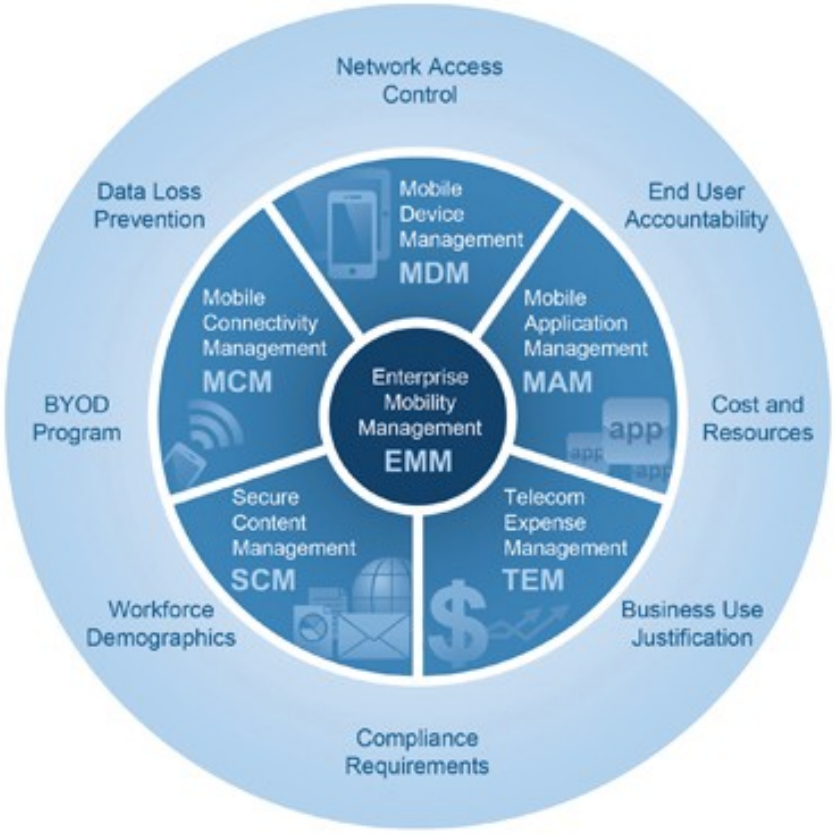

FIGURE 2.5: Enterprise Mobility Management; from Notify Technology (2015)

mitigating factors against the risks? These questions set the pace for another interesting research area beyond the scope of this research.

2.9 Knowledge Engineering from Big Data Analytic

Consequent upon the consumerisation and proliferation of mobile devices and applications, coupled with the availability of enterprise mobility management platforms to delimit the organisational boundaries for privacy, security and efficiency, an enormous amount of structured and unstructured data are being generated within the enterprise mobility and social media space (Zikopoulos *et al.*, 2012). The complexity of these data is evident in their variety (a mix of text and multimedia data and their associated metadata from social media as well as operational and external data). The speed at which these data are generated is also an evidence of its complexity, making it challenging for organisations to derive valuable insightful knowledge that is worth sharing for decision-making, competitive advantage and the ultimate impact on profitability. As hinted earlier, in an attempt to tackle this challenge, this research uses textual analysis technique of big data analytic to perform knowledge engineering on social media data.

Shadbolt and Smart (2015) describe knowledge engineering as a discipline that has evolved to support the whole process of specifying, developing and deploying knowledge-based systems. According to them, knowledge engineering encompasses knowledge acquisition from any source, which in turn, encompasses knowledge elicitation from a domain expert. Meanwhile, 'any source' of organisation's knowledge acquisition includes knowledge discovery in databases, market monitoring, community, and collaboration networks (Peinl, 2011). The research work in this thesis is primarily concerned with knowledge discovery in community and collaboration networks in terms of the insights gained from the sentiments shared by employees, for example, through their engagement with the organisation's own knowledge social machine, which presents as the enterprise mobility and social network platforms. To achieve this, we seek to explore and exploit the integration of knowledge discovery from community and collaboration networks using some techniques in big data analytic.

However, traditional databases have limitations (Lamont, 2012) that are placed by certain structural constraints, making them rather unsuitable for storing and analysing the kind of data produced through social networks as tacit knowledge. In as much as online conversations have grown so exponentially as a result of the huge volume and variety of user-generated contents powered by enterprise social media (Enterprise 2.0), traditional data gathering and knowledge elicitation approaches like questionnaires and even relational database queries can no longer cope with the size and speed at which the social data are being generated. As such, there is a need for another approach to data gathering and analysis that is not bound by the constraints of the traditional approaches, if organisations are going to derive any valuable insights for their competitive advantage from such a powerful enabler of KM as Big Data, such that could previously only have been possible, if at all, with expensive high performance computational investments (Lamont, 2012; Chen and Huang, 2012). A simple case of less intrusive and cost effective solution for small and medium scale organisation, using textual analysis of data, is presented in Chapter 5.2.1

2.10 Chapter Summary

This review has cited some work like those of Peinl (2011), Chen and Huang (2012), Lamont (2012), and Shadbolt and Smart (2015) to establish the need for other data gathering and analytic techniques for knowledge discovery that are not bound by the constraints of traditional databases. These authors agree that there is need to re-assess the impact of KM but they are reassessing from a technological perspective, with the exception of Peinl (2011) who shows some consideration for the human factor by extending his source of knowledge discovery to community and collaboration networks.

On the other hand, McAfee (2006), Davenport (2008), Delic and Riley (2009), Griffiths and Moon (2011), and Griffiths *et al.* (2015) have established the current fidgety status of KM as a field of practice and are therefore, looking — from a human perspective — to solutions potentially inherent in the social interactions that social media platforms provide.

However, the above two propositions are not mutually exclusive. Together, they both highlight the co-constitutional involvement ((Tinati and Carr, 2012) of human and machine in the social process of knowledge creation and knowledge sharing. As this is the hallmark of the social machine paradigm, a theme that runs through this review, the literature has established knowledge sharing as an act borne out of the intrinsic motivation of individual employees (Drucker, 1994; Turban *et al.*, 2011a; Carr and Harnad, 2011; Connelly *et al.*, 2013) which strengthens the people dimension of a socio-technical system (Piccoli, 2008, pg. 35-38) by which a social machine can be defined.

The volatility of KM within the context of the complexity and dynamism of the technological trends that are shaping it has resulted in fragments of divergent views on the defining concepts by numerous authors. Paradoxically, the harmonisation of these divergent views from the literature (see Table 4.1) has emanated in a convergence of the basic elements of the conceptual framework which is a major research output presented in this thesis.

Moreover, it can be deduced from the literature that KM, having been previously oversold to organisations by its consultants, was quickly becoming a lacklustre concept due, largely in part, to a want of measurable value, and also to a perceived 'rivalry' between KM and the new technological trend of social media (see Section 2.4. However, even though there is a consensus over the need of KM to deliver value to organisations again if it were to remain relevant and sustainable within the context of new technological trends of social media, there is not yet a framework that integrates KM value for organisations into the current trends. This framework is achieved in this research and it is presented in Chapter 4.3 of this thesis.

Chapter 3

Research Methodology

In addition to an outline of the research methods employed for this research (see Figure 3.1), this chapter also provides a broad overview of the general philosophical underpinning that guides the choice of the research methods. This philosophical foundation is discussed first in Section 3.1.

3.1 Methodology Overview

Research Methodology is often explained from two perspectives. One is the perspective of the methods, processes and techniques used in data collection, analysis and decision making (Kothari, 2004, pg. 7). The second perspective highlights the distinction between the research method, as indicated by the first perspective above, and the research methodology, wherein, *methodology* is the overall approach to research linked to the paradigm or theoretical framework while the *method* refers to systematic modes, procedures or tools used for collection and analysis of data (Mackenzie and Knipe, 2006).

In alignment with the second perspective for explaining the concept of research methodology, the research methodology for this research is underpinned by the theoretical framework of *pragmatism*, which Mackenzie and Knipe (2006) describe as the research paradigm that is "not committed to any one system of philosophy or reality" but applies whatever approach that works towards resolving the research problem. The entrenchment of this practical approach in *Mixed Methods Research* is why it has been closely linked with the pragmatic research paradigm (Morgan, 2014; Cameron, 2011; Johnson and Onwuegbuzie, 2004).

3.1.1 Mixed Methods Research

For this thesis, *mixed methods* research can be defined as a paradigmatic research method that serves as a bridge between the qualitative and the quantitative research methods.

According to Kothari (2004), "qualitative approach to research is concerned with subjective assessment of attitudes, opinions and behaviours". It helps researchers in exploring insights, discovery and interpretation rather than hypothesis testing or measurements in terms of quantity, amount, intensity or frequency (Noor, 2008). This approach lends some credence to the researcher's subjective interpretations in as much as one cannot be separated from the knowledge that one possesses, making the researcher the only source of contextual reality. This assertion is according to Johnson and Onwuegbuzie (2004), who also inferred that quantitative approach, on the other hand, promotes an objective style of inquiry in which the researcher's biases and emotions are detached from the study, and stated hypotheses are empirically justified. Johnson and Onwuegbuzie (2004), therefore, join forces with the pragmatic school of thoughts in advocating that a mixed method approach allows researchers to mix and match research components that offer the best solution at resolving their research questions, while also addressing the perceived dichotomy between qualitative and quantitative research methodology. (Mackenzie and Knipe, 2006; Johnson and Onwuegbuzie, 2004, pg.15).

Although, most studies of computer systems are based on quantitative methods (Kaplan *et al.*, 1988), missing out on the benefits inherent in mixing the outcome with insights from qualitative analysis. Miles and Huberman (1994) also suggest that qualitative data "are a source of well-grounded, rich descriptions and explanations of processes in identifiable local contexts". They (Miles and Huberman argue further that, "words, especially organised into incidents or stories, have a concrete, vivid, meaningful flavor that often proves far more convincing to a reader — another researcher, a policymaker, a practitioner — than pages of summarised numbers". This is probably why Mackenzie and Knipe (2006) argue that discussions of research methods in research texts and university courses should include mixed methods and should address the perceived dichotomy between qualitative and quantitative research methodology.

This research is largely underpinned by a pragmatic exploratory approach in which a *triangulation* technique of mixed method research is adopted.

3.1.2 Triangulation

Triangulation is defined as *the mixing of data or methods so that diverse viewpoints or standpoints cast light upon a topic* (Olsen, 2004). It is also described as an attempt to explain more fully, the complexity in human behaviour by studying it from more than one perspectives, using both qualitative and quantitative data (Simuforosa and Wiseman, 2015, p.88).

For this research, quantitative data were gathered from survey to establish which of the devices used at/for work employees are most satisfied with (see Chapter 6). Yet, there is a need to position these quantitative data within the context of participants' reasons for being mostly satisfied with their chosen devices. This falls within the realms of qualitative method, in which textual data from the free expressions of participants were captured and analysed. In essence, the design of this embedded pragmatic mix of methods within the same survey is influenced by the concept of triangulation, even in as much as a survey could be based on a mix of quantitative and qualitative method (Jick, 1979).

Considering that triangulation could be based on data sources, data types, researcher, theory and/or methods (Mertens and Hesse-Biber, 2012; Miles and Huberman, 1994), the methodology used in this research is largely based on the triangulation of methods. For example, having used Social Network Analysis (SNA) to measure an engaged corporate workforce, this research also studies the impacts of mobile devices and applications on the intrinsic motivation of individual employee for engagement, using a survey. Even within the survey questionnaire, there are questions that allow for free text responses which provide further contexts and insights to multiple choice and Likert scaled questions (E.g., see Chapter 6.4.3).

Triangulation has helped in establishing the veracity of the conceptual framework (see Figure 4.1) emanating from this research as well as the findings and recommendations (Mertens and Hesse-Biber, 2012). This approach has also resulted in a fine-tuned articulation of the research question as extended in Section 1.2.1.

An overview of triangulated research methods employed throughout this research is visually depicted in Figure 3.1.

The next section discusses the individual research methods shown in Figure 3.1, together with their indications within the thesis.

3.2 Research Methods

With reference to the research questions in Chapter 1.2, Table 3.1 on page 41 presents a mapping of the research questions with the research methods used in this research. As indicated in Table 3.1, resolving each research question requires more than one research methods. Also, a research method could be used in resolving more than one research question. For example, *literature review* cuts across the entire research questions — from the overarching research questions through the extended research questions. *Social Network Analysis (SNA)*, *Case Study*, as well as *Texual/Data Analysis* all cut across both Extended Research Questions 1 and 2.

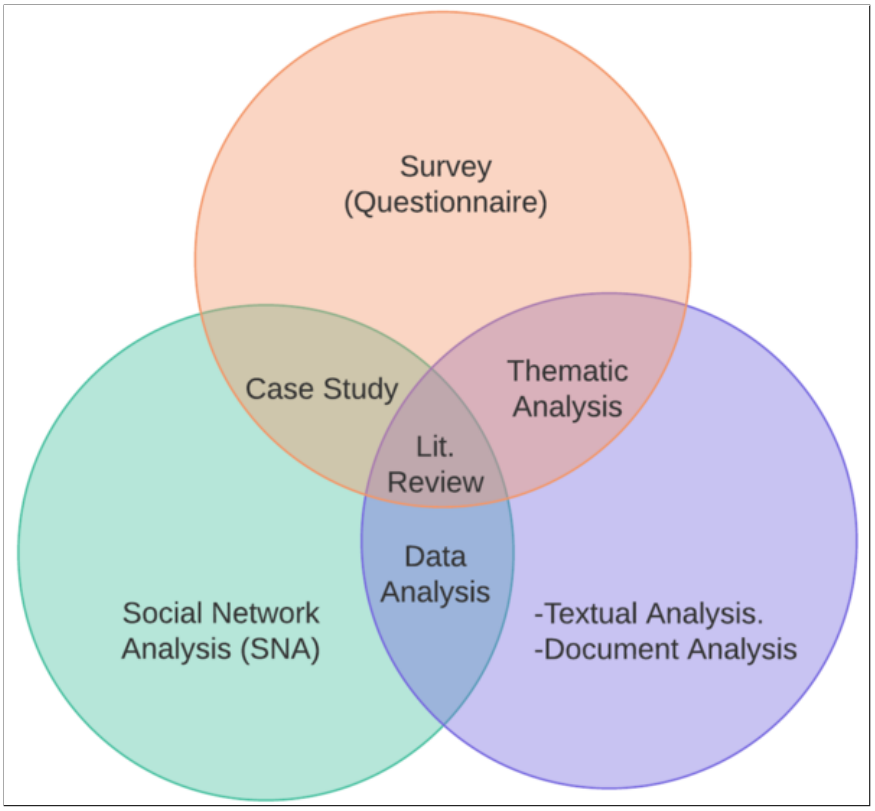

FIGURE 3.1: An Overview of Triangulated Research Methods

Table 3.1: A Mapping of Research Questions with Research Methodology/Methods

Research Questions		**Research Methodology/Methods**	*		
Overarching Research Question	*How Can Social Media Platforms like Twitter Deliver Knowledge Management Value to Corporate Organisations?*	Triangulation technique of Mixed Methods approaches, as guided by the pragmatic paradigm of research. Informs the articulation of the extended research question as well as the choice of research methods to address the questions;			
Extended Research Question 1	*What is an appropriate social framework for delivering KM values?*	Document Analysis; Thematic Analysis Conceptual framework		***S.N.A./Textual/Data Analysis***	***Literature Review***
Extended Research Question 2	*What are the intended outcomes from social media by which KM values can be measured?*	Knowledge Discovery; Textual/Data Analysis Social Network Analysis (SNA)	***Case Study***		
Extended Research Question 3	*What are the impacts of mobile devices and social applications on employee engagement?*	Survey; Thematic Analysis SNA			

Table 3.2 is an indication across this thesis, of methods highlighted in Figure 3.1 and Table 3.1.

TABLE 3.2: Indications of Research Methods

Methodology	Indication
Literature Review	Chapter 2 & Entire Report
Document Analysis	Chapters 2.8.2 & 2.10
Conceptual Framework	Chapter 4
Thematic Analysis	Chapter 6.4.3
Case Study	Chapter 3.2.5
Knowledge Discovery	Chapter 5.2
Textual/Data Analysis	Chapter 5.2.4
Survey Questionnaire	Chapters 6.1 & 6
Social Network Analysis	Chapters 5.6.1

The next subsections describe each methods adopted as they evolve within the course of this research. The three main dimensions of methodological triangulation used in this research are literature review, case study and data analysis. As can be seen in Figure 3.1, they are the conduits that run through other research methods adopted.

3.2.1 Literature Review

The literature review is a search and evaluation of the available literature in a given subject or chosen topic area (Royal Literary Fund, nd), and it represents the foundation for information systems research (Webster and Watson, 2002).

There are different type of literature review: integrative reviews, systematic reviews, meta-analyses, and qualitative reviews. In alignment with this research's overarching mixed method research approach, the literature review adopts an integrative method as it is the only approach that allows for the combination of diverse methodologies (Whittemore and Knafl, 2005).

As stated earlier, the *Literature Reviews* is one of the three main conduits that connect the entire thesis. The literature review began with a structured search for relevant literature for knowledge management publications published between 2004 and 2016, as described in Chapter 2.8.2. The literature indicates how that the volatility of knowledge management, within the context of the complexity and dynamism of the technological trends that are shaping it, has resulted in fragments of divergent views about the future direction of KM, by different authors. These divergent views in the literature were harmonised in this research (see Chapter 4.1), resulting in a convergence of the basic

elements of the conceptual framework (see *EMSoD* in Chapter 4.3), which is a major research output presented in this thesis.

3.2.2 Document Analysis

Bowen (2009) describes *document analysis* as a qualitative research method that involves a systematic procedure for reviewing or evaluating both print and electronic documents. This is aimed at using the documents as data source for some research outputs that are not created on the basis of data collection (Seuring and Müller, 2008).

According to Bowen (2009), the analytic procedure entails finding, selecting, appraising (making sense of), and synthesising data contained in documents. For this research, a total of 160 knowledge management documents were analysed. The process of finding, selecting and synthesising these documents are described in Chapter 2.8.2, and, in accordance with Labuschagne (2003), as cited by Bowen (2009), "document analysis yields data— excerpts, quotations, or entire passages— that are then organised in to major themes, categories,and case examples specifically through content analysis". *Content analysis* is a qualitative method that runs as theme across document analysi, textual/data analysis and thematic analysis methods, as described in Section 3.2.7.

The word cloud in Figure 2.3 of Chapter 2 is an output from the data yielded by the document analysis, which also serves as an input to the process of developing the conceptual framework in Chapter 4.

3.2.3 Conceptual Framework

Shields and Rangarajan (2013) define a conceptual framework as "the way ideas are organised to achieve a research project's purpose". This is in so far as *conceptual framework* is viewed from an academic research perspective where it provides some direction for the researcher before and during the research by mapping out what to cover, who to consult and why (Miles and Huberman, 1994). However, in the spirit of pragmatism, as discussed in Section 3.1, the conceptual framework in this research has been developed from the business perspective, as described by the Business Dictionary:

> "A theoretical structure of assumptions...that hold together the ideas comprising a broad concept".

For example, in an attempt to resolve the differences among entrepreneurs and among their ventures, Gartner (1985) developed a conceptual framework for describing new venture creation. This is analogous to *Financial Times's* definition of conceptual framework as "a theory of accounting prepared by a standard-setting body against which practical problems can be tested objectively" (Financial Times, nd).

In essence, the *EMSoD* framework developed from this research was not meant to provide direction for the research but attempted to put together a theoretical structure of assumptions that hold together the proposed solution to a business problem, which is ultimately aimed at redeeming the image of knowledge management and re-positioning it for value within the context of current social media trends. The detailed method employed in the making of the conceptual framework has been an iterative process between four phases, as described in Chapter 4.2.1. However, there is no formal constraints on the order of inter-relatedness of variables within each element of the EMSoD structure. Such formal constraints on the inter-relatedness of variables can only be tested and validated with a *model*, and not a framework. The operationalisation of such constraints within a corporate software is a developmental research area to which this research could be extended, with the *emergent conceptual model* from this framework, as presented in Chapter 4.5.

3.2.4 Thematic Analysis

Thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within data through a 6-phase process from familiarisation with the data to producing report based on established meaningful pattern within the data set (Braun and Clarke, 2006; Fereday and Muir-Cochrane, 2006). As mentioned in Section 3.1.2, there is a need to position quantitative survey data within the context of participants' reasons for being mostly satisfied with their chosen devices. This falls within the realms of qualitative method, in which textual data from the free expressions of participants were captured and thematically analysed, through a rigorous process of iteration around the six phases (Fereday and Muir-Cochrane, 2006), from familiarisation with the data through the generation of initial codes to the identification of the prominent themes within the data set. This was aided by the use of *NVivo*, a software tool for qualitative data analysis, which is used in filtering responses against each of the devices. The detailed method of thematic analysis used is described in Chapter 6.4.3, while Figure 6.6 is a direct output of the thematic analysis process, showing the prevalent themes that run across the participant's reasons, as supplied within the data set.

3.2.5 Case Study

The *case study* is defined as an empirical inquiry that investigates a contemporary phenomenon — which could be an entity, an individual or even a unit of analysis — within its real life context, using multiple sources of evidence or the relationship between a limited number of events/conditions (Zaidah and Zainal, 2007; Yin, 2006). It is worth noting the emphasis of *case study* on a particular issue, feature or unit of analysis rather than being a study of the entire organisation (Noor, 2008). Despite its criticism for

being less generalisable, case study based on critical case can be generalised on the basis that a proposition that is valid for one case can be valid for one — or many — cases (Flyvbjerg, 2006). It is on this basis that a medium-scaled organisation is selected as the most likely suitable case for studying how small and medium-scaled enterprises (SME) could exploit knowledge discovery from social media data, using Twitter, the micro-blogging platform. The detailed methods and processes for selecting the case of Twitter and the SME are discussed in Chapters 5.2.1 and 5.2.2, respectively.

The University of Southampton used in social network analysis, and whose employees constitute the target population for the survey presented in Chapter 6 is also a critical case, as findings from its data can be generalised to other Universities where participants share similar characteristics (education, middle class). These characteristics are also generalisable across the United Kingdom, a country that has seen an upsurge in the number of the middle class above the lower, working class (Arnett, 2016).

In addition to the above, the *case study* is also implied as one of the mixed methods used for *Social Network Analysis* as indicated in Chapter 5.6.1 which involves a study of the University of Southampton's (@unisouthampton) Twitter network. This is also true for the recruitment of participants for the survey questionnaire that studied the impact of mobile devices and mobile (social) applications on employee engagement (see Chapter 6.3). The implication of the case study in analysing the survey data is that it allows for further depth in the understanding of participants' responses (for example, through a thematic analysis of participants' free text responses). This is in consonance with Zaidah and Zainal (2007) who assert that, "case study allows the analysis to go beyond the quantitative statistical results and understand the behavioural conditions through the actors perspective".

3.2.6 Knowledge Discovery

Knowledge discovery is a superset of *data mining*. This assertion is based on Fayyad *et al's* (1996) description of knowledge discovery in databases (KDD) as "the overall process of discovering useful knowledge from data" while data mining refers to "a particular step in this process." The main thrust of the process [of knowledge discovery] is the application of specific data mining techniques for pattern discovery and extraction, in which *knowledge* is the end product of such data-driven discovery. This is also an assertion by Fayyad *et al.* (1996), who further describe knowledge discovery as computational theories, methods and tools to assist humans in pattern discovery and extraction of useful information (knowledge) from the rapidly growing volumes of digital data.

Social media have been identified as major sources of the 'rapidly growing volumes of digital data' (Zikopoulos *et al.*, 2012). As such, Twitter data was gathered on the basis of domain-driven data mining, using categorical keywords of interest to the case study

organisation's business domain. The data mining technique for knowledge discovery used in this research is based on the principle of reducing large amounts of data for ease of processing, as, only a handful of an enormous amount of data may contain the valuable and actionable knowledge that propels an organisation towards strategic competitive advantage (Liao and Triantaphyllou, 2008, pg.5). The technique also includes the use of three methods from *Tweepy*, a Twitter Python library. They are OAuthHandlers, Stream and StreamListener. The gathered Twitter data (approximately 150,000 tweets) was parsed in JSON (JavaScript Object Notation - A lightweight data interchange format) for structure and analysis with Dataframe method of Pandas, another Python library. A detailed description of the methods and processes, as they evolve towards knowledge discovery, is contained in Chapter 5.3.

3.2.7 Textual/Data Analysis

Although social media generate a variety of data types in multi-media formats, Twitter, as a micro-blogging platform, enables expressions in free text, which is why the bulk of its data are textual. Making sense of textual data requires *content analysis* technique by which the researcher explores textual data with a view to grouping together similar types of utterances and ideas, aimed at identifying key issues in the data (Burnard, 1996). *Content analysis* is the process of organising information into categories related to the central questions of the research (Miles and Huberman, 1994). Miles and Huberman also recognise content analysis as the intersection point between *thematic analysis* (see Section 3.2.4), *document analysis* (see Section 2.8.2) and *textual data analysis*.

The textual Twitter data harvested for the investigation of knowledge discovery from social media data in this research were categorised in accordance with the *content analysis* technique, as presented in Chapter 5.3.

3.2.8 Survey Method

The *survey* is used in gathering relatively small amount of data from a relatively large sample of people from a target population to make some inference about the wider population (Kelley *et al.*, 2016).

The rationale for the survey and the actual questionnaire used as survey instrument is described in Chapter 6.1. Also, the detailed method and process of framing the survey questions and recruiting the survey participants are highlighted in Chapters 6.2 and 6.3, respectively.

3.2.9 Social Network Analysis

In consonance with the principles of triangulation as discussed in Section 3.1.2, frequency of access and usage of an organisation's social network within a *managed platform* (see Chapter 4.3.1), in addition to the employees social contributions, could be studied as a measure of their engagement. Not only would this relieve employees of the burden of responding to surveys, (Baesens, 2004, p.180) assert that it is also acceptable to use analytic techniques to extract information linked to the users' interaction where it becomes infeasible to conduct an engagement survey traditionally.

The use of traditional survey method (as reported in Chapter 6) notwithstanding, the main thrust of social network analysis method used in this research is for a detailed examination of the structure of the social network and its effect on the engagement of actors (people) within the network, where the structure is considered to be more important than the individual actors (Keenan and Shiri, 2009). A detailed description of this method and process, which involve the identification of two network types — the *topical network* and the *structural network* — is presented in Chapters 5.6.1 and 5.6.4.1.

Moreover, statistically studying frequency of access and usage of an organisation's social network entails quantitative data analysis. However, quantitative data are more restrictive while qualitative data allows for methods used to interpret meaning of network diagrams and measures (Coviello, 2005). Also, Coviello (2005) further argues that networks are both structure and process at the same time, and therefore evade simple categorisation as either quantitative or qualitative phenomena. This is why the social network analysis in this research has been approached not only from a quantitative but also from a qualitative perspective. This is evident in the attempt made at creating an understanding of features and limitations of the *topical*, and, the *structural* Twitter networks, as presented in Sections 5.6.2 to 5.6.4 of Chapter 5.

3.3 Chapter Summary

This chapter provides a justification for the pragmatic approach to the techniques of mixed methods used in this research. The *trickle down effects* of the overarching research methodology on the entire research methods, as well as the indicative use and implications of the individual methods, are highlighted from a topic-based perspective. This is closely aligned with the non-linear development of the narratives in this thesis.

Chapter 4

The Conceptual Framework

4.1 Background

Some key issues were identified in the Research Motivation and Problem Space discussion in Chapter 1.1 and in the Literature Review in Chapter 2. These include the fact that KM is becoming a lacklustre concept, in terms of its application as a strategic management tool (Griffiths and Moon, 2011) and the perceived tension between KM and Social Media (Ford and Mason, 2013a). Griffiths *et al.* (2015) also conclude in their 2015 Global Knowledge Management Observatory report, that KM need to reposition itself and deliver measurable values if it is to remain relevant in organisational strategic planning and positioning. This is against the backdrop of the criticism for the lack of a measurable value, which resulted in the image problem KM faced, despite its overselling by vendors and consultants in the 1990s.

This research had been motivated by the need to proffer pragmatic solutions to the persistent problems of KM rather than fanning the flames of a new set of concepts like Enterprise 2.0 (McAfee, 2006), which may soon become "tired" and in need of a newer set of concepts for vendors and consultants to "oversell". Also, rather than appearing despondent about the future of KM as some KM experts like Davenport (2008) were quick to be about a decade ago, the framework propounded in this thesis, adopts a pragmatic approach in establishing itself behind KM as a sustainable concept and a viable field of practice for which mobile devices and social media are available as new technological tools.

Moreover, the GKRN research mentioned in Section 1.1, identifies the challenges of KM in delivering measurable value for business but it fails to suggest ways in which KM can deliver this value. Even the latest Knowledge Management Observatory as propagated by Griffiths *et al.* (2015) highlights the gloomy state of KM wherein KM activities are technology-driven rather than being people-driven. The report also highlights the

importance of measurable value of KM to organisation but does not delve into what could constitute *measurable value*.

In view of the above, this work postulates a rudimentary conceptual framework (Miles and Huberman, 1994) (See Figure 4.1), which, when fully strengthened, will lend credence to KM as a sustainable field of practice, in spite of an increasing social media ascendancy and the want of a measurable value.

4.2 Harmonisation of Literature

With regards to the image problem suffered by KM in the 1990s (Bolisani and Handzic, 2015), there has been an increasing effort by KM consultants and academics, since the 2000s, to explore how the growing trends of enterprise mobility — as manifest in the surge in mobile devices and applications — can be exploited for corporate Knowledge Management. This is evident in Knowledge Management literature, which abounds with issues and concerns about Enterprise Mobility (see Chapter 2.8.2).

Moreover, the conceptual social framework emanated from a synthesis of a wide range of literature. In Table 4.1, this thesis presents an associative classification of literature that have been harmonised in formulating the conceptual framework. This is in order to help the reader in quickly establishing, from the literature, the provenance of the basic elements of the conceptual framework. Although in-exhaustive, the first column of Table 4.1 presents a list of literature upon which the development of a conceptual framework is justified while the other five columns are some literature that inform the basic elements of the conceptual framework.

TABLE 4.1: Harmonisation of Literature

Rationale for a Conceptual Framework	Managed Platform	Social Media	Knowledge Discovery	Tacit Knowledge	KM Value
Griffiths and Moon (2011), Griffiths *et al.* (2015), Delic and Riley (2009) Bolisani and Handzic (2015), Ford and Mason (2013a), McAfee (2006), Davenport (2008), Ford and Mason (2013b), Turban *et al.* (2011a), Shadbolt *et al.* (2013), Lamont (2012) Burégio *et al.* (2013) Bradley and McDonald (2011)	Mallis (2009), Piccoli (2008), Dalmeyer and Tsipis (1997) Hitchcock (2012), Sorensen (2011), Kietzmann *et al.* (2013) Davenport (2008), Zikopoulos *et al.* (2012), Moore (1998), Griffiths and Moon (2011), Microsoft (2015), Enterprise Mobility Exchange (2015), Enterprise Mobility Exchange (2016)	Adetunji and Carr (2016b), Tiropanis *et al.* (2015), Zeng (2014), Cabiddu *et al.* (2014), Razmerita *et al.* (2014), Smart and Shadbolt (2014), Ford and Mason (2013b), Ford and Mason (2013a), Guy *et al.* (2013), Soto-Acosta *et al.* (2013), White (2013), Tardanico (2012), Fischer and Reuber (2011), Miller *et al.* (2011), Haefliger *et al.* (2011) Sousa *et al.* (2010), Kaplan and Haenlein (2010) Keenan and Shiri (2009), Sankar and Bouchard (2009), Delic and Riley (2009), Davenport (2008), McAfee (2006), O'Reilly (2005)	Adetunji and Carr (2016b), Shadbolt and Smart (2015) Fang (2015), Guy *et al.* (2013), Lamont (2012), Chen and Huang (2012) Falls (2012) Zikopoulos *et al.* (2012), Peinl (2011), Miller *et al.* (2011), Lin and He (2009)	Turban *et al.* (2011b), Alavi (1999), Nonaka and Takeuchi (1995), Connelly *et al.* (2013), Carr and Harnad (2011), Davenport and Prusak (1998) Littlejohn and Margaryan (2013) Drucker (1994) Haslinda and Sarinah (2009), Zikopoulos *et al.* (2012), Schumaker (2011), Ackoff (1999), Chou (2005), Bellinger *et al.* (2004), Hijikata *et al.* (2007), Terra and Angeloni (2003)	Adetunji and Carr (2016b), Bolisani and Handzic (2015), Griffiths and Moon (2011), Ford and Mason (2013a), Delic and Riley (2009), McAfee (2006), Koller (1994), Edvinsson and Malone (1997), Gruman (2007), Becerra-Fernandez and Rajiv (2001), Porter (2010), Marr (2014), Kumar *et al.* (2014)

4.2.1 The Making of the Conceptual Framework

Arriving at the conceptual framework has been an iterative process between four phases, as described in this section:

1. In phase one, the document analysis of 160 KM literature described earlier (see Chapter 2.8.2) serves as an initial input in the construction of the framework. This involves identifying a wide range of terms and concepts within enterprise mobility, social media, and Knowledge management, which are the core concepts of the research title. These were then scaled down to pervading concepts of relevance and concerns to different schools of thoughts — from those who question the continued relevance of KM in the face of Social media ascendancy, to those who still criticise KM for its want of measurable value. The aim was to arrive at a short list of concepts that would serve to mediate between KM and Social media, while keeping an outlook for a framework that delivers KM value to corporate organisations.

2. Phase two involves a process of consolidating into sub components, the pervading concepts of relevance and concern, as identified in phase one above. For example, "explicit knowledge" was consolidated within "tacit knowledge". This is because "tacit knowledge" is already a core element, and, one of the main challenges of KM is the conversion of tacit knowledge to explicit. Understanding and appreciation of the embedded tacit knowledge within its workforce is sufficient in making organisations realise the potentials for social media to help in overcoming the challenge of tacit -to- explicit knowledge conversion. This phase leads to an initial list of seven core components, which originally included: (1) EMM, (2) Tacit Knowledge, (3) Knowledge Discovery, (4) Social Media Data, (5) Cloud Computing, (6) Information Security, 7) KM Value. Then, this was taken for a series of informal consultations for feedback from KM and Social Media scholars from within the university as well as those met at conferences.

3. The feedback from phase two serves as input to phase three, which involves a process of manoeuvring that reduced the list of seven shortlisted core elements into five: (1) Managed Platform, (2) Tacit Knowledge, (3) Knowledge Discovery, (4) Social Media, (5) KM Value. For example, 'social media data' is a distinct element from 'social media', as one can be utilised without the other. This research has demonstrated how a SME utilised public social media data for its own competitive advantage even when not actively present on the social media platform concerned. The scope of the framework was reduced to be manageable and delineated by removing the elements of Security and Cloud Computing. This prevents the framework from being bloated than manageable.

4. In the final phase, the core elements and sub-elements are fine-tuned and aggregated. The inter-relatedness of each element is determined and it is decided that KM Value should be at the core, since it should be the ultimate aim of any KM effort. The framework was finally determined and presented diagrammatically in a way that describes the loose inter relatedness of the concepts, with KM Value at the centre and everything else contained within a Managed Platform. The cyclical presentation of the diagram highlights the iterative interaction between the elements in the process of tacit to explicit knowledge conversion, generating KM value.

4.3 EMSoD - The Conceptual Framework

This section presents **E**nterprise **M**obility and **So**cial **D**ata (EMSoD) as a conceptual framework for using enterprise mobility and social data analytics as leverage for corporate knowledge management, with a description of the basic elements of the framework as shown in Figure 4.1. The framework is presented cyclically to emphasise their interdependence and that changing one element has an impact on other elements and might reduce the capability for the framework to deliver the intended KM value at its core, and that it is necessary to review all of the elements of the framework and not just one or some of them.

4.3.1 Managed Platform

This framework supports the vision of a knowledge social machine, which serves as a leverage for the flow and conversion of tacit knowledge on existing social interactions within the boundary of the organisation, as defined by its enterprise mobility strategies. This social machine has the organisation's workforce as its user base, using their own devices (BYOD) or using the company-owned devices that have been personally-enabled for them (COPE). With BYOD for example, the choice of the brand, functionality and installed apps are entirely that of the employee and, as discussed in Chapter 2.8.4, when these devices are allowed to be used to access the corporate data from anywhere the employee may be, it exposes the organisation to the risk of compromise of the privacy and security of its corporate data. Also, because there are as many different devices as there are employees, the organisation is faced with the challenge of how to integrate these disparate devices into a platform for ease of support and interoperability. To mitigate against these constraints of privacy, security and interoperability, there is need for the organisation's enterprise mobility strategy and social media data to be contained within a managed platform, where all mobile processes, technologies policies and people converge, as illustrated in Figure 2.5.

4.3.1.1 Enterprise Mobility Strategy

> "*Given the plethora of devices, operating systems, solution providers and overall mobility commoditisation, how will technology leaders meet their employees needs and offer mobile access to corporate system, data and information they crave, in order to maximise the potential for productivity and the competitive advantage that follows?*" (Enterprise Mobility Exchange, 2016)

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The above quote is from Mihaela Biti, the Programme Director of *Enterprise Mobility Exchange*, in her *Foreword* on the Enterprise Mobility Exchange (2016) as reported by the company, following a global survey. The report shows that the bulk of the respondents are IT, Mobility and Technology workers, an industry where mobility is already widely embraced. Also, about 30.1% of the respondents have their operations globally, which presupposes they would have to mobilise, anyway. The mobility agenda for these enterprises are largely for automation aimed at operational performances and not for the facilitation of social interactions among employees. For example, when UPS successfully introduced the handheld Delivery Information Acquisition *mobile* Device (DIAD) for their drivers in 1991 (Mallis, 2009), the question arose as to whether the next move was for customers to be able to quickly look and see real-time location of their driver and contact them directly. An answer to this question is FEDEX Mobile Solutions which allows customers to conveniently track their shipments, find the nearest FedEx station or drop-box, etc. An enterprise mobility strategy that is geared towards simple automation with mobile devices is good for enhancing operational efficiency of an enterprise. Of course, this is a source of competitive advantage, but only up to the point where they are unique to the company and as such, cannot easily be replicated (e.g., the Walmart Satelite investment (Dalmeyer and Tsipis, 1997)).

However, the consumerisation of mobile devices has meant that the competitive advantage that a company derives, if any, from automation or implementation of mobile solutions will soon erode when competitors have adopted the same or similar solutions. In essence, a true competitive advantage is attainable when businesses and organisations proceed to the second - and third - order of organisational change, which are to *informate* and *transform* as highlighted by Piccoli (2008).

Therefore, the focus of this research is on mobile applications and devices that facilitate social interaction among employees from which organisational knowledge could be gained. Such mobile devices as smart phones and tablets as well as the mobile applications like social media that they enable, which are in turn, enablers of social interaction within the organisation.

KM based on the management and facilitation of these social interactions is potentially able to propel organisation to strategic competitive advantage, especially in this era of knowledge economy where social media is playing a crucial role.

Technically, custom-made mobile devices for single applications like those used in the FEDEX and UPS examples can not be integrated with social interaction as the limitation of their design and capabilities precludes this. Therefore, employees cannot be expected to bring their own (BYOD), neither could they be expected to choose (CYOD) or have company's devices personally enabled (COPE) for them. Nonetheless, the newer technological trends of smart phones are already being used for the same functions, which means, delivery drivers can track and manage their delivery on their smart phones while also using the smart phones to interact with their colleagues on social media. They can, for example, tweet their locations or ask for direction and get immediate response from colleagues. On the same smart phone, they could make/receive calls to/from friends, family or colleagues or even interact with friends and family through social media on the smart phones. These are healthy for work life balances (Fleck *et al.*, 2015; Nam, 2013), which results in a satisfied work force that is motivated to engage in social interaction and as such, knowledge sharing. This is altogether a function of the flexibility of the enterprise mobility management strategy (see Section 2.8.4) adopted by the organisation. If the organisation's mobility strategy is aimed only at operational efficiency without the facilitation of social interaction, then the organisation may not be able to reap the benefits in employee insights and knowledge for its strategic competitive advantage.

Meanwhile, the findings from both 2015 and 2016 Enterprise Mobility Exchange (2015, 2016) would have been sufficient for understanding the current state of Enterprise Mobility. However, as stated earlier, the mobility concentration of the survey is predominantly geared towards enterprise mobility strategies that are inclined towards process automation. The respondents are also predominantly comprised of those for whom IT, technology and mobility are an essential part of their job roles (e.g., those who are in the business of developing mobile applications or selling mobile devices). Since this research is concerned about such enterprise mobility agenda as facilitates the social interaction that exists within an organisation, a survey has been designed and administered with the aim of understanding the impact of these mobile devices and applications on social interaction, employee engagement and knowledge sharing. A sample of the survey is available in Appendix A while its findings and results are presented in Chapter 6.

4.3.2 Tacit Knowledge

Inherent in humans is a *tacit power* by which all knowledge is discovered, and this propels an "active shaping of experience performed in the pursuit of knowledge" (Polanyi, 2009). This framework places more emphasis on the externalisation of tacit knowledge, which, it is believed, has become the more dominant element of the widely known Nonaka's

model of knowledge conversion (see Figure 2.2). This is due to the impact of the current trends of mobile devices and social media which allow an uninhibited externalisation of thoughts even on the spur of the moment (Zikopoulos *et al.*, 2012), except where the inhibiting factor is the individual motivation. Three sub-components are identified for consideration within the *tacit knowledge* element of the framework:

1. 'Externalisation' Driven by Individual Motivation

   The distinction between data and information is a given, from Computer Science and Information Systems perspectives (Langefors, 1987). However, Information is often used interchangeably with Knowledge, albeit erroneously. Davenport and Prusak (2000) have gone a step further in attempting to create an understanding of data and information as necessary tools [or resources] for knowledge, discarding the notion that knowledge is data or information. Ackoff (1999), Schumaker (2011) and Bellinger *et al.* (2004) all agree on a DIKW (Data-Information-Knowledge-Wisdom) pyramid, which describes the configuration of data, information, knowledge and wisdom while Terra and Angeloni (2003) attempt to highlight the important differences between knowledge management and information management. It is because of the explicit nature of information that it has often been used interchangeably with knowledge whereas, explicit knowledge is only one side of the coin for knowledge. The other side of the coin is tacit knowledge, which people have in their minds and are not represented in an explicit way (Hijikata *et al.*, 2007) because it is highly personal and difficult to formalise (Turban *et al.*, 2011b, 478). One distinguishing factor between knowledge and information is in the disposition of tacit knowledge through its conversion to explicit knowledge (externalisation) on the one hand, and the exchange of explicitly codified knowledge on the other.

   However, unlike the spiralling movement of tacit knowledge as described by the SECI (Socialisation-Externalisation-Combination-Internalisation) model of Nonaka and Takeuchi (1995) (see Figure 2.2), this framework considers the cyclical flow of tacit knowledge between individuals within an organisation. This flow consists in each individual 'externalising' their views, opinions, sentiments and know-hows, at the spur of the moment (Zikopoulos *et al.*, 2012) as enabled by the affordances of social media and mobile devices like smart phones and are supported by the current social interactions that exist within the organisation. Having established engagement as a measurable value for organisations, the measurement of engagement is hinged upon the analysis of the social network that serves as the platform for the social interactions that exist within the organisation. The thesis in this work is in the potential for a vast amount of data being generated by this social interaction, and from which actionable knowledge of value for the organisation can be discovered.

2. Subsumption of SECI Model

Chou (2005) categorises KM processes into knowledge learning and developing phases. The main task in the knowledge learning phase is to learn new knowledge and increase employees' tacit knowledge from other tacit knowledge *(Socialisation)* or explicit knowledge *(Internalisation)*. The main task in the knowledge developing phase is to develop new knowledge by transforming tacit knowledge into explicit knowledge *(Externalisation)* or by combining explicit knowledge with other explicit knowledge *(Combination)*. In as much as tacit knowledge remains the conduit that connects both phases, the main thrust of this framework is to determine how the KM process can add value to organisations by enhancing tacit to explicit knowledge conversion within the construct of new technological trends of social media and enterprise mobility. This implies that this study is mostly concerned with the impact of the new technological trends of social media and enterprise mobility in supporting the "externalisation" pane of SECI model.

As far as this researcher is aware, this is the first framework that subsumes an aspect of the SECI model into current technological circumstances. By the same token, this is the very first attempt at positioning an engaged workforce as the nucleus of an organisational knowledge creation process.

Argyris (1987) argues that socialisation results in what he calls organisation defensive routines with which most individual employees behave consistently even as the individuals move in and out of the organisation. He concludes, therefore, that "because the actions used to create or to trigger organisational defensive routines are used by most people, their use cannot be attributed primarily to individual psychological anxiety". In as much as knowledge conversion occurs when individual employees cooperate voluntarily in the process based on their own intrinsic motivation (Böhringer and Richter, 2009), the organisational culture would determine how this cooperation would engender positive knowledge sharing experience (Sousa *et al.*, 2013). In supporting the externalisation and combination stages of SECI model, Hijikata *et al.* (2007) observes the availability of knowledge acquisition methodologies for expert systems, discussion support systems or groupware in stimulating people's interaction. "However, these methods do not support the people's real-time discussion for knowledge acquisition", notes Hijikata *et al.* (2007). Mobile devices and social media trends enhance real-time discussion and as such require a new methodology in enabling them to support knowledge acquisition (Zikopoulos *et al.*, 2012).

3. KM Process within New Trends

   The tacit knowledge that exists within the socialisation pane of SECI model cannot be converted to explicit knowledge if it existed solely at this pane, and therefore would not be usable except in an apprenticeship or a mentoring situation (Chou, 2005). As mentioned above, one of the the main thrusts of this framework is in how

social media and enterprise mobility support employees in externalising their tacit knowledge in such a way that shared knowledge is created through a combination of the explicit knowledge thus created with other explicit knowledge.

This framework subsumes the entire SECI model into the externalisation of individuals' tacit knowledge which is enhanced by the Enterprise Mobility strategies of the organisation coupled with the freedom of spontaneous expression offered by social media (Zikopoulos *et al.*, 2012). Social media tools like blogs and wikis, in addition to platforms like Twitter and Facebook, constitute the new technological trend with which KM must contend and subsist if it were to remain relevant (Ford and Mason, 2013b; Guy *et al.*, 2013; Sousa *et al.*, 2010)

It is worth noting that existing methodologies in Computer Science do not sufficiently support the SECI model of knowledge conversion (Hijikata *et al.*, 2007), especially in this new era in which IT has revolutionised the world (Sousa *et al.*, 2013). Therefore, this framework is all about repositioning KM in a way that it delivers measurable value to organisations within these new trends.

4.3.3 Social Media

Although, they are becoming increasingly disruptive to organisational structures and processes, social media have become viable sources of data from which corporate organisations can discover knowledge and insights for their strategic competitive advantage (see Chapter 5.2.

Social media are the collection of adaptable, scalable Web-based tools and technologies that facilitate the creation and sharing of user-generated contents (Fischer and Reuber, 2011; Kleek and O'Hara, 2013). Cabiddu *et al.* (2014) describe them as "browser or mobile-based applications that allow users to easily create, edit, access and link to content and/or to other individuals.". "Perhaps the best definition of social media, though, is content that has been created by its audience", posits (Comm, 2010). They include blogs, wikis and other social networking platforms like Facebook and Twitter (McAfee, 2006; Sousa *et al.*, 2010; Guy *et al.*, 2013; Ford and Mason, 2013b; Razmerita *et al.*, 2014), and collaborative platforms like Myspace,Wikipedia, Ushahidi and Galaxy Zoo (Kaplan and Haenlein, 2010; Smart and Shadbolt, 2014). Although, their origin can be traced back to the era of "*weblog*" which coincided with the creation of "*Open Diary*" which brought together online diary writers into one community in the sixties, they have become a popular trend that have become interest to any company (Kaplan and Haenlein, 2010). Wikis are good for preserving the organisation's memory while social networks like Facebook and micro-blogs like Twitter are helpful in expertise identification and location within the organisation (Miller *et al.*, 2011). When it comes to including customer insight in an organisation's social media strategies as suggested by Zikopoulos *et al.* (2012), forums and message boards are probably the most common platform

for questions and answers about products and brands (Falls, 2012), and can as well be included as a constituent source of external (public) social media — in addition to micro-blogging platform like Twitter — that serve as external data source to the social data within the organisation's managed platform. Following is a discussion of the three main sub-components of the "Social Media" element that are identified within the EMSoD framework:

1. Social Interactions on Social Media

   Despite the media richness and "lifelike immersive world" that some social media platforms like *Second Life* provide, interactions on social media still cannot be as effective as face-to-face interactions (Ford and Mason, 2013b), which has traditionally been the means of knowledge creation and transfer (Alavi, 1999, pp. 7). In fact, there has been a number of criticisms with regards to the authenticity of the interaction and communication exchange over social media. One example put forward by Tardanico (2012) is the story of a daughter who attempted suicide while in an actual state of distress whereas, she was at the same time using smiling emoticons and positive expressions to communicate a state of happiness to her mother. Perhaps this is why White (2013) believes that social media allows "*individuals to put on masks and hold up shields*". Yet the common denominator between all the Web-based social media tools and platforms is their ability to facilitate social interactions and conversations between people (Zeng, 2014; Cabiddu *et al.*, 2014; Fischer and Reuber, 2011; Keenan and Shiri, 2009; McAfee, 2006). Moreover, it is not unusual for this online social interactions to extend even to face-face interaction, as it is found by Fischer and Reuber (2011) where a survey participant comments that:

   > " ...A lot of these people I have engaged in an online fashion have become part of our offline social functions and I formed real relationships with many. Hundreds of people: my network exploded... it grew exponentially and it's through Twitter. It's through connecting with people. They find me. They reach out to me or I find them. I reach out to them. And we engage in ongoing conversations online, meeting up sometimes offline. These are real relationships."

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   In understanding the nature of social interaction on social media, Keenan and Shiri (2009) have aptly and succinctly provided some operational definitions of the following terms, which are reproduced here, with kind permission from the publishers (See Appendix H):

   (a) Sociability

The ability to interact with others, or to socialize... Websites use features, design standards or technologies to encourage sociability. For example, an online dating website uses profiles to encourage users to interact with other users. Or, a blog with user comments allows readers to respond to a topic and socialize with both the author and other readers.

(b) Social network theory

An interdisciplinary theoretical lens that emphasizes the relationships between actors (or users) within the network [wherein] the structure of the network is understood to be more important than the individual users... Social network theory, also called social network analysis (SNA), examines how the structure of a network affects users within the network.

(c) Social networking sites

Websites that encourage social interaction through profile-based user accounts. Social networking sites are commonly defined as Web 2.0..., meaning they mimic desktop applications. Popular social networking sites include Facebook and MySpace.

(d) Social websites

Websites and web technologies that promote socialisation online. This term encompasses social networking sites as well as more traditional social web technologies including bulletin boards, message boards or web-based chat rooms. This will be the primary term used in this work to describe social networking websites.

2. Folksonomy

Folksonomy is a term coined as a linguistic contraction of *folk*, which informally refers to "people in general" (Wal, 2007); and *taxonomy*, which, as a formal system of structured classification of things and concepts, arose as a solution to the paramount problem in information management and retrieval: lack of organisation (Avenue, 2004). Folksonomy is a practice in which individual users save/define Web contents as bookmarks/keyword in a social environment by attaching annotations in form of tags (Zubiaga, 2012).

While taxonomy is a structured, top-down tagging system which the organisation or a content creator imposed on the content for ease of retrieval and organisation, folksonomy is an informal bottom-up approach to tagging where the user assigns tags to contents depending on the system. These tags are often used to create aggregated informal classifications (or, folksonomy), and as a navigational/discovery method.

3. Social Network Analysis

"*A social network is a social structure comprised of types of interdependency between nodes. Nodes are most commonly individuals or organisations. The configuration of individual nodes into a larger web of interdependency creates a social network*", explained Keenan and Shiri (2009), who also identify the two major types of interaction that exists within the social Web as:

(a) People focused, which emphasises social interaction through user-driven personal content centred around a personal individual profile (e.g., Facebook, Twitter).

(b) Activity focused, which emphasises social interaction through site-specific content centred around a thematic focus for a website with users providing their own contributions to that specific theme (e.g., Youtube and Flickr for video and photo themes, respectively).

According to Keenan and Shiri (2009), this analysis of the social web examines people focused websites and their strategies to encourage sociability. It also entails studying the structure of the connections and relationships within a social network like Twitter with regards to the further depths and insights they provide towards the pieces of knowledge discovered from the network as suggested in Adetunji and Carr (2016b).

Using Enterprise Mobility and Social Media to Deliver Knowledge Management Value to Organisations – A Conceptual Framework

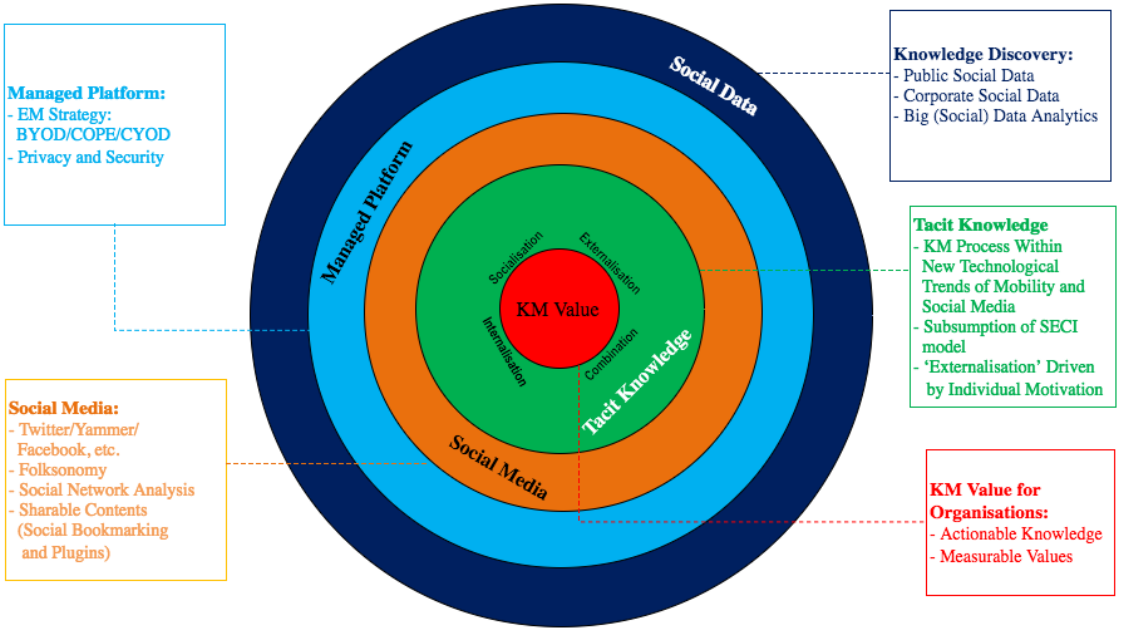

FIGURE 4.1: Enterprise Mobility and Social Data (EMSoD): A Framework for KM Value

4.3.4 Knowledge Discovery

Frawley *et al.* (1992) describe *knowledge discovery* as a nontrivial extraction of implicit, previously unknown, and potentially useful information from data. The word, *'nontrivial'* in the definition implies that a significant organisational effort must come to bear on a knowledge discovery initiative. Knowledge discovery has been a cause of significant concern for corporate organisations since the 1980s when the total number of databases in the world was an estimated five million (Frawley *et al.*, 1992). These days, with the proliferation of mobile devices and the social interactions enabled by them, there has been an exponential increase in the amount of data being produced — an amount that dwarfs the figure mentioned above. For example, the number of websites on the Internet recently passed the one billion mark (Berners-Lee, 2014).

As a result, corporate organisations are increasingly exploring and exploiting insights from the big (social) data being generated, for their competitive advantage (Adetunji and Carr, 2016b). Not only is there a need for organisations to focus on knowledge discovery from their private/corporate data, there are potential knowledge and insights to be gained from public social data as this would help organisations know their industry trends, know their environments and know their customers better (Zikopoulos *et al.*, 2012).

Therefore, knowledge discovery efforts must be geared towards exploring and exploiting both public and private/corporate data, using big (social) data analytics techniques.

4.3.5 KM Value for Organisations

A couple of decades ago, "*discounted cash flow value*" may have been the best measure of value creation available (Koller, 1994). In recent years, however, organisations have not only been regarding value in terms of the Returns on Investments, they have also been giving consideration to intangible assets — like organisational knowledge, patent and trademarks — as measures of an organisation's true value (Bueno *et al.*, 2014; Edvinsson and Malone, 1997). These indirect assets, according to Edvinsson and Malone (1997), include employee morale, customer satisfaction and innovation; and, they are poised to "*transform the nature of business transactions by establishing the real value of enterprises for all stakeholders*".

Knowledge Managers and/or CIOs have often struggled to justify IT expenditure, especially, since when IT has been viewed from a cost centre perspective. This has often resulted in intangible field of practice like KM taking the hits from budget cuts as a result of a lack of measurable value (Gruman, 2007). However, since each process of Nonaka's SECI model (from socialisation through internalisation), "is positively associated with perceived knowledge satisfaction", Becerra-Fernandez and Rajiv (2001) argue

that an organisation should focus more on perceived knowledge satisfaction rather than an objective measure of knowledge effectiveness. This is corroborated by some schools of thoughts which hold that "the recognition of its presence by informed observers will establish a value for a firm that dwarfs its balance sheet, even without a common yardstick for measuring Intellectual Capital" (Edvinsson and Malone, 1997, p. 6), and it is against this backdrop that Martín-de Castro (2014) proposes the intellectual capital based view (ICBV) of the firm, which organises the firm's intangible assets into the *human capital, organisational capital* and *social capital* within the Intellectual Capital concept.

Moreover, with regards to value being defined as outcomes relative to cost, cost reduction without regard to the outcome achieved is dangerous and self-defeating, according to Porter (2010), who concludes that, outcomes, which are the numerator of the value equation, are inherently condition-specific and multidimensional. This position is strengthened by the NAO's (National Audits Office) definition of Value for Money (VFM): "Good value for money is the optimal use of resources to achieve the intended outcomes" (National Audit Office, 2010). What are these intended outcomes by which knowledge satisfaction can be perceived, and by which the measure of KM value to organisations are asserted? These are the issues encapsulated in one of the extended research questions for this research (see ERQ 2 in Section 1.2.1):

> "*What are the intended outcomes from social media by which KM values can be measured?*"

4.4 Implementing the Framework

Whereas a *conceptual framework*, from a research perspective, provides some direction for the researcher before and during the research by mapping out what to cover, who to consult and why (Miles and Huberman, 1994), this research has adopted the use of *conceptual framework* from the business perspective, as described by the Business Dictionary:

"A theoretical structure of assumptions, principles and rules, that hold together the ideas comprising a broad concept"

In essence, the EMSoD framework was not meant to provide direction for this research but attempted to put together a theoretical structure of assumptions that hold together the proposed solution to a business problem, which is ultimately aimed at redeeming the image of KM as a management function while repositioning it (KM) for value within the current trend of enterprise mobility and social media.

First, the equation for Actionable Knowledge (see Chapter 5.4) emanating from a knowledge discovery activity implies that there can be any number of knowledge content item

n, and of course, there is the freedom to assign any weight to each item, depending on one's perception of its pertinence to the current undertaking or its effect on decision making. It has been stated how this could be sufficient in itself as a measure of KM value derived from the knowledge discovery undertaking. An example of this implementation is detailed in Section 5.5.1, page 87. However, the KM Value that the EMSoD framework delivers is of the essence, as far as KM value within the EMSoD framework is concerned. This is because it considers the social interactions between employees and the impact of their engagement towards the knowledge generation activities. Therefore, when one factors in the measure of an engaged workforce, the KM value derived from the knowledge discovery activity will either be attenuated or amplified.

For example, if the value of employee engagement was zero (0), then actionable knowledge (AK) value of 0.56 that was previously arrived at, will be attenuated by its multiplication by zero (zero being the value of engaged workforce), resulting in KM value (KMV) of zero. This could be considered a limitation of the equation for KM value.

However, it would be absolutely impossible to arrive at a value of zero, except, of course, where it indicates the presence of a moribund corporate social network. This is because, if the knowledge discovery activity producing the actionable knowledge is not entirely based on the corporate social media/network, EMSoD need not be implemented in full but partly. Then, the value of actionable knowledge (AK) would suffice for the knowledge management value (KMV). An example is the knowledge discovery case study presented in this thesis.

Emphatically, the value delivered by an element of the framework, Knowledge Discovery, could be sufficient for the organisation to measure, using the actionable knowledge alone as parameter. This means EMSoD has not been considered as a whole, highlighting the distinction between tailoring and a holistic embedding of the EMSoD framework. This is why this is only a framework, which is a structure of assumptions that hold the EMSoD idea together. And, of course, there is no formal constraints on how the variables interrelate to produce KM value. Such formal constraints can be implemented and operationalised within a corporate software, as a system designed in accordance with the emergent conceptual model presented in Section 4.5.

Whether tailored or fully embedded, Knowledge Management Value (KMV) thus, becomes a normalised quantitative measure in developing a case for return on investment. This is much more beyond story telling or anecdotal success stories and can be used in bench-marking similar KM investments for which EMSoD is tailored or wholly implemented.

4.5 Emergent Conceptual Model

Based on a strategic synthesis of survey findings in Chapter 6 with *actionable knowledge* and an *engaged workforce* (see Chapters 5.5 and 5.6) as parameters for measuring KM value, the interactions between the components of the Conceptual Framework described in this chapter can be seen as an iterative process that results in KM value for organisations, within the construct of social media.

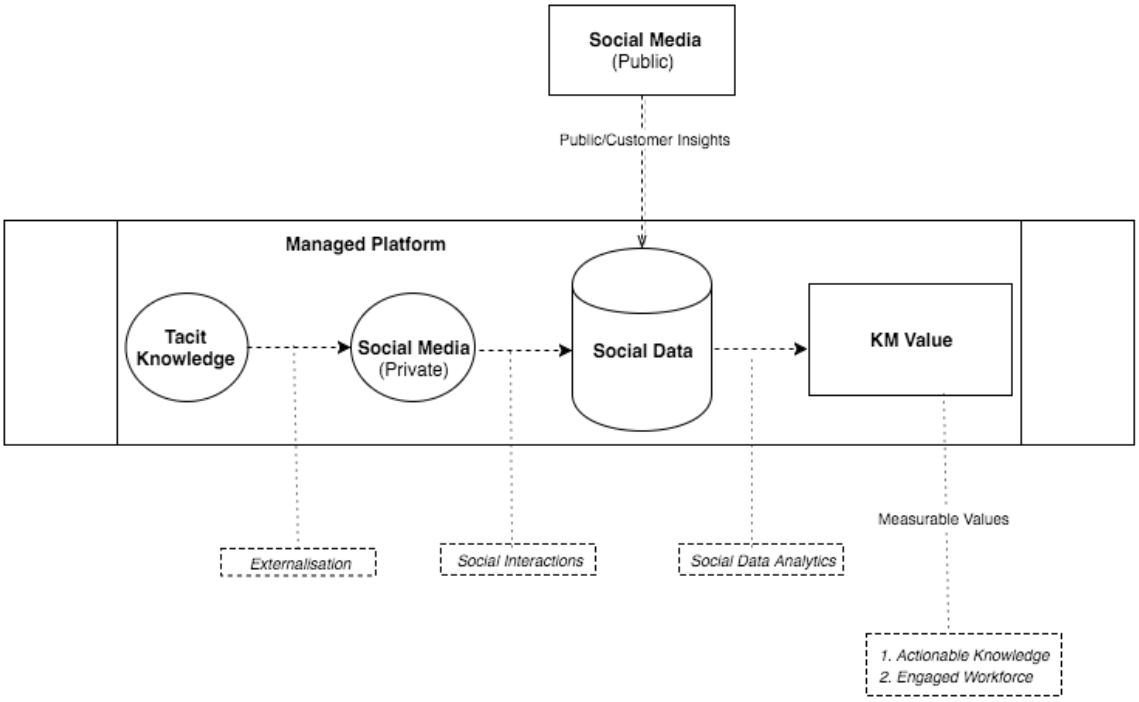

FIGURE 4.2: KM in Social Media Era - A Process to Value Model

This interaction is conceptually described with the model presented in Figure 4.2. It is worth noting the distinction between a *model* and a *framework* as mentioned in Chapter 3.2.3. In effect, software developers can use this model to define Entity classes that are independent of a database structure and then, map the components to the tables and associations of the database. This helps in fulfilling the aim of developing a data model for knowledge social machine that helps Knowledge Management (KM) deliver value to corporate organisations, as mentioned in Chapter 1.3. However, operationalisation of the constructs of this data model within a corporate social software design is potentially an intensive research outcome to which this research work can be extended.

4.6 Chapter Summary

The framework presented in this chapter conceptualises the re-emergence of KM within the current technological trends of enterprise mobility and social media, with KM value

at its core. This is aimed at re-positioning KM as a valuable strategic tool for organisations' competitive advantage.

The framework has, as its basic elements, the following: i) a *Managed Platform*, which defines the organisational boundary underpinned by the enterprise mobility strategies adopted within a corporate organisation; ii) *Tacit Knowledge*, which leads to a horizontal flow of intrinsic knowledge coupled with its explicit conversion. This also highlights a major concern of this research, which is the impact of the technological trends of social media and enterprise mobility in supporting the externalisation of tacit knowledge; iii) *Social Media*, which serve as platforms for social interactions and enable the development of social networks within corporate organisations; iv) *Knowledge Discovery*, which highlights the processes and analytic techniques for discovering knowledge from either a public or a corporate social data; and, v) *KM Value* for Organisation, which sets another perspective for seeing KM value beyond the Returns on Investment (ROI). In this element of the framework, KM value is seen in light of the optimal use of resources to achieve an intended outcome, and this is considered good value for money.

Finally, in order to help the reader in quickly establishing the provenance of each element of the framework, the research presents an associative classification of literature that have been harmonised in formulating the conceptual framework.

Chapter 5

Research Findings and Analysis

As explained in Section 1.2.1, this research sought to find answers to the extended question of what intended outcomes by which KM value can be measured (ERQ 2) and, how social media — as resources — can impact the intended outcomes (ERQ 3). The **E**nterprise **M**obility and **So**cial **D**ata (**EMSoD**) framework proposed in this research is an amalgam of components resulting from a convergence of Enterprise Mobility and Social Media in exploring how social media are delivering Knowledge Management value to corporate organisations, and as such, answers the question of an appropriate social framework for delivering KM values to corporate organisations (ERQ 1 in Section 1.2.1). This is the overarching question of this research. From this framework emerges a conceptual model (see Chapter 4.5) which describes an iterative process that results in KM value for organisations within the construct of social media. The framework, which has helped in arriving at the findings below, has also been strengthened by them. The two broad categories of findings — *actionable knowledge* and *engaged workforce* — are from the case study and a combination of survey and social network analysis, respectively. Moreover, they are both a measure of KM value to organisations, which is at the centre of the ***EMSoD*** framework. Based on the findings from this research, some recommendations are made in Section 7.3 as to how organisations can harness social media to achieve the intended outcomes.

The placement of KM value at the centre of the conceptual framework in Chapter 4 presupposes that KM value is the focal point and the driving force behind the framework. As this is a framework that repositions KM practice within the current trend of enterprise mobility and social media, the question has naturally arisen as to how social media are delivering KM value to organisations. It has been established that knowledge is an intangible asset. As such, its management and measure of value has to take an innovative approach as this research study has found, using "actionable knowledge" and "employee engagement" as parameters. But before discussing these parameters further, the next section presents the measurement mechanism proposed by this research for measuring KM value within the context of the parameters delivered by the ***EMSoD*** framework.

5.1 Measurement Mechanism for KM Value

As mentioned earlier, this research identifies two intended outcomes from which knowledge satisfaction can be perceived, and by which we assert our measure of KM value to organisations: (i) the generation of *actionable knowledge* and, (ii) the facilitation of *employee engagement*.

Although many organisations have turned to storytelling and anecdotal success stories to show the value of their KM investments, there is an increasing need for businesses to show the business value of KM in terms of normalised quantitative measures in developing a case for Return on Investments (Vestal, 2002). This is what business managers and accountants, whose perception of realities is largely in terms of numbers, are looking for when they criticise KM for want of measurable values. The ***EMSoD*** social framework advanced in this thesis report does not only deliver the KM value but also proffers solution for the measurement.

Meanwhile, "*Metrics fulfil the fundamental activities of measuring (evaluating how we are doing), educating (since what we measure is what is important; what we measure indicates how we intend to deliver value to our customers), and directing (potential problems are flagged by the size of the gaps between the metrics and the standard)*" (Melnyk *et al.*, 2004). It is worth noting that the topic of metrics is viewed differently from both Management and Academics, as Melnyk *et al.* (2004) observe:

> "The academic is more concerned with the validity and generalisability beyond the original context, of the results from such measurements that are defined, adapted and validated in addressing specific research questions. The manager, on the other hand, is more than willing to use a befitting measure if it can quickly provide useful information."

In view of this, this research has devised a simple measurement mechanism which, it is believed, satisfies both academic and management concerns. This is denoted by the formula:

$$KMV = AK \times EW \tag{5.1}$$

where,

$KMV = KM\ Value,$

$AK = Actionable\ Knowledge$

$EW = Engaged\ Workforce.$

5.2 Knowledge Discovery from Social Media Data

This study adopts a case study method, using textual analysis techniques to make sense of the unstructured social media data harvested through Twitters Streaming API. Based on a qualitative exploratory approach, the methods explore how social media data could serve as leverage for organisational knowledge.

The bulk of the materials used in the methodology and findings from this study are reproduced here as published in *Knowledge Discovery from Social Media Data: A Case of Public Twitter Data for SMEs* (Adetunji and Carr, 2016b).

5.2.1 A Case of Public Twitter Data for SMEs

According to Zaidah and Zainal (2007), "Case studies, in their true essence, explore and investigate contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships." This study adopts a single case of Twitter data for small and media-scale enterprises in exploring knowledge discovery from social media data. A multiple case design could have been adopted but a single case design is considered sufficient in cases where there are no other cases available for replication (Zaidah and Zainal, 2007).

Any social media platform could have been studied in this case, but Twitter has been chosen for the public availability of its data for research. For example, Twitter provides immediate access to public global conversation — even before any data mining technique — unlike any other social media platform. Also, as a social micro-blogging utility, Twitter creates increased interest in organisations with regards to growth, features and potential benefits to the organisation (Bulearca and Bulearca, 2010). For example, apart from its significant role in the US Elections of 2008 (Böhringer and Richter, 2009), (Kaplan and Haenlein, 2010) also alluded to Dells claim that its use of Twitter has generated $1 million$ in incremental revenue due to sales alerts. Meanwhile, Russell (2013) describes Twitter as a glorified piece of valuable infrastructure that enables rapid and easy communication and, unlike Facebook or LinkedIn, its asymmetric relationship model of following allows one to keep up with the tweets of any other user without the need for the other user to reciprocate. This facilitates a lateral flow of knowledge that is powered by the intrinsic motivation of individual employees within the organisation. Moreover, the consumerisation and proliferation of mobile devices like smart phones has driven the popularity of social media and enabled the adoption of Web 2.0 affordances, especially the deployment of micro-blogging, to the business environment. This offers powerful opportunities to distribute tacit knowledge and best practices within an enterprise (Böhringer and Richter, 2009).

An increasing number of large enterprises have already been able to tap into the benefits of Twitter as a micro-blogging platform. According to a Gartner report referenced in (Böhringer and Richter, 2009), leading-edge companies are investigating the potential of micro-blogging to enhance other social media and channels, and, as mentioned above, Dell recounts its use of Twitter as a leverage for increased revenue gains while the electoral success of Barack Obama as President in the US General Elections of 2008 is largely credited to the use of Twitter by the Democratic Party (Böhringer and Richter, 2009). Also, Ford Motors and Zappos (Porterfield, 2011) are a few examples of large enterprises already exploiting social media. How could this trend be beneficial to Small and Medium sized enterprises even where the social applications may not be hugely embedded in the work place? This chapter highlights how this research has helped a medium-sized enterprise to tap into the wealth of Twitter data for its operational and strategic insights, and thereby, positioning the organisation for competitive advantage.

5.2.2 Choosing a SME for the Case Study

Beyond their use for building relationships, connections, and/or marketing leads, social media present an opportunity for Small and Medium-sized Enterprises (SMEs) just as they do for large corporate enterprises to exploit the wealth of intrinsic insights embedded in the mass of social data publicly available, for their strategic competitive advantage. Yet, due to a perceived lack of relevance of social media to certain types of industry/sector, SMEs are often disinclined to adopting social media (Michaelidou *et al.*, 2011). This work presents a case of a medium-sized enterprise for which social media is perceived as not relevant.

The role of Small and Medium-sized Enterprises within an Economy is so crucial that the World Bank commits hugely to the development of the sector as a significant part of its efforts in promoting employment and economic growth (Ayyagari *et al.*, 2007).

Liaise Loddon is a medium-sized enterprise with about 220 employees, providing residential social care for adults with autism and learning disabilities in Hampshire, United Kingdom. As typical in this sector, operational procedures result in an enormous amount of documentation arising from daily diaries, incident/activity reports and several other reporting in compliance with regulatory requirements, analytic purposes and decision making. It was through involvement in another project that this researcher learnt of the digital transformation that the company was going through and thus, approached them as a candidate organisation for a case study. Although the company has recently deployed an enterprise mobility suite of mobile devices and applications to replace the existing paper-based documentation system, this investigation explores how this enterprise mobility agenda could be integrated with knowledge sharing and knowledge extraction from the mass of social data freely available on Twitter, for example, in such a way as it supports the organisation at the second level of organisational change (Piccoli, 2008,

p.35-38), which highlights the people dimension of a socio-technical system as described in Section 5.2.3.

5.2.3 Organisational Change and the Enterprise Mobility Agenda

As with the introduction of any new Information Technology that brings about an organisational change, mobilising Liaise Loddon's operations over mobile apps and mobile devices is an effort to move in line with the digital revolution to potentially bring about organisational change of which there are three levels, as highlighted by (Piccoli, 2008, p.35-38):

1. *Automate*: The basic level of organisation change occurs from automation wherein an IT innovation is introduced to change how an existing process is performed. Thus, the introduction of mobile devices to change the existing paper-based documentation processes at Liaise Loddon is at its basic level of organisational change. This is known as First-Order Change and its limited scope makes it easy to envision, justify and manage. However, true digital revolution does not stop at the first order change but proceeds to the Second-Order Change, or, *Informate*.

2. *Informate*: The fundamental basis of this second order change is on the people dimension of the socio-technical systems. This level of change seeks to strategically position the organisation for competitive advantage. One way of doing this is by tapping into the insights from the wealth of data enabled by the enterprise mobility platform using big data analytic techniques.

3. *Transform:* This third-order change has been described as the most pervasive level of change as it subsumes both first and second order change while also causing organisational structures disruptions. A flatter or more permeable organisational structure usually emerges after the technology implementation. Attaining this level of change requires the utilisation of technologies like the big data analytics to enable analysts and end users to have easier access to organisational data for analytical and knowledge discovery purposes.

It is worth reiterating that this research is mainly aimed at re-positioning KM to deliver value to corporate organisation within the constructs of new technological trends like social media, for which an appropriate conceptual framework has been developed (see Chapter 4) to support the organisation at the second level of organisational change.

5.2.4 Data Gathering and Processing

In Fang's (2015) proposed framework for extracting machine-readable data, four types of data sources are identified, which are: Web texts, Document Object Model (DOM)

trees, existing Knowledge Bases (KBs), and query streams. Out of these four types of data sources, *Web texts* is more pertinent to this study. This is largely because the decomposition of data generated and extracted from social Web platforms like Twitter, normally results in pure text format, even though pictures and sounds are also important data in social media.

An investigation was carried out to demonstrate the value of insights derivable from public Twitter data as relevant to the case study organisation. Ordinarily, the organisation's operations do not require social media marketing neither does it appear like the company could benefit from its employees conversations and knowledge sharing over social blogging platform like Twitter. As such, this organisation, just like many other small and medium scale enterprises (SMEs), does not have a huge following on Twitter, neither does it have any such enterprise micro-blogging platform that generates sufficient data from which employees conversations could be mined for insights. Yet, in a bid to stay abreast of — and respond quickly to — issues surrounding its area of specialism, this work harvested, from global public tweets, for *Autism* and its variants like 'ASD' *(Autistic Spectrum Disorder)* and 'disability', which are categorical keywords that tend to define aspects of its business domain. Therefore, this research polled public Twitter streaming data for approximately one week from Thursday 30th April to Wednesday 6th May, 2015. The following keywords were specifically polled, as related to insights aimed for in this research: 'ASD', 'autism' and 'disability'. These are keywords that is believed will help in the capture of any discussion and trends surrounding the topic of interest, which is *autism.*

A total of 149,501 tweets were gathered from all tweets across the world against the above keywords. As such, it would be worth knowing that there are tweets in languages other than English. For example, the word *'autism'* means the same thing as *'autisme'* in French. A person tweeting in French may have mistakenly omitted the letter 'e' at the end of the word, which would have resulted in the French tweet being harvested. Also, the abbreviation, 'ASD', does not always represent *Autistic Syndrome Disorder* even in the English language.

To begin making sense of this data, there is need to separate the language of the tweets as indicated in table 5.1. As some of the tweet languages are insignificant as per the number of tweets, the preprocessing of the data concentrates on the top 5 languages as presented in Figure 5.1.

This data would definitely contain some *noise.* For example, as stated above, the term, 'ASD', may mean a different thing in another language other than what is intended for it to mean in the English language. Even if some tweets in other languages contain the intended use of the search terms for this experiment, they still would be of little or no use to this research as it may not be possible to make sense of them. Therefore, non english language tweets from the data were filtered out. In essence, the efforts in this

research are geared towards making sense of, and deriving insights from, the English language tweets of the research's Twitter data.

TABLE 5.1: Distribution of Tweets by Languages

No. Tweets (By ISO)	**Language Name**	**No. Tweets (By ISO)**	**Language Name**
en 131993	English	da 28	Danish
und 4567	Undecided	pl 26	Polish
tr 3741	Traditional Chinese	cy 24	Cymraeg (Welsh)
es 1769	Spanish	fi 21	Finnish
ja 1618	Japanese	bs 21	Bosnian
in 869	Indonesian	sk 20	Slovak
ru 748	Russian	no19	Norwegian
it 716	Italian	sl 13	Slovene
nl 582	Dutch (Netherland)	sr 11	Serbian
tl 508	Tagalog	hr 10	Croatian (hrvatski jezik)
pt 425	Portuguese	el 7	Greek (modern)
ar 384	Arabic	vi 7	Vietnamese
fr 299	French	th 6	Thai
sv 175	Swedish (svenska)	hy 5	Armenian
de 169	German (Deutsch)	is 4	Icelandic (slenska)
ro 161	Romanian	zh 4	Zhngwn (Chinese)
et 126	Estonian	hi 3	Hindi
uk 93	Ukrainian	lv 3	Latvian
hu 73	Hungarian	ta 2	Tamil
lt 63	Lithuanian	bn 2	Bengali
ko 51	Korean	fa 2	Persian (Farsi)
bg 51	Bulgarian	iw 1	Hebrew
50	Unknown	ur 1	Urdu
ht 29	Haitian, Haitian Creole	ne 1	Nepali

Moreover, if it was decided to target tweets from particular countries, there would be need to separate the tweets in this research's data according to the countries they emanated from. However, there is the constraints of people not updating their Twitter data with their country or location. To compound this, Twitter's geo-location algorithm could not detect the location, resulting in a 'null' value for the 'place' key in a vast majority of the research's tweets' data.

In essence, the country could be determined for only about 3.5% of tweets in the Twitter data, as indicated in Table 5.2.

TABLE 5.2: Tweets without Country Value

		Percentage (%)
No. of Tweets without Country Value	144246	96.5
No. Tweets with Country Value	5255	3.5
Total No. of Tweets	149501	100

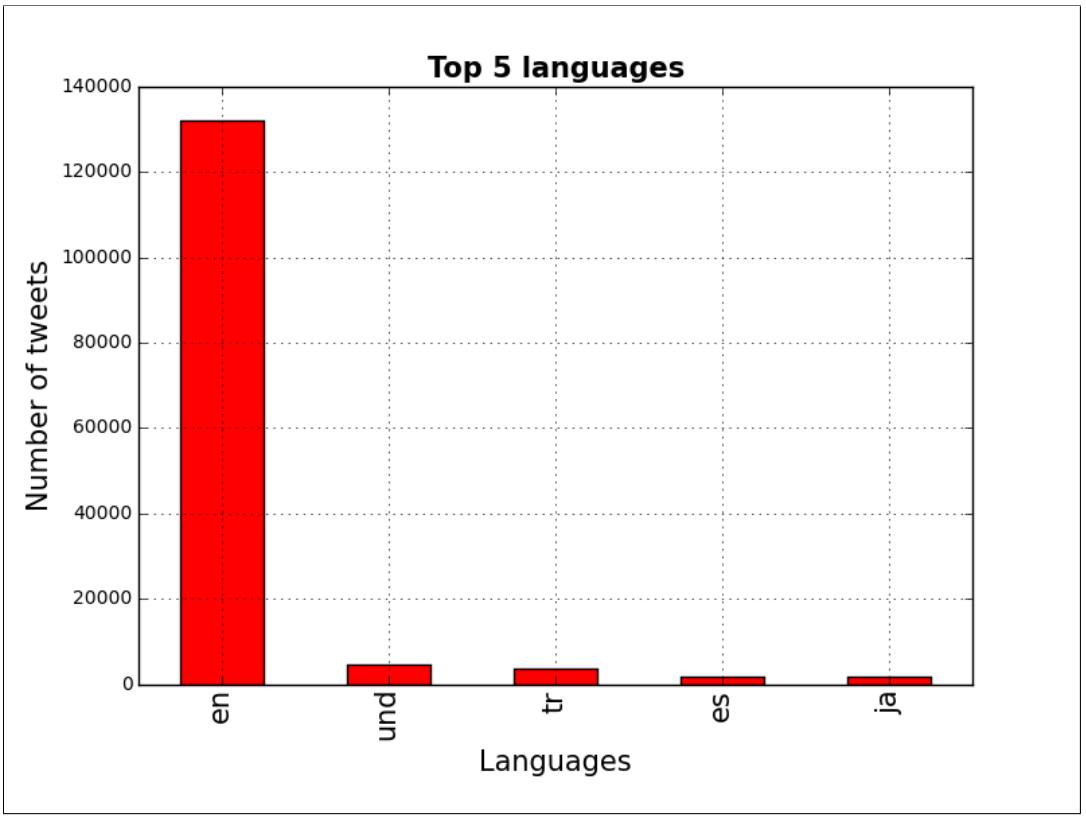

FIGURE 5.1: The Top 5 Languages of Tweets Polled

Nonetheless, even from the 3.5% tweets with country value, United Kingdom tops the list, followed by the United States (Figure 5.2), both which are the two largest English speaking countries.

5.2.5 Content Classification of Tweet Data

One solution to handling vast volumes of data is to reduce the data (Liao and Trianta-phyllou, 2008). Therefore, having already reduced the data-set for exploration to only those with 'country value' as indicated in table 5.2, the research further concentrates on the tweets in English language from the United Kingdom. As indicated in Figure 5.2, there are 1,473 tweets emanating from the United Kingdom. These are classified in Table 5.3, according to the contents.

5.3 Knowledge Elicitation from Tweet Data Contents

With regards to the case study and data gathering described in sections: 5.2.2 and 5.2.4 respectively, this section presents the findings from the twitter data used for the study. Immediately following this is a discussion on what constitute *actionable knowledge* for the case study organisation.

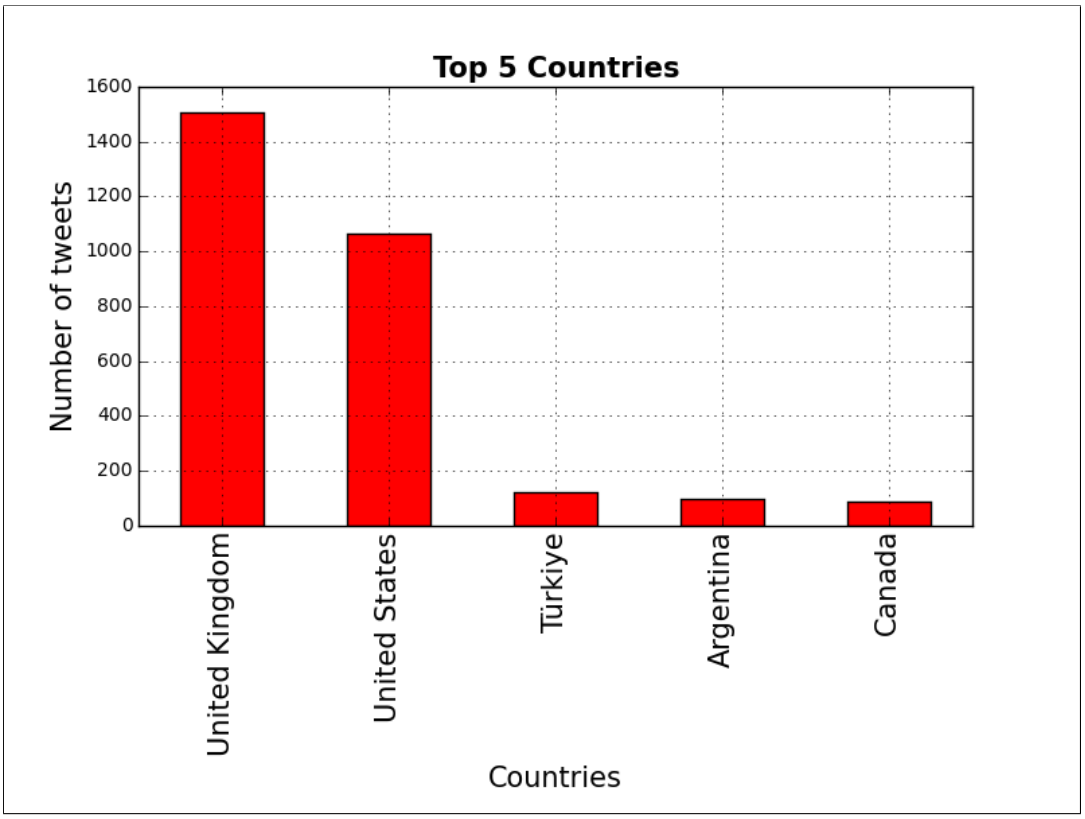

FIGURE 5.2: The Top 5 Countries of Tweets Polled

TABLE 5.3: Content Classification of Tweet Data

Contents	***No. of Tweets (Including RTs)***
Impact of Technology on Disability	15
Information Gathering	10
Political Opinions (#votecameronout)	132
Social Welfare Benefits	327
Living with Autism	989
Total Tweets	**1473**

Despite the data collection being based on domain-specific keywords of interest to the case study organisation, the research is an exploratory study in which there was not a preconceived idea of the insights/knowledge inherent in the data. Out of an enormous amount of data, only a handful may contain the valuable and actionable knowledge that propels an organisation towards strategic competitive advantage (Liao and Triantaphyllou, 2008, pg.5). As such, the bulk of the contents as seen in Table 5.3, are largely re-tweets (RT) of the original messages and so, may be regarded as extraneous amplification of the original tweets. Therefore, while the next section follows with a discussion on the value and actionability of the knowledge so discovered, this section reproduces the categories observed in the data as described in Adetunji and Carr (2016b):

5.3.1 Impact of Technology on Disability

> "*RT @BILD_tweets: Helping to unlock the secrets of autism - a project using innovative technology aims to change how we address autism http:...*"

The above tweet provides an insight into a project using innovative technology to change how the subject of *autism* is addressed. As this research's case study organisation is in the business of autism support and also currently implementing mobile technologies to enhance its operational performance, it is worth exploring this piece of insight further.

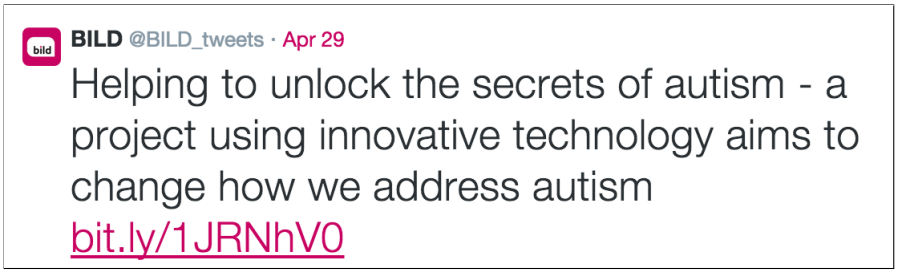

FIGURE 5.3: Original Tweet with Link to Project on Innovative Technology

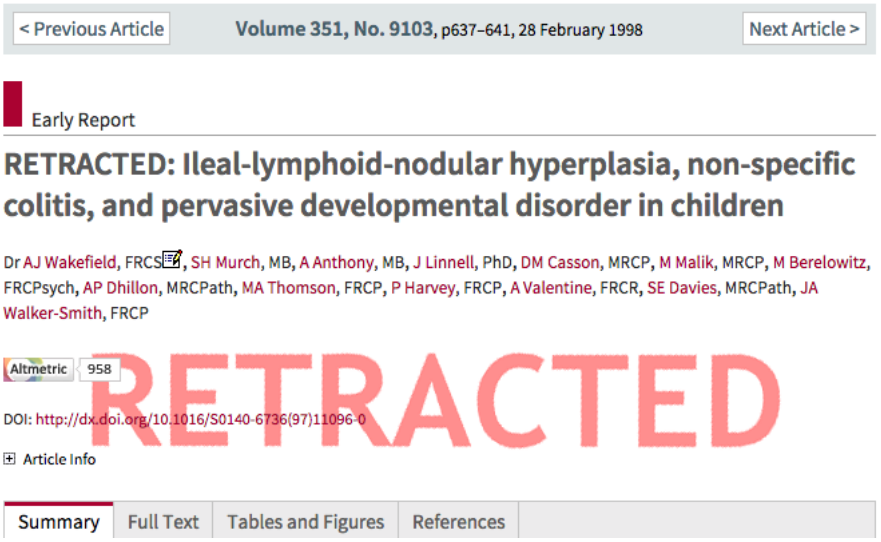

FIGURE 5.4: Retracted Study Linking Vaccine to Autism

Although the link to the actual URL of the story about the project is missing from the tweet, the original source of the tweet can easily be followed up, as the above is a retweet (RT) of @BILD_tweets, which is the Twitter handle for BILD (British Institute of Learning Disabilities). BILD actually tweeted that tweet on the 29th of April, which is a day before this research's data capture began, as can be seen in Figure 5.3. This explains why the original tweet was not captured in this research's twitter streaming data capture of 30th April to 6th May. From this original tweet, it has been possible to extract the URL link (bit.ly/1JRNhV0) to the story about the project on innovative

technology. This is about the National Autism Project, which "aims to create a more strategic approach to addressing the challenges of the condition". This project highlights the impact of iPads, picture dictionaries and interactive schedules on the improvements of communication and vocabulary of autistic people. Strategic competitive advantage requires an alignment/tagging along with this project. Below are a sample of other tweets related to this content of Technology's impact on disability while its pertinence, as an actionable piece of knowledge, is discussed further in Section 5.4:

> "*tech reducing the impact of disability - or are the latest gadgets too pricey? Watch @SkyNewsSwipe at 2130 http://t.co/iHtX1spOqQ*"

> "*Technology limits impact of disability but is it affordable? @TwitterUser_GT http://t.co/Az3nJejO32*"

5.3.2 Information Gathering

> "*@TwitterUser @BBCNewsUS @BBCWorld Please direct me to this research, the thing about vaccines causing autism was admitted to be a fraud.*"

The first tweet about vaccines causing autism in this category is a request for information. Just as enterprise micro-blogging tool could be used within the organisational social network, public micro-blogging tools like Twitter provide the platform to quickly seek information, knowledge and/or ideas from a heterogeneous audience defying the constraints of space, time and location. Thus, the above tweet was almost instantly replied to by the one below:

> "*@TwitterUser Here's the original study that said that vaccines cause autism, from a respected, peer-reviewed journal: http://t.co/cmVVKpLQgh*"

Even though the original study is from a 'respected, peer-reviewed journal', as claimed by the sender of the above tweet, we know from the link provided that the publication of the research has been retracted as shown in Figure 5.4. The ability for anyone to search, gather and distribute information seamlessly in this manner provides an interesting dimension of social media as "relatively inexpensive and widely accessible electronic tools that enable anyone to publish and access information..."Murthy (2013).

Meanwhile, the following two tweets provide link to further information that could help drive home the knowledge that the research study in question has actually been rebuffed:

> "*RT @TwitterUser: @SB277FF vaccines do not cause autism. They don't. But if they did, what would you prefer? Autism or incurable smallpox/po*"

> ""*RT @BILD_tweets: There is 'no link between MMR and autism', major study concludes. http://t.co/Re9L8fPfGV via the @guardian #autism*""

In as much as Twitter allows for an almost spontaneous expression of opinions by anyone (Lim and Buntine, 2014), it offers a good platform for polarisation and debate (Kalsnes *et al.*, 2014; Lorentzen, 2014) on topical issues from which knowledge could be mined, as exemplified by the question of preference between autism and incurable smallpox posed by one of the tweets above.

Moreover, the following tweet with a URL link to *Learning Disability Census* is an example in knowledge discovery (of an official census and regional data on Learning Disabilities), which when actioned in conjunction with the enterprise resource planning, could have an impact on the company's strategic planning:

> "*RT @dmarsden49: Learning disability census with regional stats is out. Check http://t.co/Ja3tk7ZRDZ*"

5.3.3 Political Opinions (#votecameronout)

The role of public opinion cannot be over-emphasised insofar as it shapes and is shaped by government policies. A recent and relevant example is the UK tax credits row, (Tax Credits Row) which has seen the planned tax credit cuts, at the time of writing this report, suspended by government because the scheme proved unpopular to the public and thus, was defeated in the House of Commons. Social media, especially Twitter, provides a means of capturing and measuring the sentiments and opinions of the electorate.

It is therefore, no coincidence that political opinions that have been expressed, are included in the Twitter data gathered over *autism* and *disability* keywords:

> "*#votecameronout Because he wants to get rid of Human Rights Act which will affect: Maternity Rights; Workers rights; Disability Rights*"

FIGURE 5.5: The Proliferated Re-tweets of Political Opinion

"*For the harassment of people struggling on sick & disability benefits... #VoteCameronOut*"

"*5 more years of the Tories we will lose Social Care, NHS, Human Rights, Workers Rights, Unions, Disability support. #VoteCameronOut*"

Using the hashtag #votecameronout in the run up to the UK General Elections of 2015, the above tweets represent an active campaign against the then incumbent Tory-led government in which David Cameron was Prime Minister. It is interesting to note that the bulk (129) of the political tweets in this experiment's Twitter data are a proliferated re-tweets (RT) of the above 3 original tweets as exemplified in Figure 5.5. The correlation between public sentiments on social media and elections results and/or on government policies, is another growing area of interest in social media research. In politics meanwhile, it is not uncommon for opponents to whip up public sentiments by whatever means possible. Social Welfare issues are quintessentially core, and often politicised, concerns in the UK. A parallel category of tweets in this work is that of social welfare benefits, which is described in the next section. Although this research's data-set is based, as stated earlier, on categorical keywords that define the business of the case study organisation, the infiltrated political opinions cannot be ignored in as much as these are public opinions that shape political trends which potentially impacts on businesses in terms of government policies. Akin to this is the category on social welfare benefits, described in the next section.

5.3.4 Social Welfare Benefits

Social Welfare simply implies the "Well being of the entire society" (Business Dictionary), which promotes inclusivity for the disabled, the sick, the elderly/pensioner, the unemployed and even the low income earners. As this is the hallmark of an egalitarian society, the UK government renders financial assistance to these categories of people in form of a range of Social Welfare Benefit payments. Figure 5.6 provides an insight into

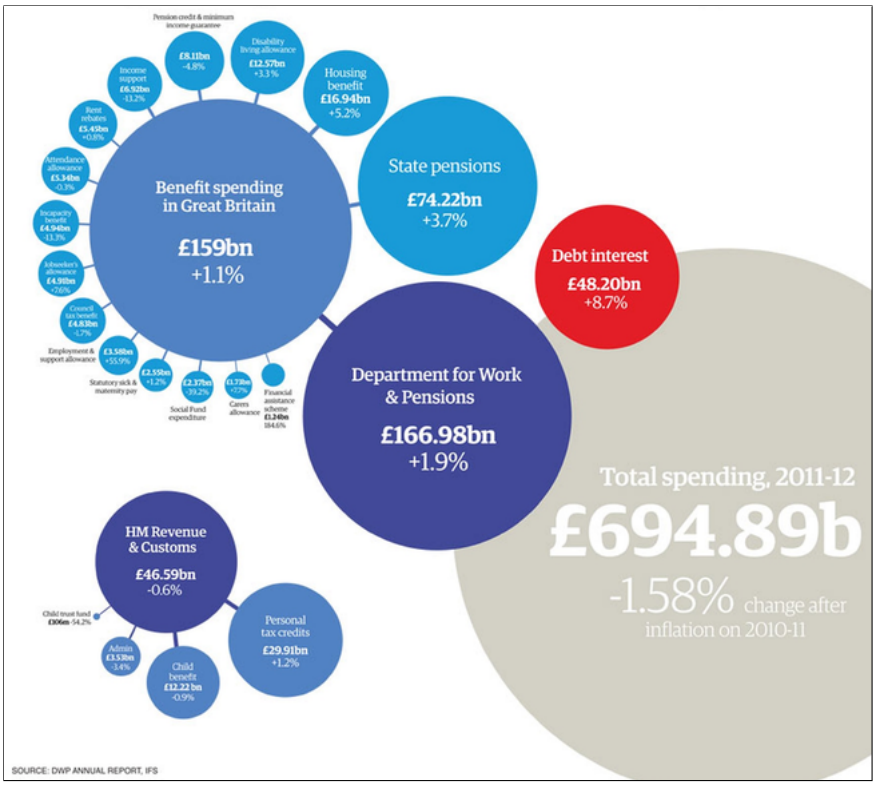

FIGURE 5.6: Public Spending on Benefits in the UK
(*Source: http://bit.ly/1dtVQEh)*

public spending on social welfare benefits in the UK. As indicated in the preceding section, social welfare issues affect the fabrics of the society and any proposed significant cut in social welfare benefits is a natural invitation for public dissent. This category of tweets from this work represents genuine sentiments and opinion of those expressing them, without political motivations like the preceding category:

> "*Uproar at thought of @Conservatives cutting child benefits if elected - I wish there was same media outrage over disability cuts #GE2015*"

> "*@George_Osborne If only I could live until pensionable age. You've reduced my disability benefit well below living standards!*"

> "*39 yo woman killed herself after Department Work and Pensions threats to cut off disability benefits http://t.co/TkVQF2UYki...*"

Again, the above are a few samples of sentiments and opinions about *Child Benefits* and *Disability Benefits*, which provide an initial understanding to the unassuming, that social welfare benefits are not a one-size-fits-all affair but are multifarious (see Figure

5.6), with some being exclusively non- means tested (e.g, Child Benefit). These tweets provide some insights into public sentiments towards government policies. Since any such social welfare benefit cuts would directly and/or indirectly impact the service users and providers of social care, it can be inferred that the case study organisation would also share these public sentiments.

5.3.5 Living with Autism

Autism is defined as a "life-long neurodevelopmental condition interfering with the person's ability to communicate and relate to others" (Elsabbagh *et al.*, 2012). How can this definition be juxtaposed with one of the myths surrounding autism (Baldock, 2015, item 8) that *autistic people do not interact*? This myth is however, dispelled by the tweet below, which is a re-tweet of an original tweet by an actual autistic blogger who attempts to use his blog posts to connect with the general public:

> "*@matt_diangelo RT? It would be truly amazing if u could view my blog about living with Autism&OCD. Would mean a lot-http://t.co/JCGBBZz8fJ*"

This category constitutes the bulk of the Twitter data for this work as it contains multiple unique re-tweet of the same tweet over 900 times (see Table 5.3). This is an indication of the public interest/curiosity and positive sentiment towards the subject of autism in general, and towards the autistic blogger in particular. Despite the NHS's attempts at educating the general public by diffusing some of the myth surrounding the subject of Autism Choices (2015), among several Autism Awareness initiatives, the story of autism as told by an autistic person appears to garner more public support and understanding. Measuring public opinion and sentiments through social media impact, reach and networks is another interesting research area in social media research towards which this work can potentially be extended.

5.4 Actionable Knowledge from the Case Study

The real essence of knowledge is its actionability, especially when it contributes to the advancement of a proposed undertaking (Cross and Sproull, 2004). Each of the knowledge items discovered from the tweet data, as highlighted above, is capable of providing significant insights that would inform decision making, which impacts company's proposed undertakings at one point or the other. However, the first item, *Impact of Technology on Disability* (see 5.3.1), is more pertinent to the enterprise mobility agenda by which the company deploys mobile application and devices to its operations. For example, one of

the shortened URL above (http://t.co/Az3nJejO32) leads us to a Sky News supplement on *'How Tech is Helping with Struggle of Disability'*.

To aspire to a leadership position in the health and social care sector, the case study organisation cannot afford to be oblivious to such reports as this, which could potentially shape the industry trends and direction. This knowledge, coupled with the insights gained from the use of iPads and pictorial dictionary mentioned in the *'Project on Innovative Technology'* resulted in an official resolution by the company to extend the use of mobile devices to its service users as well, and not only to help staff in operational performances. It is worth noting that, although the piece of information regarding the impact of technology on disability was on the news prior to the extraction of data for this work, it was not an actionable knowledge for the company until the above decision was driven by it through a presentation made by this researcher. Discovery of insights and actionable knowledge is one of the ways in which social media is helping KM to deliver value to organisations when appropriately leveraged. In corroborating this finding, the next section presents some further insights from recent Twitter data.

5.4.1 Further Insights from Recent Twitter Data

As it has been over one year since the data used for the case study (as reported in Section 5.2.4 was gathered, using the categorical keyword of *autism*, a decision was made to do a quick check on the current public conversation on the subject. A total of 6118 tweets were gathered, mentioning the categorical search keyword of *autism* for just one day on the 5th of August, 2016. Of these, 3,290 are original posts by Twitter users, 2828 are re-tweets of the original posts while the rest are *replies-to*. Although the day opens with a tweet containing a pleasant human story about the cure of autism (Figure 5.7), we found it surprising that some top issues as discovered from our data of over a year ago, are still currently leading the conversations on the subject, as shown in Figure 5.8. Considering (A) and (B) from Figure 5.8, the following tweet content, as tweeted by the CNN, led the conversation at different times of the day, with 111 and 93 reactions, respectively:

> "How pokemon go helps kids with autism https://t.co/DZatqTX4sc #PokemonGo"

It is worth recalling that the theme of the *impact of technology on disability*, which was the most pertinent knowledge item from the previous data, did inform a significant corporate decision by the case study organisation, as asserted in Section 5.4. The above tweet on how the new *Pokemon Go* game helps autistic kids, is an indication of the fact that the theme of the impact of technology on disability, dominates the conversations on the subject of autism for the second year running. Although, not directly related to

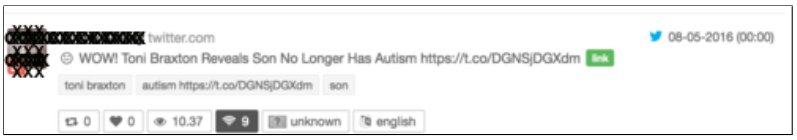

FIGURE 5.7: Tweet about Cure for Autism

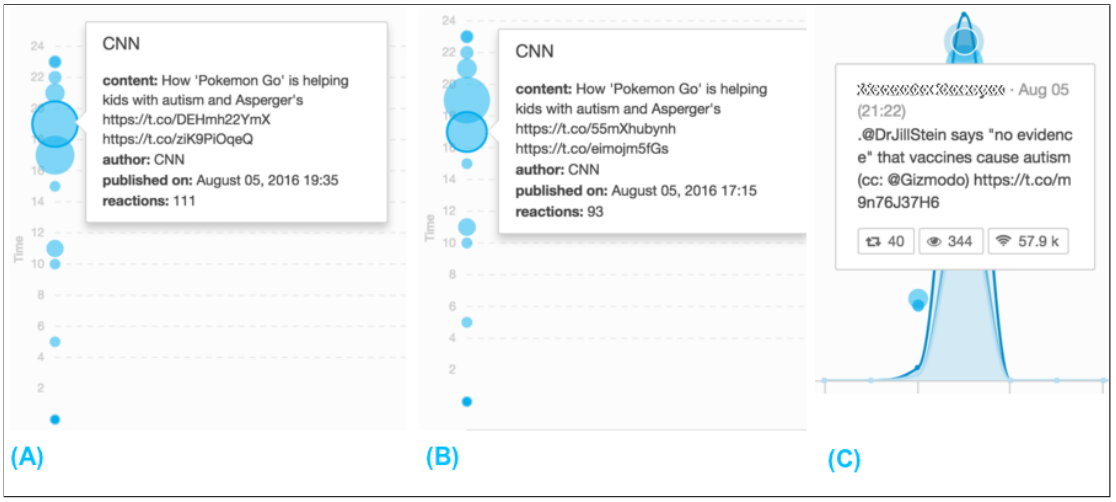

FIGURE 5.8: Top Issues from Newer Twitter Data

our *actionable knowledge* gains, another issue that gained prominence in our previous data was the debate over the causal relationship between vaccines and autism. The same debate still reappears prominently in the recent newer data on the subject of autism as shown in Figure 5.8 (C). The next section proceeds with a discussion on *actionable knowledge* and presents our proposed mechanism for placing a weighted measurement for KM value.

The next section presents a discussion on **actionable knowledge** and its measurement mechanism.

5.5 A Focus on Actionable Knowledge

"Everyone agrees that Knowledge entails true belief" (Pritchard, 2009), but this is not always the case. Using an analogy, Gettier (1963) argues that it is possible for a person to be justified in believing a proposition that is in fact, false. This brings about the question of what actually counts as knowledge. In light of our data, we shall examine this question in our discussion on *actionable knowledge*, next.

According to Argyris (2005), propositions that are actionable are those that actors can use to implement their intentions effectively. A case in point is the enterprise mobility agenda of the case study organisation as discussed in Section 5.2.2. The outcomes from an organisation's KM efforts cannot adequately be measured from the report card (like a student's annual progress/performance report) perspective and indicator systems used

in schools, for example. These systems, according to Posner (2009), contribute far less than they could to school improvement. Posner highlights the following as the reasons for this assertion:

1. Their purposes and intended audiences are often diffuse or ill-defined.
2. They tend to focus too much on ranking and not enough on exemplary practices and models for action.
3. Many data sets are overly tied to consumer choice and not enough to citizen engagement.
4. Despite vast improvements, research remains inaccessible to many people, bringing knowledge online but not infusing it into capitols, classrooms and kitchen-table problem-solving

Posner (2009) therefore, suggests that information must be crafted around organising and action, citing Argyris (1993), who says, "Actionable Knowledge is not only relevant to the world of practice, it is the knowledge that people use to create that world".

The action triggered by knowledge is of the essence in determining the value that KM delivers to an organisation. In fact, the real essence of knowledge is its actionability, especially when it contributes to the advancement of a proposed undertaking (Cross and Sproull, 2004).

Each of the knowledge items discovered from the tweet data, as highlighted in Section 5.3, is capable of providing significant insights that inform decision making, which impacts company's proposed undertakings at one point or the other. However, as stated in 5.3, the first item, *Impact of Technology on Disability (No.1)*, is more pertinent to the enterprise mobility agenda by which the company deploys mobile application and devices to its operations. For example, one of the shortened URLs contained in one of the tweets (http://t.co/Az3nJejO32), leads to a Sky News supplement on *How Tech is Helping with Struggle of Disability.*

It can be asserted therefore that, to aspire to a leadership position in the health and social care sector, the case study organisation cannot afford to be oblivious to such reports as this, which could potentially shape the industry trends and direction. This knowledge, coupled with the insights gained from the use of iPads and pictorial dictionary mentioned in the *Project on Innovative Technology*, resulted in an official resolution by the company to extend the use of mobile devices to its service users as well, and not only to help staff in operational performances. It is worth noting that, although the piece of actionable knowledge regarding the impact of technology on disability was on the news prior to the extraction of data for that research, it was neither known nor acted upon by the

company until the above decision was driven through a presentation made by us, the authors.

Meanwhile, this research also discovered further insights from recent data, as discussed in Section 5.4.1, which indicates that the theme of the *impact of technology on autism* is still leading the conversations on *autism* for the second year running. We had earlier alluded to the criticism of Knowledge Management as a field of practice, in spite of the gains — albeit intangible — from Knowledge Management and knowledge discovery efforts. This is due, in part, to the lack of a measurable value of those gains. With Equation 5.1 in Section 4.3.5, this research proposes a measurement mechanism for KM Value delivered by the *EMSoD* framework, which is one of the main objectives of this work. The next section proceeds with a measurement mechanism for *actionable knowledge* as a parameter of KM Value.

5.5.1 Measurement Mechanism for 'Actionable Knowledge'

The main objective of this work is the delivery of KM value to corporate organisations which, this researcher believes, the ***EMSoD*** framework helps to deliver. *Actionable knowledge* had earlier been identified as a measure of KM value, denoted as AK for measurement purposes (see Equation 5.1 in Section 4.3.5).

To find the numerical value of (AK) in the equation $(KMV = AK \times EW)$, a simple measurement mechanism is devised, as denoted in Equation (5.2):

$$\frac{\sum^{n} Weight_n}{n \times MaxWeight} \tag{5.2}$$

where,

n = total content items
$MaxWeight$ = maximum assignable weight

As an example, considering the knowledge content items from previous investigation on knowledge discovery from social media data (see Section 5.3) and displayed in Table 5.3, the total content items (n) is 5 and each one of them is given a weight of 2, 3 or 5, which represent low, medium or high value, respectively. Please note that the weights have nothing to do with the *No. of Tweets* as displayed in the second column of Table 5.3.

However, the weights represent the pertinence of the knowledge item to the matter or issue at hand within the organisation, where the maximum weight (MaxWeight) of 5 represents a high pertinence, 3 represents medium pertinence and the weight of 2 represents a low pertinence. High to low pertinence is directly mappable to high to low value,

respectively. The probability and freedom for subjectivity in assigning these weights is acknowledged. It is worth reiterating, for emphasis, that the acknowledgement of the possibility and freedom for subjectivity is only in the weighting system, where content items of knowledge are assigned numeric weights based on the perception of pertinence of the knowledge item to the organisation's proposed undertaking. For example, "impact of technology on disability" received the highest weight of 5 because of its direct pertinence to the ongoing mobility agenda of the organisation. The mobility agenda was of priority to the company, and, any proposition that advances their priority would be considered of high weight.

In essence, what is considered a priority is a judgement call. Therefore, Knowledge Management and/or IT practitioners should find out what problem is of priority to a client organisation so solutions could be proposed that resolve existing problems rather than searching for new problems that the organisation may not consider to be of priority. This is according to Ray Dawson in Loughborough University (2013), who suggests that this approach helps in reducing the likelihood of failure in implementation of knowledge management initiative. Matching proposed solution to client's priority also helps in assigning weights to the knowledge content items in accordance with the pertinence/direct relevance of each knowledge item to the organisation's proposed undertaking, thereby, reducing the possibility of subjectivity. Moreover, in order to reduce the level of subjectivity, it is recommended for this measurement activity to be carried out only after the KM activity/event in question has been concluded. In our example, the knowledge discovery from social media data has been completed and we know which of the knowledge items has had a high impact on management's decision making for us to assign a high weight of 5; and, medium weight of 3 and low weight of 2 to items we consider of medium and low values, respectively, as shown in Table 5.4.

As earlier stated in page 65 during the discussion on the implementation of the framework (see Chapter 4.4), Knowledge Management Value becomes a normalised quantitative measure in developing a case for return on investment, regardless of whether the EMSoD framework is tailored or fully embedded. This is much more beyond story telling or anecdotal success stories and can be used in bench-marking similar KM investments for which EMSoD is tailored or wholly implemented.

TABLE 5.4: Knowledge Contents and their Weights

Content	***Weight***
Impact of Technology on Disability	5
Information Gathering	2
Political Opinions (#votecameronout)	2
Social Welfare Benefits	3
Living with Autism	2

The item with the maximum weight (MaxWeight) of 5, *Impact of Technology on Disability*, is of a high pertinence to the enterprise mobility agenda by which the company

deploys mobile application and devices to its operations. Therefore, going by Equation (5.2), the maximum value is 25, being a product of the total number of content items (5) and the maximum weight (5). Also, with the numerator being a sum of all the $Weights_n$, the value of AK from Equation 5.1 is given thus:

$$KMV = 0.56 \times EW \tag{5.3}$$

The *EMSoD* framework presented in this thesis is predicated upon the capability of social media in delivering actionable knowledge to corporate organisations. We have thus, been able to place a measurable value on actionable knowledge (AK). This is ordinarily sufficient as a measure of KM value derived from such insights from social media data. However, our framework — and the KM value it delivers to corporate organisations — is further strengthened by an additional measure of the KM value, which is *employee engagement*, denoted as EW (Engaged Workforce) in Equation 5.1. The next section discusses *employee engagement* in the light of the social network that exists within the organisation, the impact of the structure of the network on employee engagement and knowledge sharing as well as a measurement mechanism for the KM value of *employee engagement*.

5.6 Engaged Workforce

As can be inferred from Chapter 2.7.1, it is worth considering the suggestion for *employee engagement* as a measure of KM values, given that "the level of employee engagement is one of the most important indicators of the likelihood of an organisation succeeding financially and delivering to its vision and mission statements" (Marr, 2014). Also, research has shown that having a highly engaged workforce not only maximises a companys investment in human capital and improves productivity, but it can also significantly reduce costs (such as turnover) that directly impacts the bottom line (Kumar *et al.*, 2014).

Thus, the organisation's Enterprise Mobility Management (see *Managed Platform* in Chapter 4.3.1) defines the organisational boundary within which employees' contributions are gathered as a measure of their engagement and as a reference point for the organisations Social Network Analysis, which can serve as knowledge input to the organisation's Intellectual capital.

In an organisational setting, the utilisation of social networking for knowledge sharing and as a source of knowledge elicitation can be influenced and measured by employee engagement (see Section 5.6.5, which is underscored by the enterprise mobility policies of Bring Your Own Device (BYOD) and/or Company-Owned devices that are Personally-Enabled (COPE). As actors within the social network, how are employees impacted by

the use of mobile devices and applications to engage with the organisation, their work and their colleagues? This research attempts an answer to this question with *Findings from the Survey Questionnaire* presented in Section 6.

Based on the above premises, this work posits that knowledge sharing would be rife in an organisation with a truly engaged workforce. How then, does the social network facilitate employee engagement? How does the structure of the connections and relationships within a social network provide further depth and insights to knowledge discovered from such networks, as highlighted in Section 5.2? This is explored further with the findings from the *Social Network Analysis* presented in Section 5.6.1.

5.6.1 Social Network Analysis

Social Network Analysis is described as a detailed examination of the structure of a network and its effect on users (actors) within the network, wherein the structure of the network is understood to be more important than the individual users (Keenan and Shiri, 2009). A core component of the *EMSoD* framework is Social Media (see Section 4.3.3), which serve as platforms for social interactions on the Web. With the peculiar example of Twitter, these social interactions are explained by the relationship types of *'mentions', 'replies to'* and just, *'tweets'*. A *mentions* relationship exist when a message (*tweet*) on Twitter mentions another user (@Username) while a *replies to* relationship exist when a *tweet* is in reply to another user's tweet by preceding the *tweet* with the other user's Twitter ID (@Username) (Itai Himelboim *et al.*, 2017). When a tweet is neither a reply to - nor contains a mention of - another Twitter user, the tweet creates a relationship type of *tweet*, which exist as a self loop and is indicated on a network visualisation as a node with an arrow that projects and returns unto itself. These relationships develop into a network of connections.

In strict adherence to the Ethics approval for this research, the University of Southampton Twitter network (@unisouthampton) is used in this study. As Twitter *following* model enables anyone, even without any affiliation with the University, to 'follow' or 'join' the network, the researcher manually identify 93 Twitter users through the @sotonwsi node. These are are known to be affiliated to the university by virtue of being academic/non-academic staff and researchers. Considering its perceived ease of use and a broad coverage of social network analytic metrics and visualisation features (Hansen *et al.*, 2013), this research uses NodeXL - a network analysis and visualisation package designed for the analysis of online social media on Microsoft Excel (Hansen *et al.*, 2010) - to examine the network (Golbeck, 2015) of relationships that develop over a one month period (from 26/07/2016 to 25/08/2016) among the 93 users.

In social network analysis, the connections between people are considered as the units of analysis that reveal the flow of information and how these connections define the structure of the network, which also refers to the presence of regular patterns in relationships (Wasserman and Faust, 2012). Gaining insights towards the understanding of the components and structure of a social network requires a vocabulary and techniques provided by social network analysis and visualisation (Gruzd and Haythornthwaite, 2013). This vocabulary and techniques are described in our examination of two different kinds of networks identified by Rossi and Magnani (2012) as, (i) the *topical network*, which is made up of relationships created through tweets/activities that are aggregated over a topic or the *#hashtag* and, (ii) the *Twitter network*, which is made up of all the relationships between the users (followers and friends).

5.6.2 Understanding the Topical Network

A topical network is created when users are connected by common topical issues, where individuals save/define Web contents as bookmarks/keyword in a social environment by attaching annotations in form of tags (Zubiaga, 2012), normally preceded by the hash symbol on most keyboards (#). The hashtag can be said to be the democratic manifestation of taxonomic principles in the social media era (see Section 4.3.3). Trant (2009) highlights the description of such *tags* as publicly shared user generated keywords, which have been suggested for use as a trivial mechanism for further improving the description of online information resources and their access through broader indexing.

An example of the topical network is shown in the Influencers Engagement Network Graph presented in Figure 5.9. This network has been aggregated over the search keyword and hashtag of *#autism*, as found in our recent data on the subject (see Section 5.4.1. Both this *topical network* study and the study that results in further insights on our previous study from recent data, were performed on Southampton University's account on the Pulsal Platform — an audience intelligence analytic platform for social media.

5.6.3 Limitation of the Topical Network

The *EMSoD* social framework proposed in this research operates within a *managed platform* (Section 4.3.1)0, which defines the organisational boundary. Although the hashtag phenomenon has been successful in aggregating online topical discussions without boundaries, the relationships created over mutual hash-tagged conversation is ephemeral (Rossi and Magnani, 2012), and so is the network created. Unless the hashtag can be tamed, its use on a public Twitter account can be so widespread that it compromises the need, if there were, to keep the conversations within the organisational boundary. Even with the use of enterprise Twitter's alternatives, such as *Yammer*, aggregating events

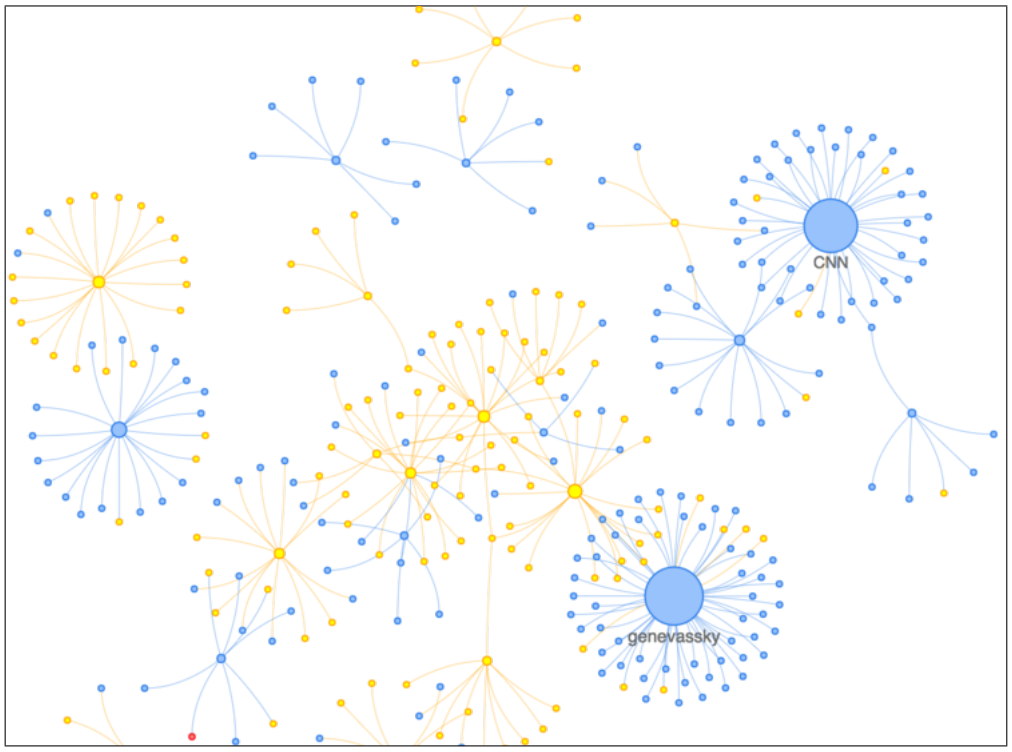

FIGURE 5.9: Influencers Engagement Network Graph

and conversation over the hashtag cannot but include *Yammer-wide* conversations and events from outside the organisational boundary.

For example, when one takes a look at the topical network created over our recent data on the subject of *autism* in Figure 5.9. The nodes are not defined within a single geographical boundary. The nodes in yellow colour represent those from the United Kingdom. The location information for the nodes in blue is unavailable. This means that users from various countries other than the UK are aggregated over this topic. In fact, the two most engaged influencers's networks (CNN and genevassky) are not from the UK. This may be good in that it provides further reach and depth around the topic but not for classified organisational conversation that needs to be kept within the boundary of the organisation's network, assuming the UK was a corporate entity in the business sense.

Specifying network boundaries in terms of hashtag or keywords that connect people together in this manner is more akin to the *normalist approach* of specifying a network, which is based on the theoritical concerns of the researcher (Wasserman and Faust, 2012), whereas the actors may not even know one another. Contrarily, Wasserman and Faust also describe a second way of specifying network boundaries, the *realist approach*, wherein the actors know one another, since membership of such network is as perceived and acknowledged by members themselves. In essence, employees would readily acknowledge and engage with fellow colleagues as members of the same network. The *realist approach* aligns with the *Twitter* network as identified by Rossi and Magnani Rossi and

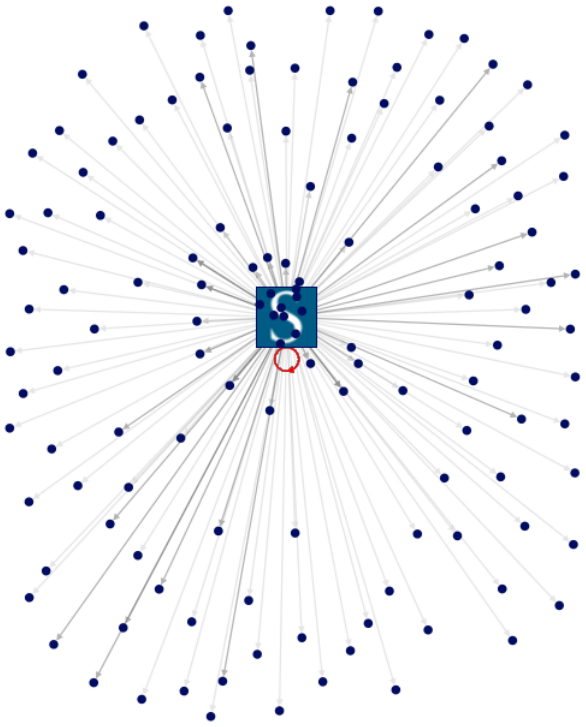

FIGURE 5.10: A Directed Network Graph of @unisouthampton

Magnani (2012). The next section attempts to create an understanding of the *Twitter* network.

5.6.4 Understanding the Twitter (Structural) Network

Considering its perceived ease of use and a broad coverage of social network analysis metrics and visualisation features (Hansen *et al.*, 2013), we used NodeXL — a network analysis and visualisation package designed for the analysis of online social media on Microsoft Excel (Hansen *et al.*, 2010) — to examine the egocentric network (Golbeck, 2015) of relationships that develop over a one month period from 26/07/2016 to 25/08/2016. As stated earlier, relationships emerge when a user (the source) *mentions* or *replies to* another user (the destination) in their tweet. For example, the following tweet of 29/07/2016, in which @unisouthampton *mentions* @nature — the Twitter handle for the International Weekly Journal of Science — creates a relationship (*mentions*) between the two entities:

> "Our #research places us top 50 globally and 4th in the UK, in @nature Index Rising Stars: https://t.co/XwXKR9N8Az https://t.co/VGQDxPE74y"

A relationship also emerges when a tweet is self sufficient without *mentioning* or *replying to* any other tweet by including or preceding with another Twitter @username, respectively. These are regarded as *self loop* and is indicated in Figure 5.10 by the red arrow

proceeding and returning to the source (@unisouthampton). As can be expected that a user could tweet without having to mention or reply to any other user, there are 68 such self loops, 102 unique Edges and 129 Vertices (Nodes) within the network so generated (see Table 5.5). The connections made through the *'replies to'* relationships are represented with Edges (connections lines) of 60% opacity than the connections made through the *mentions* relationship, which are represented by Edges of 20% opacity.

TABLE 5.5: Graph Metrics for the Directed Network Graph of @unisouthampton (Figure 5.10)

Vertices	129
Unique Edges	102
Edges With Duplicates	163
Total Edges	265
Self Loops	68

According to Wasserman and Faust (2012), "the concept of a network emphasises the fact that each individual has ties to other individuals, each of whom in turn is tied to a few, some or many others. The phrase, "social network" refers to the set of actors and the ties among them. The network analyst would seek to model these relationships to depict the structure of a group. One could then study the impact of this structure on the functioning of the group and/or the influence of this structure on individuals within the group".

However, the network as it is presented in Figure 5.10 is not an ideal network that encourages knowledge sharing and engagement among the actors. The three relationships that develop were initiated by @unisouthampton's tweets in which other users were *mentioned* or *replied to* or in which the tweets were sent wholly to create a *tweet* relationship. Querying NodeXL with only the Twitter ID of a corporate or individual's Twitter account, as we did with @unisouthampton, would only result in a visualisation of the list of connections, as Figure 5.10 reveals. Moreover, with over 40,000 nodes, a meaningful visible visualisation of a network of such magnitude as the @unisouthampton's can be difficult because of the inherent complexity of the relationships and limited screen space (Dunne and Shneiderman, 2013). According to Wasserman and Faust (2012), "the restriction to a finite set or sets of actors is an analytic requirement."

Therefore, the researcher identified 93 Twitter users (Vertices or Nodes) within the University of Southampton and examine the network of connections that evolves around them. Table 5.6 presents the overall graph metrics. Of particular interest in Table 5.6 is the the graph density as it is calculated before the network is grouped in accordance with the node importance of betweeness centrality (see Section 5.6.4.1.

TABLE 5.6: Graph Metrics for the Network Graph of 93 Vertices identified within the University of Southampton's Twitter Network

Graph Metric	**Value**	**Graph Metric**	**Value**
Graph Type	Directed	Connected Components	9
Vertices	93	Single-Vertex Connected Components	8
Unique Edges	303	Maximum Vertices in a Connected Component	85
Edges with Duplicates	15925	Maximum Edges in a Connected Component	15758
Total Edges	16228	Maximum,Geodesic Distance (Diameter)	3
Self-Loops	13628	Average Geodesic Distance	1.962102
Reciprocated Vertex Pair Ratio	0.221206581	Graph,Density	0.078073866
Reciprocated Edge Ratio	0.362275449	NodeXL Version	1.0.1.355

5.6.4.1 Grouping the Network on the Basis of Node Importance

Various metrics (Degree centrality, eigenvector centrality, pagerank, etc) capture various ways in which each individual node (user) acts as a centre of attraction through which knowledge and information propagates within the network. Sorting by Betweenness Centrality for example, sorts people who have the quality of most broadly connecting across the network to the top while Clustering coefficient measures how closely connected each users connections connected to one another (Smith *et al.*, 2014). As this work is focused on measuring and seeking to facilitate employee engagement, we have used Betweeness Centrality as our measure of ranking for node importance based on the potential of such central points for binding the network together by coordinating the activities of other points, albeit, they may be viewed as structurally central to the extent that they stand between others and can therefore facilitate, impede or bias the transmission of messages (Freeman, 1977). Moreover, measuring proximities can help to characterise the global structure of a network by showing how closely coupled it is (Koren *et al.*, 2007).

Accordingly, the 93 nodes (users, also referred to as *vertices*) in the network are ranked and grouped on the basis of their Betweeness Centrality, with each group disc sized according to the number of nodes that make up the range of measures for the group, as visualised in Figure 5.11 and the group metrics in Table 5.7.

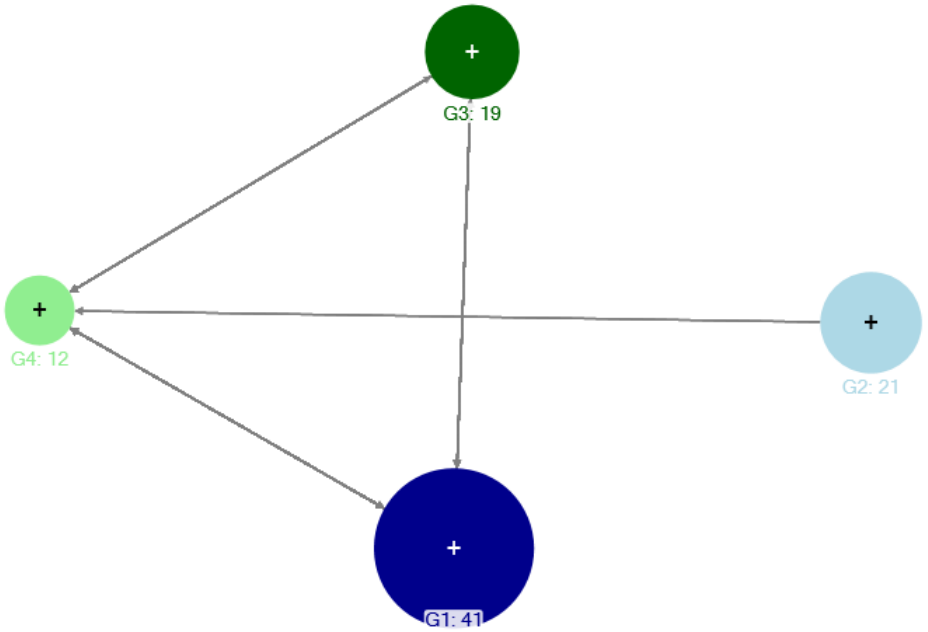

FIGURE 5.11: Graph of 93 Vertices, grouped according to Betweenness Centrality

TABLE 5.7: Groups of Vertices according to Betweeness Centrality metric

Group	Vertices	Unique Edges	Edges with Duplicates	Total Edges	Self Loops	MAX. Geodesic Distance	AVG. Geodesic Distance	Graph Density
G1	41	90	7415	7505	6972	4	2.083	0.115
G2	21	1	2112	2113	2113	0	0.000	0.000
G3	19	2	2759	2761	2751	1	0.240	0.012
G4	12	21	2151	2172	1792	2	1.194	0.462

5.6.4.2 Decomposing the Network Group of 93 Nodes

The smallest group in the network graph presented in Figure 5.11 (Light Green, G4:12) is a group of 12 nodes with the highest Betweeness Centrality ranging from 115.194 to 2494.640 (see Table 5.8), although the node with the highest Betweeness Centrality (2494.640) is @unisouthampton, and understandably with over 40,000 followers compared to only 558 followers of the next highest Betweeness Centrality node, @sotonwsi (at betweeness centrality score of 522.543), and 2390 followers for @lescarr (with a betweeness centrality score of 425.512), in that order.

The largest group (Dark Blue, $G1 : 41$) is comprised of 41 nodes (vertices) with the second highest Betweeness Centrality ranging from 11.408 to 99.715, with the highest being @garethpbeeston (99.715), @lisaharris (94.079) and @mark_weal (93.573) in that order. Group 3 (Dark Green, G3:19) is composed of nodes with the third highest betweeness centrality ranging from 1.067 to 8.627.

Group 4, 3 and 1 are subgroups of this directed graph, as demonstrated by the direction of the arrows on all sides, and as such, potentially represent an engaged network that

could possibly facilitate knowledge sharing. Group 2 (Light Blue, G2:21) may be considered negligible as 16 out of the 21 nodes have zero score for Betweeness Centrality, and thus, they would have little or no impact on the network. Expanding the graph to show the nodes in each group (see Figure 5.12) reveals some of the nodes in group 2 (light green dots) are actually outliers that have no tie with the network at all as they have not engaged in any relationship with any other member of the network, either by mentioning or replying to, other than themselves by way of tweeting (self loop), hence, they have each scored zero in the betweeness centrality measurement. We can even spot 2 of them that have never tweeted within the timeframe and as such, they do not have the arrow-edged ring of self loop (tweet) but are standing aloof. The top 20 nodes are labelled 1 through 20 in order of their Betweeness Centrality while the top 12 are colour coded light green. Essentially, the groups are examples of subgroups in a one-mode network, in which measurement is based on just a single set of actors (Wasserman and Faust, 2012), albeit grouped according to their individual attributes of Betweeness Centrality.

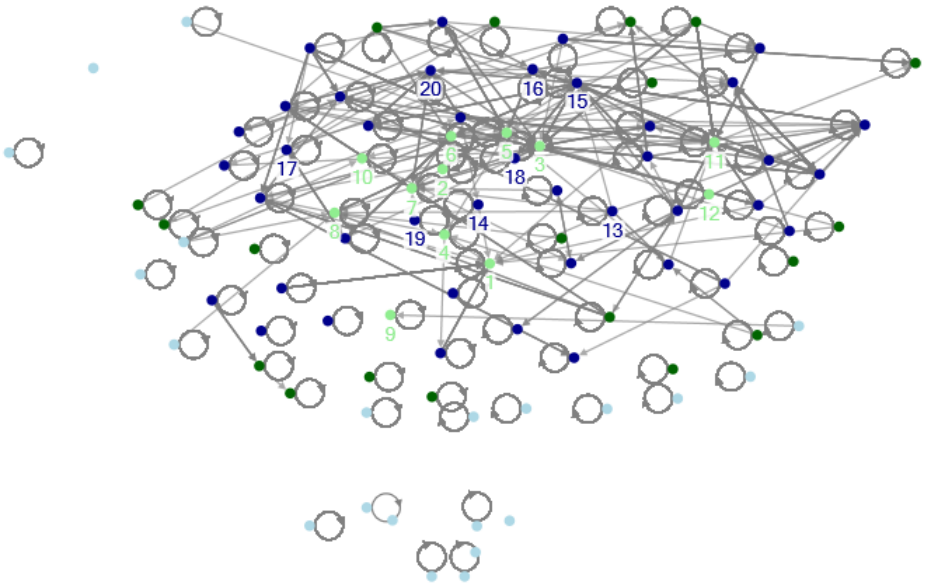

FIGURE 5.12: Expanded Group of Nodes According to Betweeness Centrality

Meanwhile, the chart in Figure 5.13 reveals that the Red, Dark Green and Green bars are in the top echelons of nodes with the highest Betweeness Centrality (a total of 23 nodes) while the bulk of the nodes in the entire graph — that is, a total of 70 nodes represented as Dark Blue bar on the chart — are within the lower range of Betweeness Centrality. With the highest Betweeness Centrality of 2,494.64 (Colour red on the far right), the node representing the egocentric network of @Unisouthampton, which is the official Twitter account of the University of Southampton, has over 40,000 followers. However, the measure of a node's Betweeness Centrality is not based on the number of followers but on the number of shortest paths from all nodes to all other nodes that pass

Table 5.8: Top 12 Individual Node Metrics

No.	Node	Betweeness Centrality	Eigenvector Centrality	Page Rank	Clustering Coefficient
1	unisouthampton	2494.640	0.038	4.644	0.092
2	sotonwsi	522.543	0.037	2.764	0.198
3	lescarr	425.512	0.031	2.520	0.186
4	ecsuos	349.333	0.028	2.308	0.191
5	suukii	325.737	0.019	1.756	0.165
6	susanjhalford	206.940	0.029	2.065	0.227
7	damewendydbe	179.074	0.028	1.852	0.284
8	hughdavis	164.789	0.019	1.538	0.233
9	iliadsoton	150.258	0.015	1.646	0.174
10	webscidtc	146.866	0.026	1.784	0.268
11	richardgomer	134.370	0.14	1.321	0.180
12	sotonwais	115.194	0.015	1.176	0.233

through that node (Freeman, 1977). This explains why the node with only 558 followers (@sotonwsi) has the second highest betweeness centrality (522.543). Although it could be argued that both @unisouthampton and @sotonwsi are non-personal accounts, it must be noted that the node with the next highest betweeness centrality of 425.512 (@lescarr) has more follower count (2390) than the previous (@sotonwsi). The top 20 nodes by betweeness centrality can be visualised in the network graph in Figure 5.12 (with each node labelled 1 through 20) while Table 5.8 presents the individual metrics for 12 of the top 20 nodes (users), according to betweeness centrality, within the network. The node metric table (Table 5.8) provides another interesting aspect, which is that, another metric or a combination of metrics may be used depending on the intended purposes, although we have ranked these 12, out of 20 nodes, according to their scoring highest in Betweeness Centrality. For example, if the nodes were ranked in accordance with their Eigenvector Centrality, @susanjhalfod (No.6) would have ranked higher than @suukii (No.5). Eigenvector is a centrality measure that considers the value of a node, not in terms of its connections but in terms of the value of centrality of such connections (Ruhnau, 2000).

5.6.5 Measurement Mechanism for 'Engaged Workforce'

With reference to our Knowledge Management Value measurement in Formula 5.1, where $KMV = AK \times EW$ (see KM Value in Section 4.3.5), we hereby devise a mechanism to define the value of an engaged workforce (EW). We have established that the interactions that create the user network is based on users' activities in *tweeting* and/or *mentioning or replying-to* another user within their own tweets, thereby creating the relationships known as Edges in Table 5.7. Each node in the network has been assigned to the groups in Table 5.7 based on individual node's measure of Betweenness Centrality. Table 5.7 also includes the graph density for each group. A sum of all the

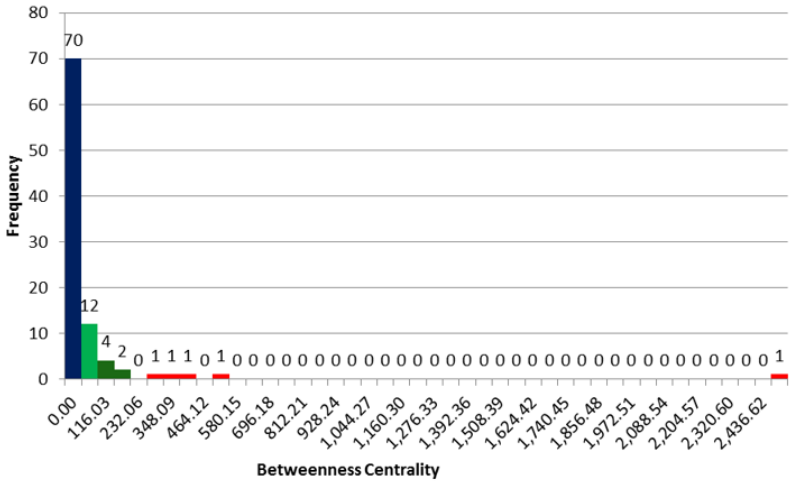

FIGURE 5.13: A Chart of Betweeness Centrality Spread among the 93 Vertices

groups' graph densities equals 0.59, which can be said to be a network of a little over medium density. This indicates that users in this network are nearly highly interlinked, owing that density captures inter-connectivity of individuals in a range between 0 and 1, for low and high density, respectively (Hansen *et al.*, 2010). It should be noted that, grouping the network users on the basis of node importance (Betweeness Centrality, in this case) has an effect of bringing the network closer together. This is because a social network, regardless of its size, is made up small clusters of connected individuals, whose formation of subgroups within the larger network, results in shorter connections than the long paths in the larger network (Itai Himelboim *et al.*, 2017). Hence, a higher network density (of 0.59) than the ordinary network density (of 0.078) calculated for the entire network graph of 93 vertices before the grouping (see Table 5.6).

Graph density is an indicator of *connectedness* of a network, given as the number of connections in a graph divided by the maximum number of connections (Lorentzen, 2014). This *connectedness* is also a function of the interactions that create the relationships upon which the network is formed. As such, Itai Himelboim *et al.* (2017) agree that interaction between individuals lead to shared knowledge which, in turns, leads to further interaction; they thereby, conclude that the rate of information flow within a network is a function of its density. We therefore, measure *engagement* in terms of *graph density*. Whatever value we get for AK is either maintained or negated by the value of EW depending on the spectrum of network density between dense and sparse, respectively. Hence, Knowledge Management Value (KMV) is calculated thus:

$$KMV = 0.56 \times 0.59 = 0.33 \tag{5.4}$$

The assumption here is that both measures of actionable knowledge and an engaged workforce are performed on the same social network as utilised by the same corporate

organisation. And, it is worth noting that the measure of an Engaged Workforce (EW) in terms of the engagement of employees on social media application is underpinned by the multifarious impact of mobile devices and social applications as found from the survey questionnaire and its data analysis discussed in Chapter 6.

The Knowledge Management Value (KMV) provides a normalised quantitative measure in developing a case for return on investments, rather than turning to storytelling and anecdotal success stories to show the value of their KM investments (Vestal, 2002). In essence, this could be used as an alternative measure that is closer to the actual measure of returns on investments , as it is represented in numbers, and not just an acknowledgement of the presence of some values that cannot be measured. Also, this method can be used in bench-marking similar KM investments for which the EMSoD framework is tailored or fully implemented.

This method can be used to compare Knowledge Management values derived from different KM activities/events or expressed in percentage to determine the return on investments on such activities/events.

5.7 Chapter Summary

This chapter has presented a discussion on the findings and analysis from this research. With regards to KM value to organisations being at the core of the conceptual framework and the question of how social media can deliver KM value, findings from a study on Knowledge Discovery, which culminated in the discovery from social media data, of actionable knowledge to the case study organisation described in Section 5.2.2. Thus, *actionable knowledge* is presented as a measure of KM value in so far as the real essence of knowledge is its actionability, especially when it contributes to the advancement of a proposed undertaking (Cross and Sproull, 2004). Also in this chapter, findings from social network analysis were presented concerning the endpoint of an *Engaged Workforce* as an intended outcome and second parameter for KM Value which social media are capable of delivering to corporate organisations. The measurement mechanisms that result in Knowledge Management Value (KMV) as a product of *actionable knowledge* and *engaged workforce* has also been presented in this chapter. The next chapter explores the multifarious impact of mobile devices and social applications on employee engagement, as found from the analysis of data from the survey questionnaire designed for this.

Chapter 6

Survey Data Analysis and Findings

In Section 4.3.1.1, a reference is made to some surveys on the global state of enterprise mobility. As stated then, the findings from those surveys would have been sufficient for understanding the current state of enterprise mobility from the perspectives of the impact of mobile devices and applications on employee engagement, and thereby, knowledge sharing. However, the mobility concentration of those surveys is predominantly geared towards enterprise mobility strategies that are inclined towards process automation aimed at operational efficiency. This is the First-Order state of organisational change in which any derived competitive advantage erodes as soon as competitors adopt same or similar process automation technology.

Meanwhile, in as much as the enterprise mobility perspective of this research is concerned about such strategies which propel and support the organisation through the more collaborative, engaging and people-oriented level of organisational change (see Section 5.2.3), this survey was designed and administered to capture the current state of such enterprise mobility agenda that facilitate the social interactions that exists within the organisation. The key findings (see Section 6.5) from this survey provide up-to-date and representative information on the current state of enterprise mobility in terms of the mobile devices and social applications enabled by them, which is indicative of their multifarious impact on employee engagement — a precursor to knowledge sharing — as expounded with the third extended research question for this work (see Section 1.2.1). This section presents analysis of the data gathered from the survey questionnaire.

6.1 The Survey Instrument

In studying the impacts of mobile devices and applications on employee engagement and thus, finding an answer to the third Extended Research Question (*ERQ* 3) presented in this research, this survey focuses on mobile applications and devices that facilitate social interactions among employees, from which organisational knowledge could be gained.

TABLE 6.1: Survey Questionnaire Response and Completion Rates

		Attempted	Completed	**Response Rate**	**Completion Rate**
Population Size	6000				
Confidence Level	95%				
Margin of Error	5%				
Sample Size	362	220	187	**52%**	**85%**

To this effect, a survey questionnaire was designed and administered as survey instrument, with the aim of understanding the impact of these mobile devices and applications on social interaction, employee engagement and knowledge sharing within an estimated population of about 6,000 staff members (University of Southampton).

6.2 Framing the Survey Questions

All the questions in the questionnaire are designed as build up around the two main conjectures explored in the survey:

1. That employees' engagement is impacted by the use of mobile devices.
2. That ownership (BYOD/COPE) of the device used at/for work has an impact on employee satisfaction by which engagement is enhanced.

The questions are presented in form of likert scale type, multiple choice and open-ended questions requiring free text inputs. "A likert scale is a psychometric scale that has multiple categories from which respondents choose to indicate their opinions, attitudes, or feelings about a particular issue" (Beglar and Nemoto, 2014). One of the advantages of the likert-scale type of question is in the freedom it allows participants to choose to be neutral, rather than being forced to express a binary opinion (Smart Survey, 2017).

Multiple choice — sometimes called fixed choice — present the respondent with a number of options to choose from, and it is widely used because of its reliability and consistency

(Zafar Iqbal *et al.*, 2017). These were even made more reliable by randomising the multiple choice options in order to prevent the order-effect bias. This is based on the assumption that the "relative position of an item in an inventory of questions or stimuli may uniquely influence the way in which a respondent reacts to the item" (Perreault and Jr., 1975) .

Although it can be more difficult and expensive to code and analyse, open-ended question enables the survey to measure accurately, the opinions of respondents with regards to their important concerns about the issue (Geer, 1991).

When survey participants are completing the questionnaire, the paths of questions presented to them are based on previous choices. For example, when asked whether participants own the device they use most at/for work, or if it is provided by their organisation. If a respondent chose "I use my own device", then they are presented with the path of questions that help in establishing their motivations and willingness to bring their own device to work (BYOD). Contrarily, If a respondent chose "I use company's device", they are presented with the path of questions which help in understanding how employees would feel about the synergistic use of work devices (smartphone, tablets, etc) for personal tasks. An example of such question leading on from this path is:

> "In addition to using your own device for work purposes, to what personal use would you normally put your device?"

This question checks against another question which tries to establish the personal usage of employees' own devices. Some companies provide mobile devices without any social capability but just operational applications. If the mobile device in use lacks social/sharing capabilities, it would be irrelevant to knowledge sharing. Granted that not all mobile devices may be relevant to knowledge sharing, the thesis in this survey is for operational mobile devices to be powered with social/sharing capability so as to enrich the knowledge sharing experience that potentially generates enormous amount of data from which meaningful insights could be mined for the organisation's competitive advantage.

6.3 Recruiting Survey Participants

Participants were recruited by email communication (email sample in Appendix G) targeted at the two largest Faculties in the University. These are the Faculty of Human, Social and Mathematical Sciences as well as the Faculty of Engineering and Physical Sciences, which is the parent faculty of the School of Electronics and Computer Sciences, from which this research originated. A combination of the two faculties is a good blend that represents the wider workforce in the population as they are comprised of employees

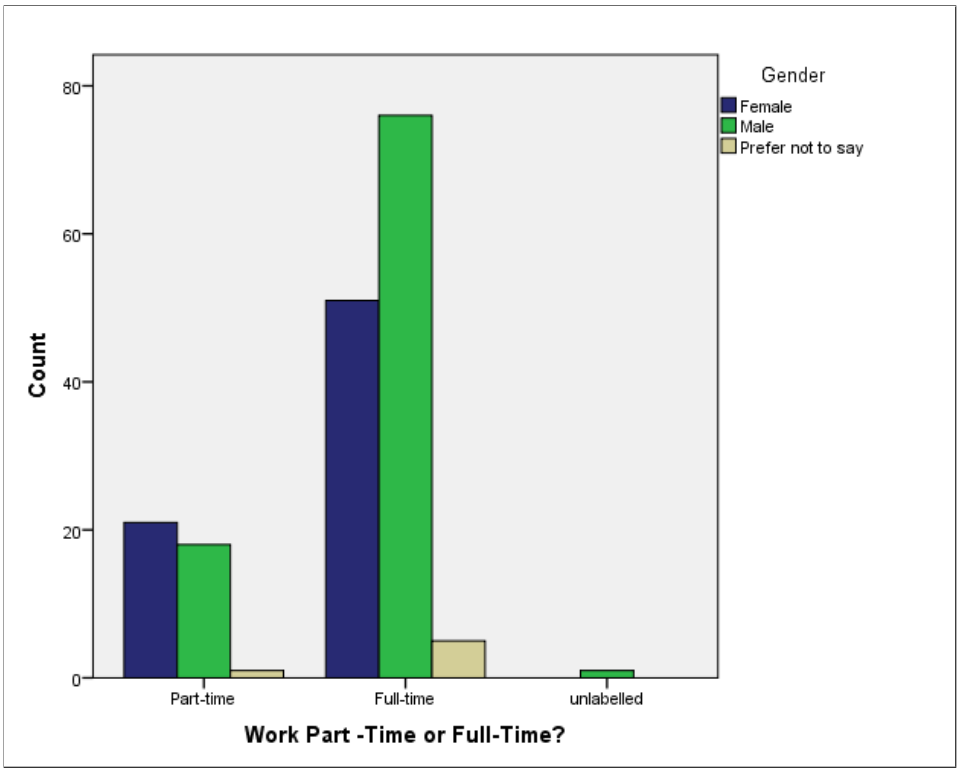

FIGURE 6.1: Full/Part time Workers according to Gender

from the Humanities, Social Sciences, Computer Science, Mathematics and Engineering. This is also a good representation of the middle class, which the United Kingdom has become more of, since the turn of the century (Arnett, 2016). It can also be confidently suggested that the sample size is a true representation of the University, having used the industry standard of 95% Confidence Level (see Table 6.1).

The emails were aimed at recruiting a minimum of 362 participants for the survey. This number is representative of the 6000 staff at the University of Southampton, as suggested by an online sample size calculator on SurveyMonkey.com. This is based on the Central Limit Theorem, which postulates that inferences can be made about a population based on a sufficient size of randomly selected samples from the population (Kwak and Kim, 2017). Out of the total emails sent, 220 recipients responded by, at least, attempting the survey, resulting in a response rate of 52% (220/362), as shown in Table 6.1. Out of the 52% who responded, 85% did complete the survey. An example of demographic findings that may not be immediately overtly relevant to the questions at hand is that there are more male participants than female who work full time, as indicated in Figure 6.1 and Table 6.2.

A sample of the survey questionnaire is available in Appendix A.

TABLE 6.2: Number of Part-time/Full Time Workers according to Gender

*Work Part -Time or Full-Time? * Gender Crosstabulation*					
		Gender			Total
		Female	**Male**	**Prefer not to say**	
Work Part -Time or Full-Time?	**Part-time**	21	18	1	40
	Full-time	51	76	5	132
	unlabelled	0	1	0	1
Total		72	95	6	173

6.4 Survey Questions Analysis and Discussions

The survey data analysis are categorised and discussed by a list of Survey Questions below while the key findings are summarised in Section 6.5 :

6.4.1 Survey Question 1

How often do you use the following devices for/at work?

This question was set to understand the frequency at which each of the devices highlighted are being used at/for work. Table 6.3 and Figure 6.2 are indications of how the participants responded. It is worth noting that some of the response options in the survey questionnaire (see Appendix A) have been bundled together for ease of reporting as presented in Table 6.3. These are "Once a day/Several times a day" and "Once a week/Several times a week" bundled together to become "At least once a day" and "At least once a week", respectively.

TABLE 6.3: Device Usage Frequency Table

	At Least Once A Day	At Least Once A Week	Once A Month	Never
Pen & Paper	162	31	4	1
Tablets	44	31	19	100
Smartphones	151	20	4	22
Laptop PC	132	29	16	20
Desktop PC	116	24	15	42

Even though a number of these groups indicate their use of mobile devices (smart phones and tablets) as well as Pen and Paper, with varying degree of frequency, they do not really enjoy using them for work as much as they do the Desktop and Laptop computers. This is inferred from the second question below.

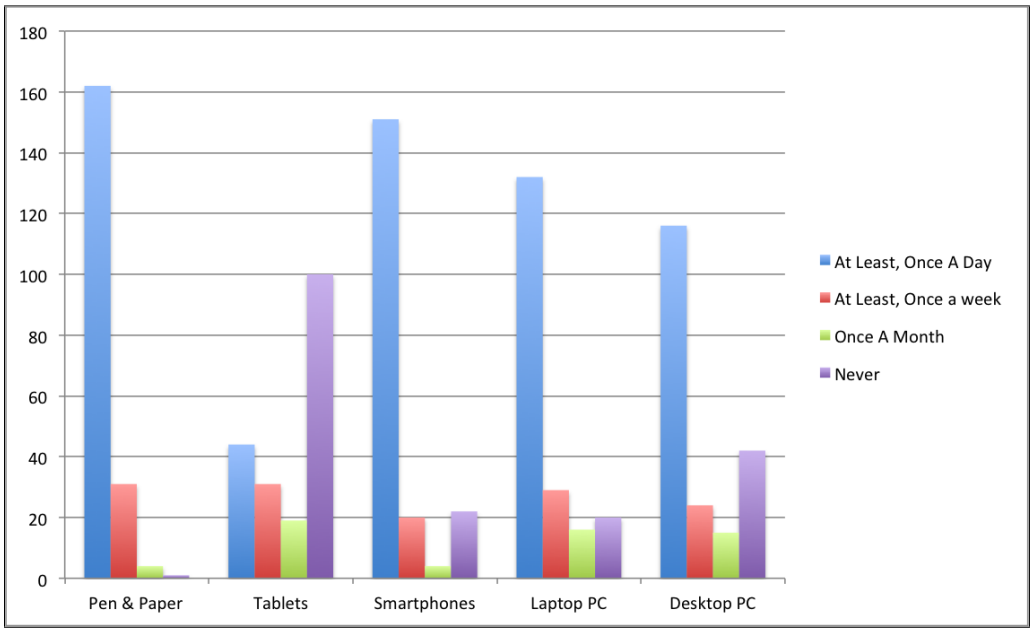

FIGURE 6.2: Frequency of Device Usage

6.4.2 Survey Question 2

Please select one of them that you enjoy using most at/for work

This question tests if the device a participants uses most at/for work is the one most satisfied with, or if the device most satisfied with is different from the one being used most at/for work. It emerged however, that the devices most frequently used at/for work is not the ones most satisfied with. As can be seen in Figure 6.3, a total 163 out of 198 enjoy using either the Laptop PC (90) or the Desktop PC (73). This represents a staggering 85% (approximately) of respondents who have a perception of satisfaction with their use of Laptop and Desktop PC over the mobile devices (smart phones, tablets). In essence, even though a number of these group indicate their use of mobile devices (smart phones and tablets) as well as Pen and Paper, with varying degree of frequency, they do not really enjoy using them for/at work as much as they do the Desktop and Laptop computers. Considering the much higher frequency of use of the "Pen and Paper", its proportionally lower indication of perceived satisfaction raises the question of whether the idea of a "paperless office" (Milliken, 2014) remains a utopian dream. So, why do the respondents enjoy the devices they each enjoy using most? This leads to the next survey question.

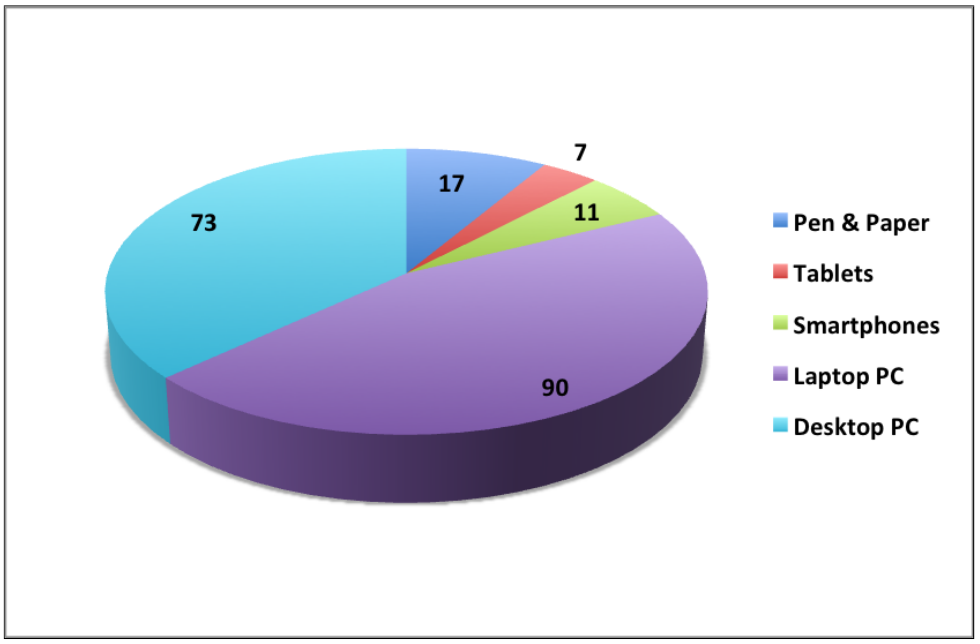

FIGURE 6.3: Device Usage and Perceived Satisfaction

6.4.3 Survey Question 3

Please explain why you enjoy the device you enjoy using most at/for work

In understanding why respondents enjoy the device they enjoy using most at/for work, this question is cross-tabulated with the question of "which of the devices do you enjoy using most at work" (Question No. 2 above).

There are as many different reasons as there are participants who responded to this question and the entire reasons provided by each participant against their preferred devices are presented in Appendix B. Meanwhile, seeing that "Laptop" and "Desktop" receive the highest number of responses at 90 and 73, respectively as shown in Figure Figure 6.3, we focus on these two devices to gain some insights into the reasons why participants enjoy them most at/for work.

Using NVivo, a "powerful software for qualitative data analysis" (QSR International, nd), the entire free text responses of participants were coded *in vivo*, resulting in 25 nodes for laptop and 40 nodes for desktop as shown in Figures 6.4 and 6.5, respectively. According to Given (2008), "*In vivo* coding is the practice of assigning a label to a section of data, such as an interview transcript, using a word or short phrase taken from that section of the data".

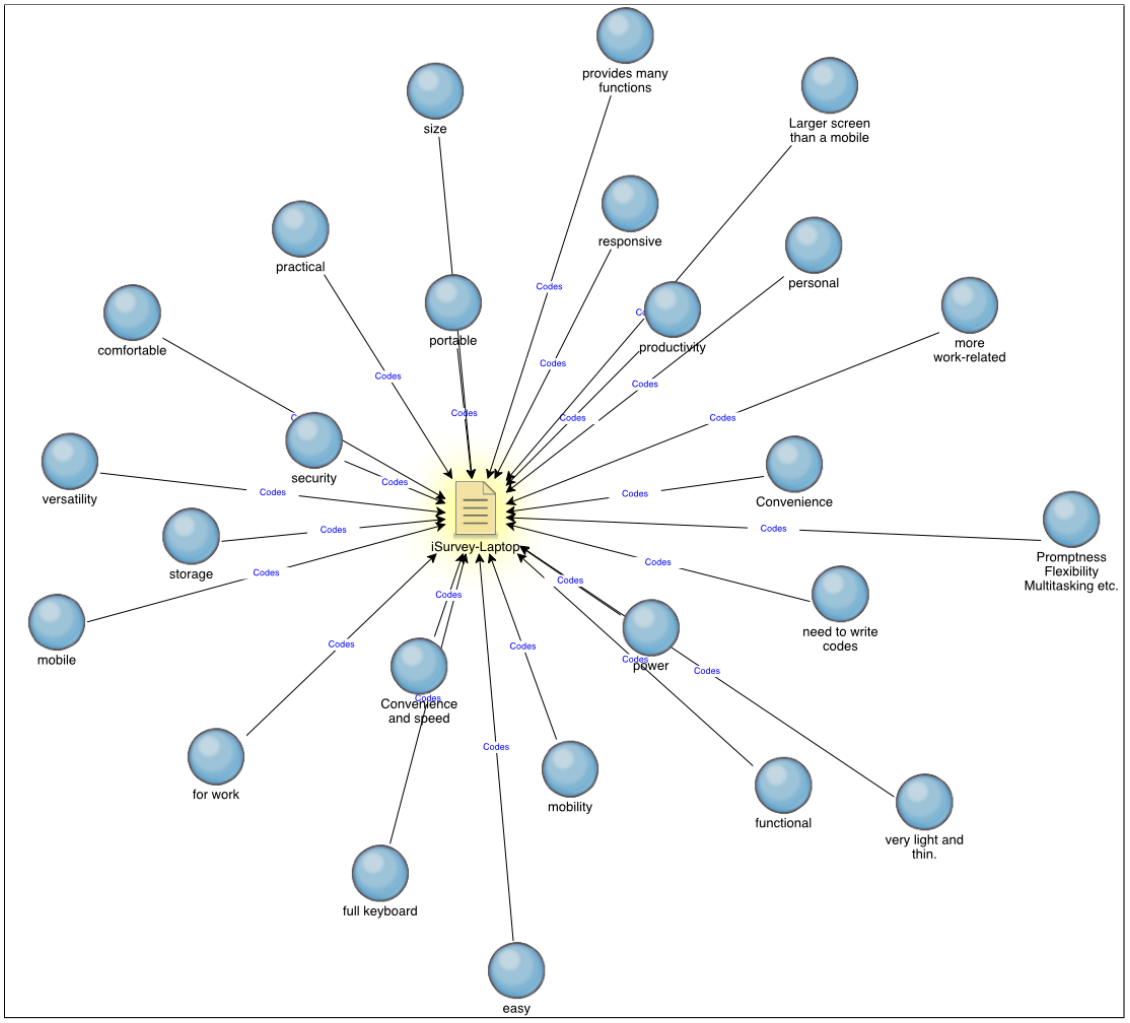

FIGURE 6.4: Coded Nodes for Survey Participants' Reasons for Laptop Preference.

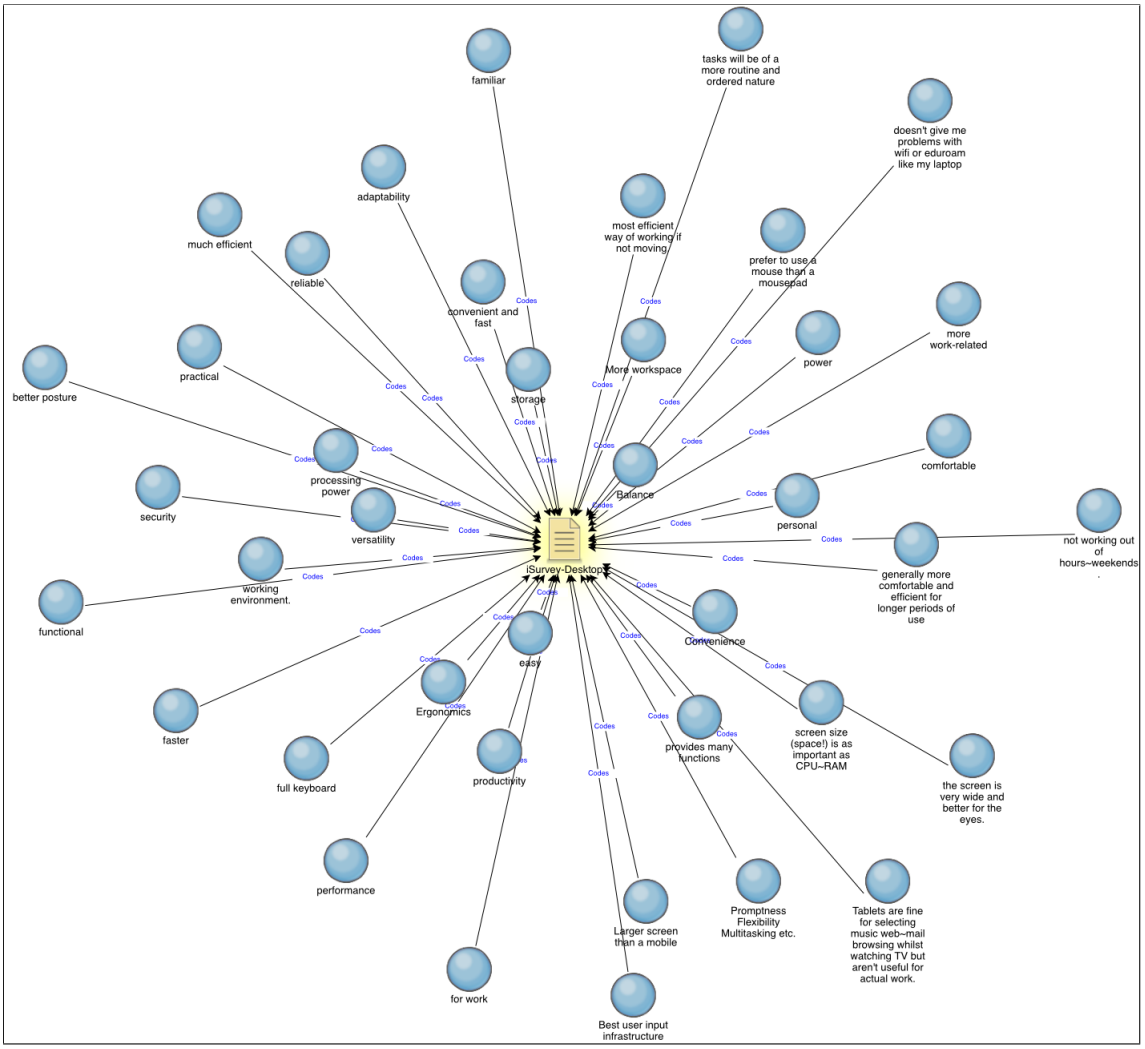

FIGURE 6.5: Coded Nodes for Survey Participants' Reasons for Desktop Preference.

The entire reasons provided by each participant against their preferred devices are presented in Appendix B. Meanwhile, below are some of the comments by survey participants as reasons why they enjoy using laptop/desktop at/for work:

- "Means I can be sat at my desk with two large monitor screens to view"
- "Because it is comfortable to use and the screen is very wide and better for the eyes"
- "It provides the easiest access for the greatest range of information: Larger screen than a mobile easier to use with finger presses a hard drive to save research papers documents my work MATLAB etc."
- "It's practical. Tablets and Mobile devices could make difficult the process of navigation and browsing."

A thematic analysis of nodes compared by number of coded references reveals *portable, easy, provides many functions, convenience and larger screen than a mobile* as the most prevalent themes that run across all participants' free-text reasons for enjoying the device they enjoy using most at/for work. The sunburst image in Figure 6.6 is NVivo's way of visualising the most prevalent themes that run across the entire coded nodes based on their references. The only other alternative is a tabular grid, which is not aggregated nor visually appealing.

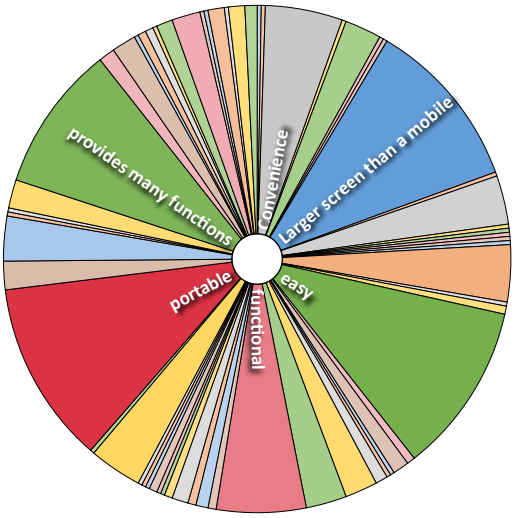

FIGURE 6.6: Prevalent Themes across Coded Nodes.

Meanwhile, *Laptop* and *Desktop* are mostly referenced by the above 5 prevalent themes with 68 and 50 code references, respectively, while *Tablet, Smartphone, Pen and Paper* are the least referenced with 6, 6, and 5 code references, respectively. The code reference of the prevalent themes are presented in Appendix C. The prevalent themes represent unique features inhenrent in laptops and desktops, making them more adaptible to/for work purposes than mobile devices.

With mobile devices (smart-phones and tablet) not being used for/at work as much as desktop/laptop, there is a need for new emphasis on the potential of mobile devices for social transformation of the workplace.

6.4.4 Survey Question 4

How would you agree/disagree with the following statements regarding the device you enjoy using most at work?

This is a closed question that serves to lend credence to the veracity of the open-ended question that produced the results above. Survey participants were asked to agree/disagree with the following statements:

1. It helps me do my job most effectively
2. It saves me time and hassles
3. It enables me to perform multiple tasks at the same time
4. I do not have to be at a desk or an office
5. I just like fiddling with gadgets
6. I prefer pen, paper and traditional desktop computers

Each of the above statements is cross-tabulated with question number 2 above, which asked participants to select which of the devices they enjoy using most, which is an indication of how satisfied they are with the device. The entire analysis of each of the participant's level of agreement with statements above against participants' preferred device is presented in Appendix D.

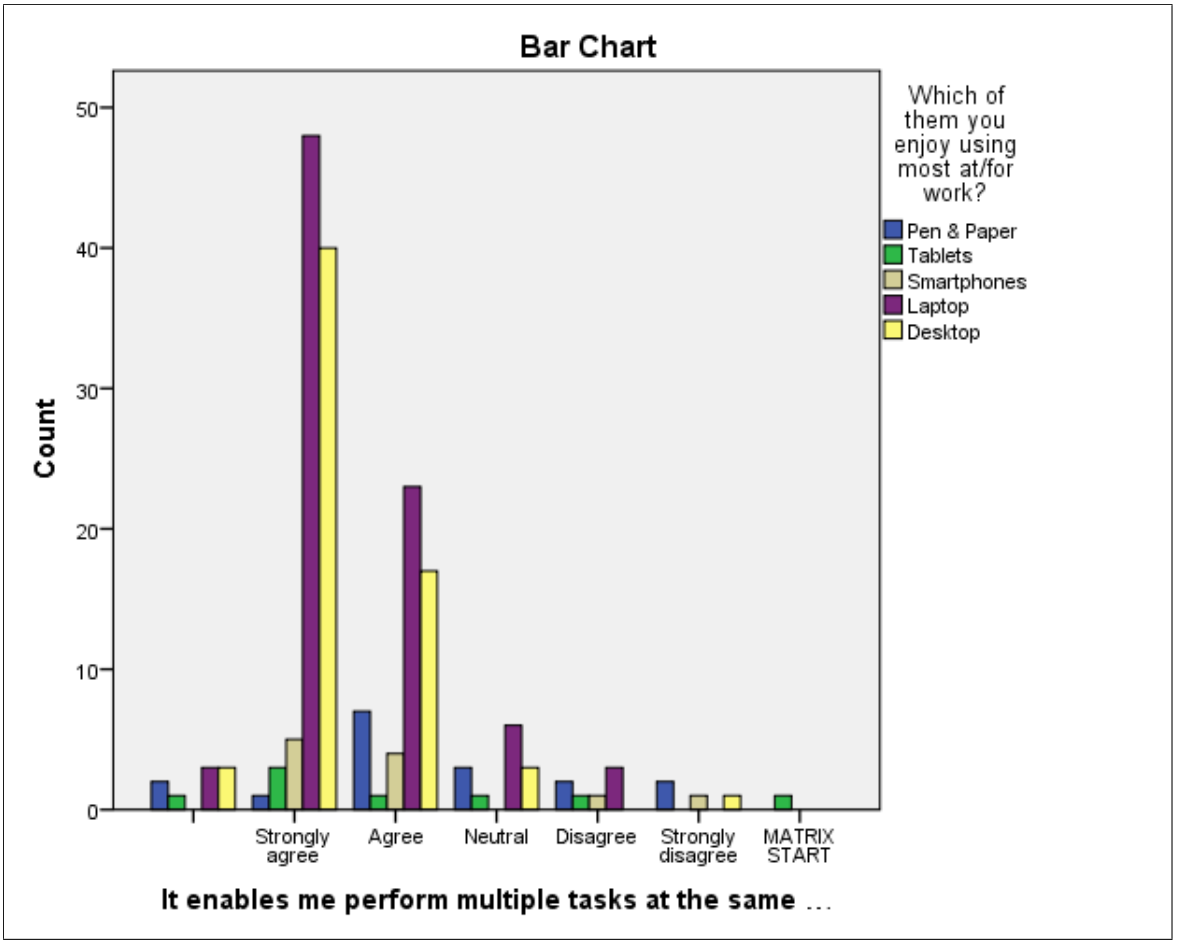

FIGURE 6.7: Respondents level of agreement with Statement 3

Meanwhile, while some of the statements are nominal, this research focuses on findings from statements number 3 and 4 as presented in Figure 6.7 and Figure 6.8, respectively.

As can be seen in Figure 6.7, more respondents who chose the laptop and the desktop device as their most enjoyed devices, do strongly agree that their chosen devices (Laptop and/or desktops) enable them to perform multiple tasks at a time. It is not surprising that multi-tasking can be more realistic on laptop/desktop than on mobile devices, as evident in the prevalent themes that run across the reasons advanced for enjoying theses devices more (see Figure 6.6. However, only laptop users — and a higher proportion of tablet users — agree more than users of any other device that they do not have to be at a desk or an office (Statement 4). Moreover, it should not be surprising that more users of Desktop *strongly disagree* with the statement, as it would be necessary to be at a desk and/or at an office, to use a desktop PC.

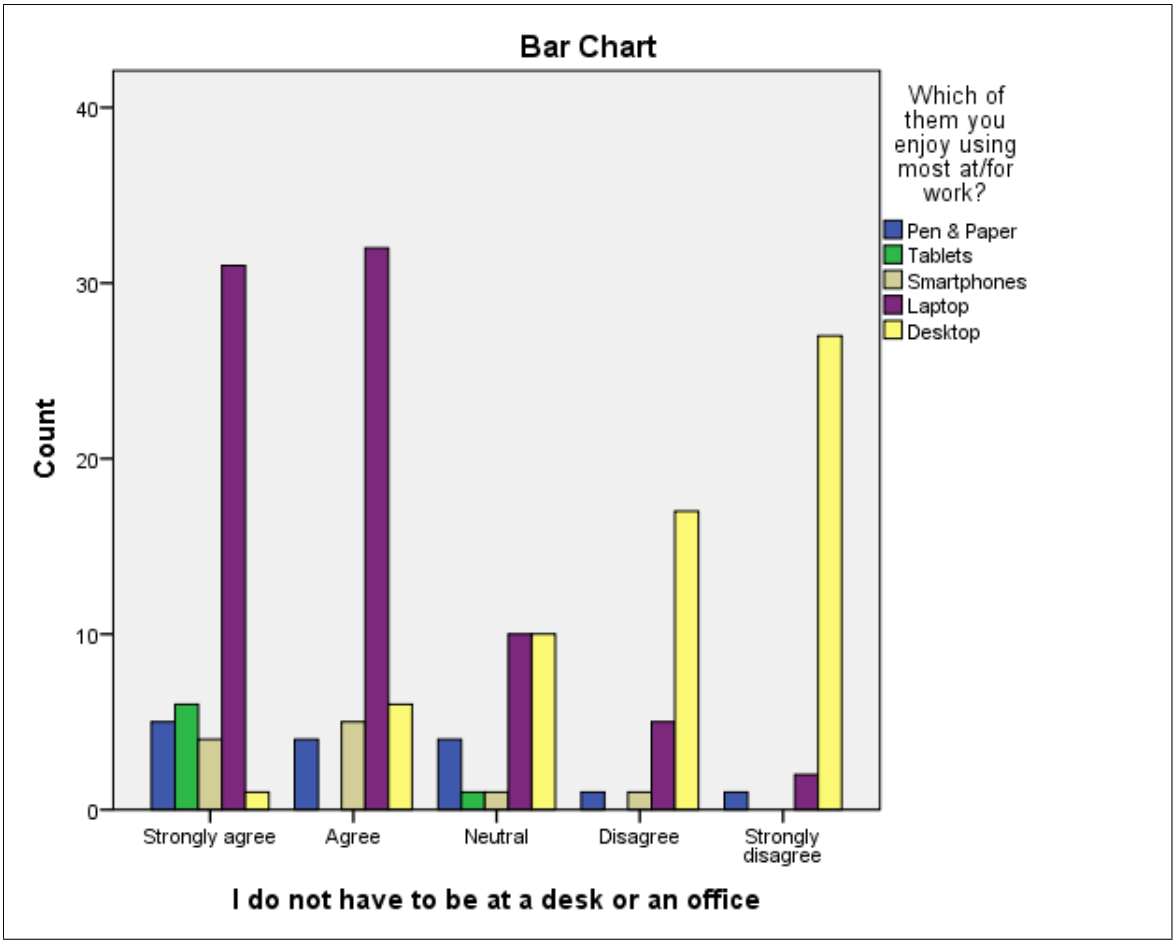

FIGURE 6.8: Respondents level of agreement with Statement 4

6.4.5 Survey Question 5

Device Ownership and Usage Satisfaction

In this subsection, we examined the effects of the ownership of devices — company owned or employee owned — on the satisfaction that employees derive from the devices.

Based on the question of which devices the survey participants enjoy using most at/for work, we asked if these devices are company-owned or employee-owned. As indicated in Table 6.4 and Figure 6.9, 38% of respondents say they use their own devices while about 62% say they use the company's devices

TABLE 6.4: Participants' Use of their Own Device or Company's Device

Own Device or Company's Device?					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Own Device**	67	33.5	38.1	38.1
	Company's Device	109	54.5	61.9	100.0
	Total	176	88.0	100.0	
Missing	System	24	12.0		
Total		200	100.0		

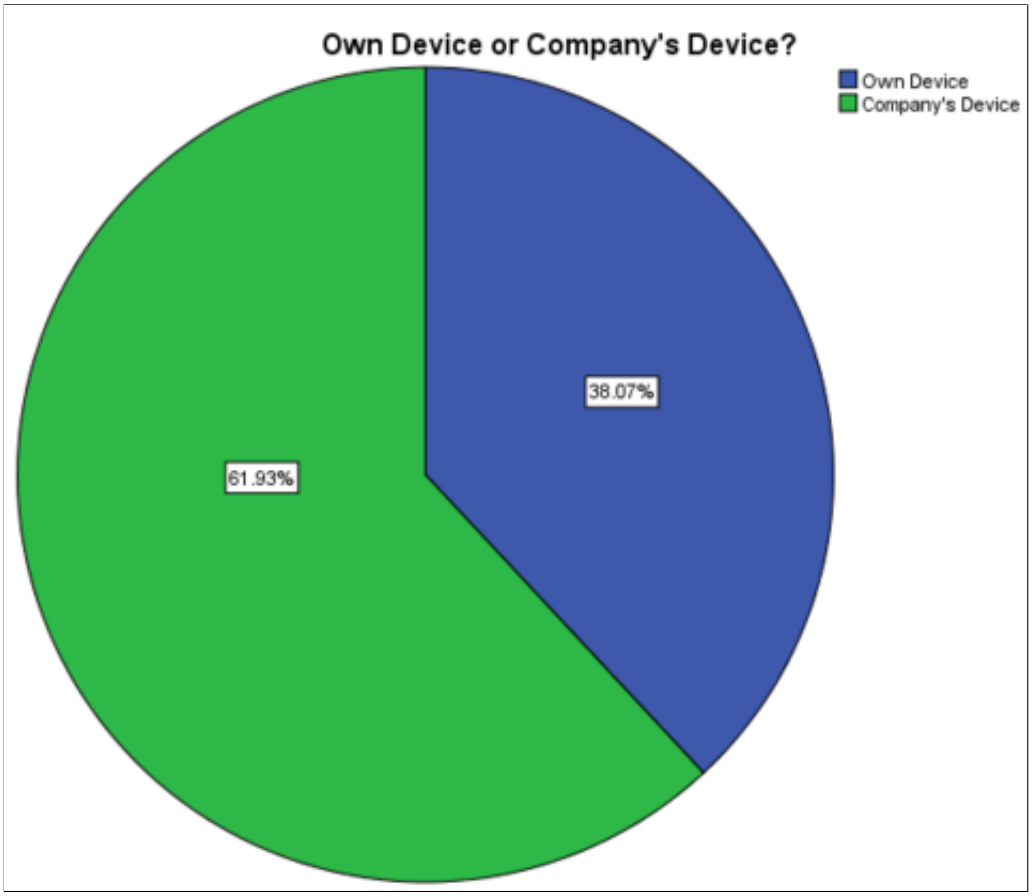

FIGURE 6.9: A Chart of Participants' Responses to "Own or Company's Device"?

How can we tell whether the 38% derive satisfaction from the use of their own devices or the 62% from using the company's devices? Having asked which device each participant enjoy using most (see Figure 6.3), a cross examination of this question with the question of ownership of the device, is presented in Table 6.5 and Figure 6.10

As indicated in Table 6.5 and Figure 6.10, Laptop and Desktop count higher than Pen & Paper, Tablet & Smartphone as devices the survey participants enjoy using most

TABLE 6.5: Device Ownership and Employee Usage Satisfaction

Which of them do you enjoy using most at/for work? * Own Device or Company's Device? Crosstabulation				
			Own device or company's device	
		Own Device	**Company's Device**	Total
Which of them do you enjoy using most at/for work?	**Pen & Paper**	6	9	15
	Tablet & Smartphone	12	6	18
	Laptop	36	44	80
	Desktop	12	49	61
Total		66	108	174

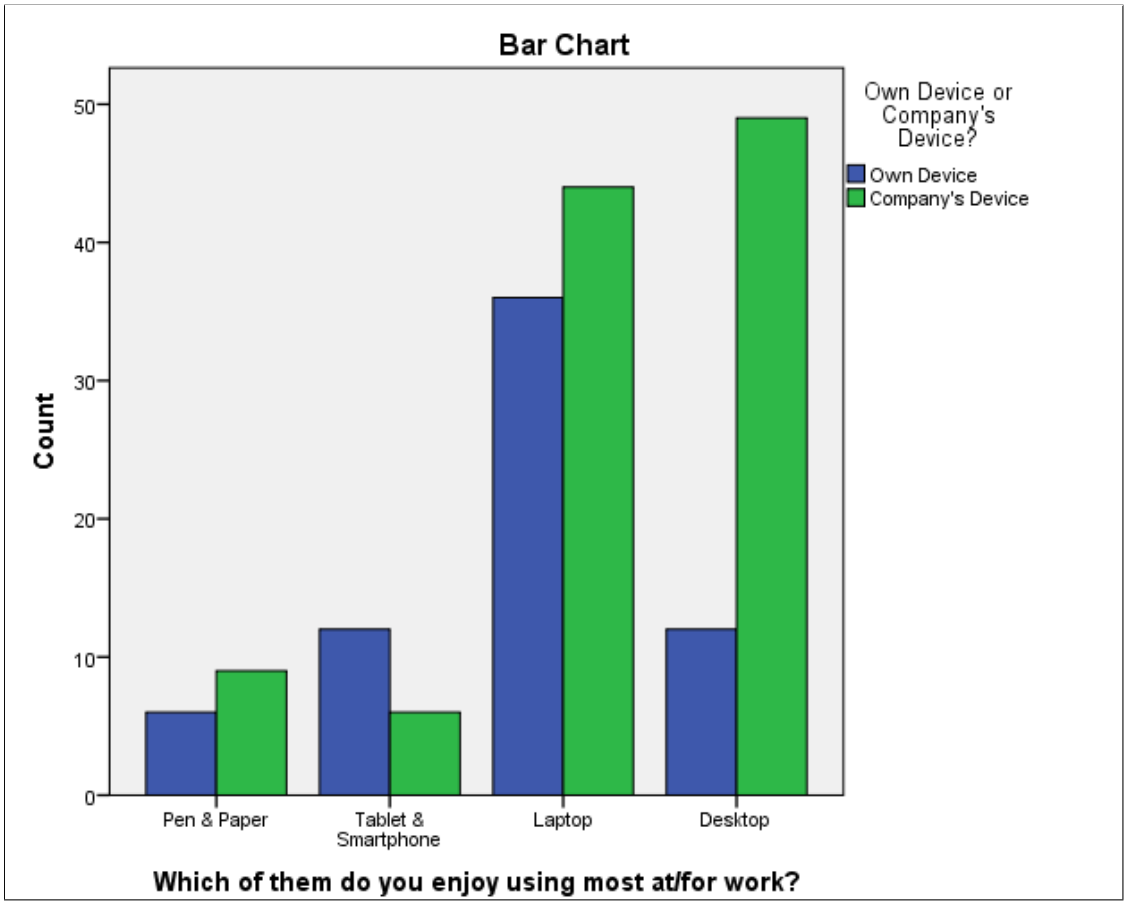

FIGURE 6.10: Device Ownership and Usage Satisfaction

at/for work; and, more of these devices (Laptop and Desktop) are company's devices (Green bar) as opposed to being employees' own devices (Blue bar). Also, as can be seen in Figure 6.10, not as many of the respondents enjoy using mobile devices (tablets and smartphones) at/for work as do laptops and desktops. This indicates that tablets and smartphones are the least enjoyed devices at/for work by employees, suggesting that these devices are not as popular for work purposes as their laptop and desktop counterparts.

But this notwithstanding, a good number of those who say they enjoy tablets and smartphones at/for work, responded that they use their own devices as opposed to company's devices.

Given the above, we postulate therefore, that usage satisfaction with a device increases with more employees using their own device. This is also in consonance with some schools of thoughts that the BYOD policy increases employees' satisfaction. However, both Correlations and Chi-Square tests reveal a weak positive correlation, as indicated by the *p-value* of .200 *Asymptotic Significance* value of .001 in Tables 6.7 and 6.6, respectively. In essence, in as much as there is not a strong enough evidence to suggest a linear relationship between the ownership of devices and the satisfaction that employees derive from using those devices, there would be no need to explore a causal relationship between them, albeit, the statistical significance of the weak positive correlations must be acknowledged.

TABLE 6.6: Chi-Square Test Results based on Device Ownership and Usage Satisfaction (Figure 6.10)

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.676a	3	.001
Likelihood Ratio	17.279	3	.001
Linear-by-Linear Association	8.771	1	.003
N of Valid Cases	174		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.69.			

Since more of the few participants who enjoy tablets and smartphones more, do use their own devices (see Figure 6.10), we can assume that they enjoy using these devices at work and not necessarily all for work. What uses if not for work? In the next survey question, we explore further use cases for the company's device and explore their convergence with the use of employee's own devices at work

TABLE 6.7: Correlation Between Device and Usage Satisfaction

Correlations			
		Which of them you enjoy using most at/for work?	*Own Device or Company's Device?*
Which of them you enjoy using most at/for work?	Pearson Correlation	1	.200**
	Sig. (2-tailed)		.008
	N	183	174
Own Device or Company's Device?	Pearson Correlation	.200**	1
	Sig. (2-tailed)	.008	
	N	174	176
** Correlation is significant at the 0.01 level (2-tailed).			

6.4.6 Survey Question 6

In addition to work related use, how often do you use the company's device for the following?:

1. To keep in touch with friends and family.
2. To keep in touch with work colleagues
3. For personal organisation/admin and time management
4. For games, entertainment and relaxation
5. To keep updated with general news and current affairs
6. To keep updated with work related news and gossip.

The analysis of responses for this question is presented in Appendix E. Meanwhile, it is worth noting that a vast majority of participants responded that they rarely or never (Not at all) use the company's device to *keep in touch with friends and family* while the reverse is the case for keeping *in touch with work colleagues* as, a higher number of respondents say that they quite often or fairly often use the devices to keep in touch with work colleagues, as shown in Figures 6.11 and 6.12.

The common denominator between keeping in touch with friends and family on one hand, and/or keeping in touch with work colleagues on the other hand, is the company's device. Whether with friends and family or with work colleagues, social interaction is an innate human need which, when satisfied, can lead to productivity (Wilcock, 1993). It is not surprising therefore, that an approximately 44% of participants strongly agree

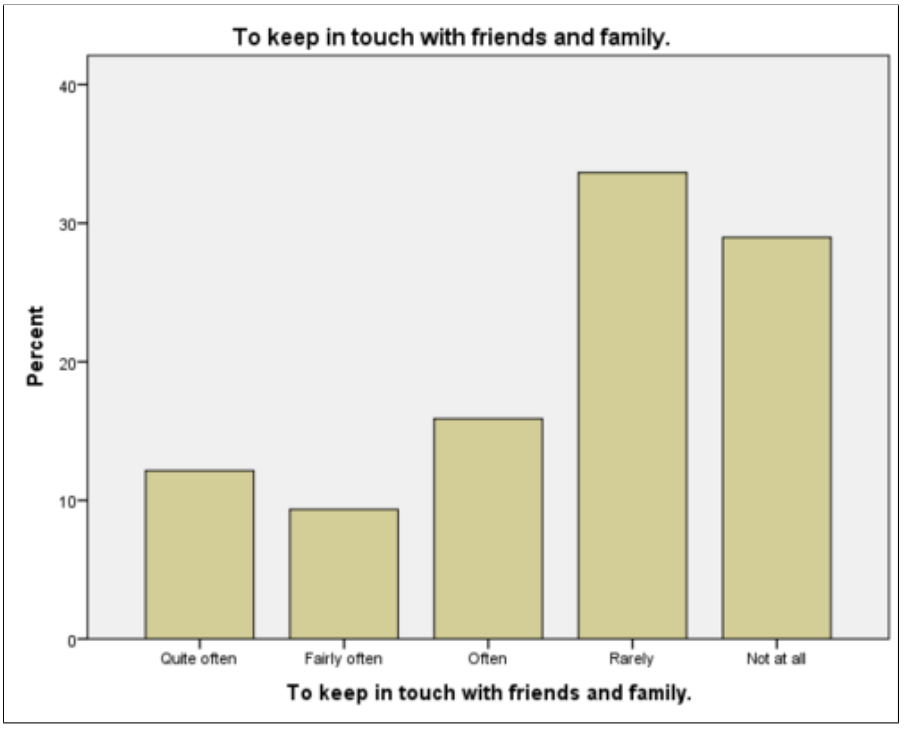

FIGURE 6.11: Using Company's Device to Keep in touch with Friends and Family

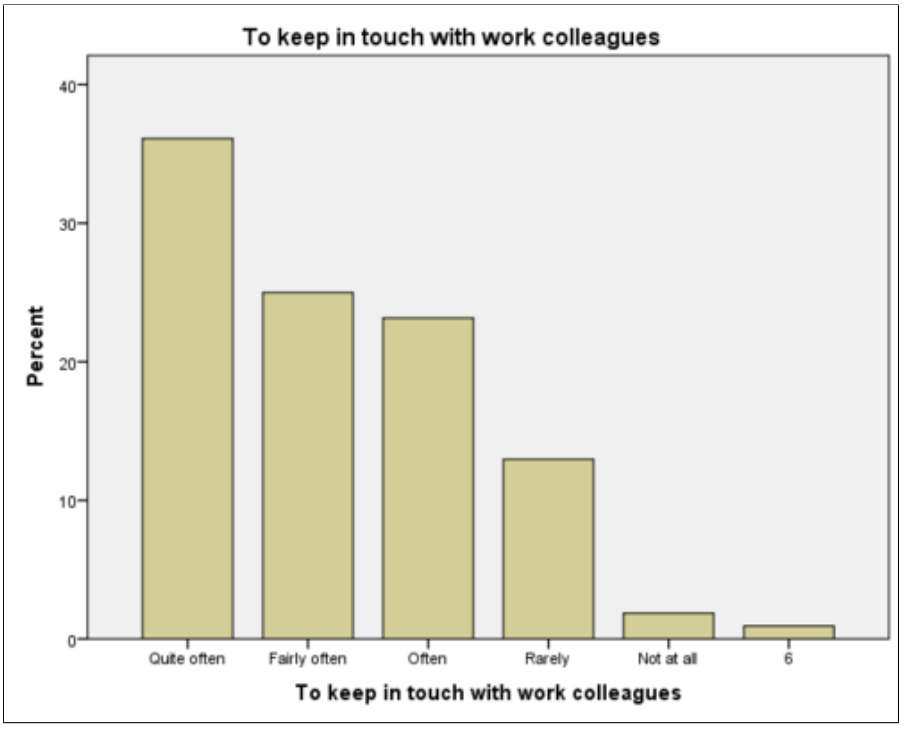

FIGURE 6.12: Using Company's Device to Keep in touch with Work Colleagues

or agree that putting the company's device to some personal use would keep them productive at work (see Table 6.8).

TABLE 6.8: Company's Devices for some Personal Use

It would keep me productive					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	13	6.5	12.0	12.0
	Agree	34	17.0	31.5	43.5
	Neutral	39	19.5	36.1	79.6
	Disagree	20	10.0	18.5	98.1
	Strongly disagree	2	1.0	1.9	100.0
	Total	108	54.0	100.0	
Missing	System	92	46.0		
Total		200	100.0		

6.4.7 Survey Question 7

How Important is it for you to share knowledge, ideas and information with colleagues on your job?; and, how would you best describe the medium/method of communication and knowledge sharing within your organisation?

We cross-examined the medium/method of communication with the level of importance that participants attach to knowledge sharing. All the participants agree, albeit with varying degree, that the sharing of knowledge, ideas and information with colleagues at work, is important. There is not a single response to the effect that knowledge sharing is "Not at all important", which is why the column for this option is missing analysis result presented in Table 6.9. Yet, *the email is predominant system of communication* for about 70% of them, followed only by Facebook/Whatsapp at approximately 15%, as shown in Figure 6.13 and Table 6.9.

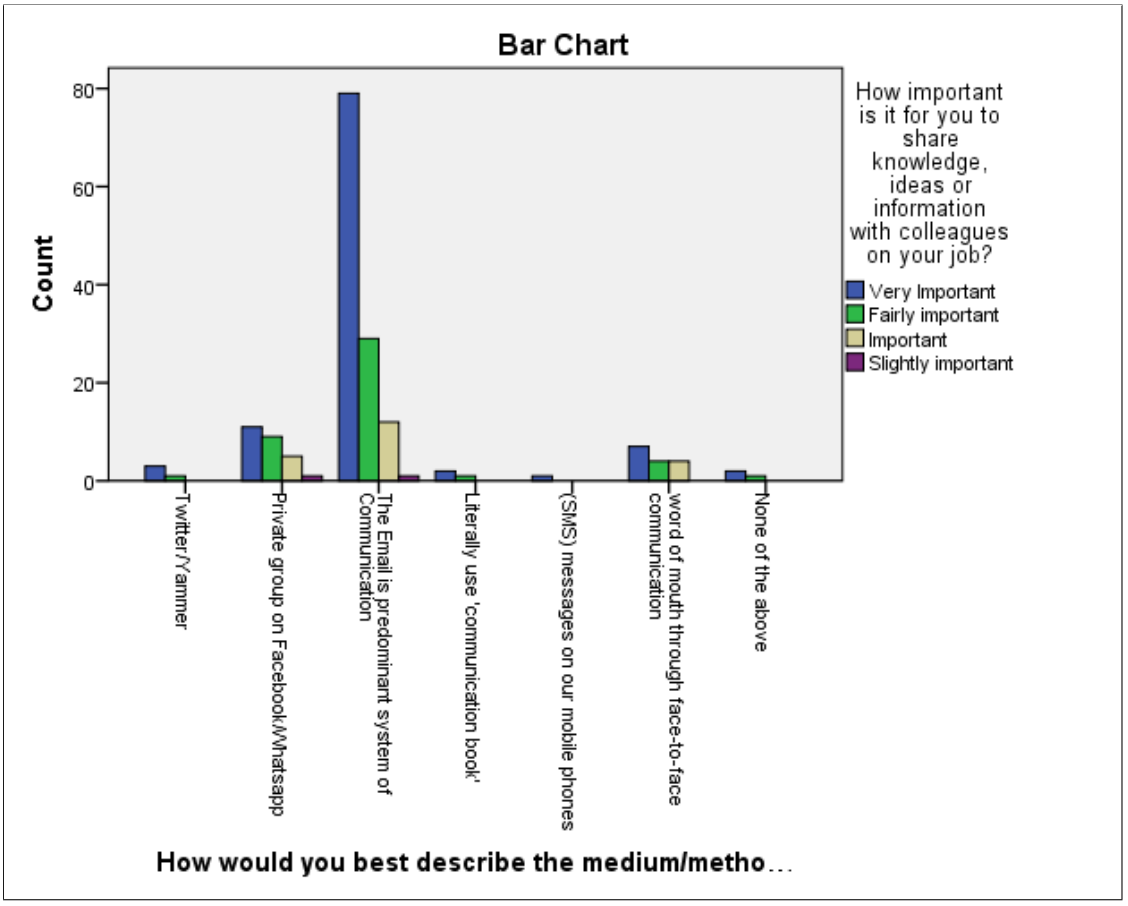

FIGURE 6.13: Level of Importance Attached to Knowledge Sharing

TABLE 6.9: Level of importance attached to Knowledge sharing

	How would you best describe the medium/method of communication and knowledge sharing within your company/institution? * How important is it for you to share knowledge, ideas or information with colleagues on your job? Crosstabulation					
		How important is it for you to share knowledge, ideas or information with colleagues on your job?				
		Very Important	**Fairly Important**	**Important**	**Slightly Important**	**Total**
How would you best describe the medium/method of communication and knowledge sharing within your Company/Institution?	Twitter/ Yammer	3	1	0	0	4
	Private group on Facebook/Whatsapp	11	9	5	1	26
	The Email is predominant system of Communication	79	29	12	1	121
	Literally use the communication book	2	1	0	0	3
	(SMS) messages on our mobile phones	1	0	0	0	1
	word of mouth through face-to-face communication	7	4	4	0	15
	None of the above	2	1	0	0	3
Total		105	45	21	2	173

6.4.8 Survey Question 8

How often do you use or access each of the following applications from a mobile device (Smartphone, tablet, etc.)

The charts in Figures 6.14 to 6.20 are based on the frequency table presented in Appendix F. It is curious to find that a vast majority of participants have never used Twitter/Yammer, Snapchat and Google+ from a mobile device. Snapchat is understandable as it is not yet as popular as the other social applications. However, the Email is more often used on mobile devices than the other applications, lending credence to the assertion that the Email as still *very important* and the *predominant system of communication*, as shown in Figure 6.13 and Table 6.9, respectively.

Meanwhile, a total of 102 out of 176 respondents (51%) claimed that they have never or rarely used Twitter/Yammer from a mobile device; whereas, for approximately 96% and 69% of respondents, Email and Facebook are used at least once a week (see Figures 6.14, 6.15 and 6.19, respectively; Appendix F).

Juxtaposed with the findings in Section 6.4.6, wherein, a higher number of respondents say that they quite often or fairly often use the devices to keep in touch with work colleagues than with friends and family, it can be inferred that the social application most commonly used to keep in touch with work colleagues is Email and Facebook.

Also, as established in Section 6.4.5 that the linear relationship that exists between the ownership of devices and the usage satisfaction is not strong enough to suggest a causal relationship, keeping in touch with work colleagues is a constant factor, regardless of whether employees bring their own devices or use the company-provided devices.

6.5 Key Findings from Survey Analysis

The third extended research question is aimed at studying the impact of mobile devices and mobile (social) applications on employee engagement. The multifarious impact has been extensively discussed in the preceding section and is hereby summarised as key findings from the survey analysis:

1. Email and Facebook are the most commonly used social applications for keeping in touch with work colleagues.
2. Electronic mailing (e-mail) is still the medium/method of communication mostly used for work-related communication within the University of Southampton, as indicated by the survey data.

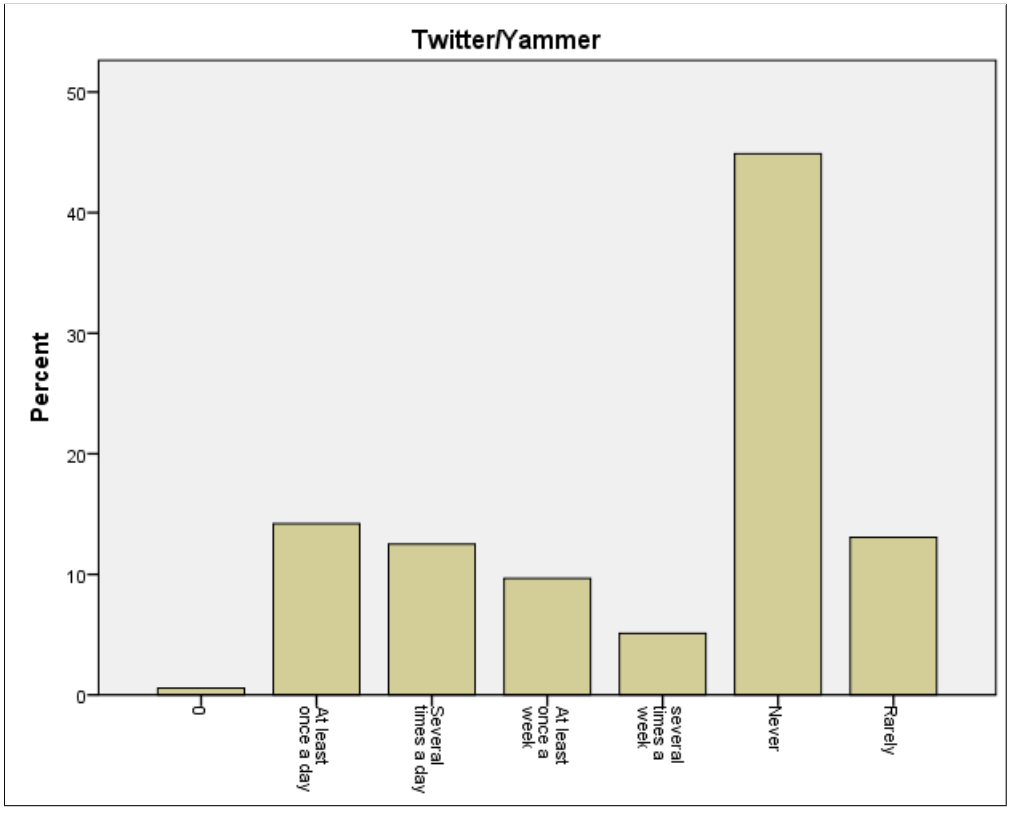

FIGURE 6.14: Usage Frequency for Twitter/Yammer

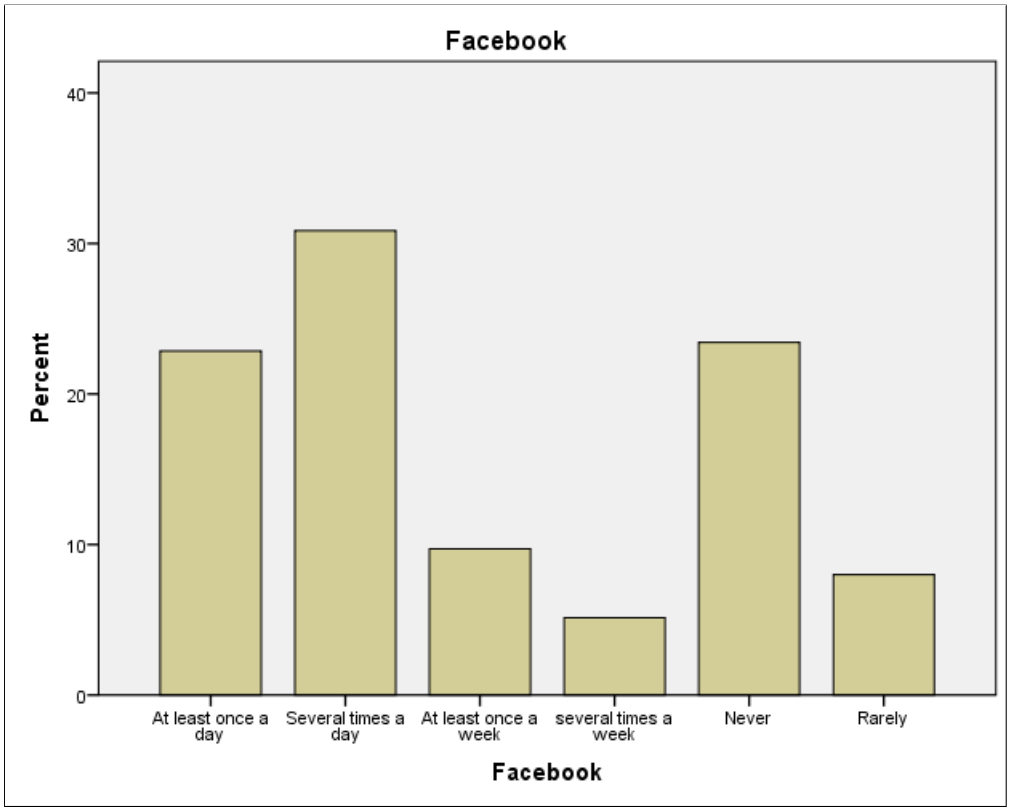

FIGURE 6.15: Usage Frequency for Facebook

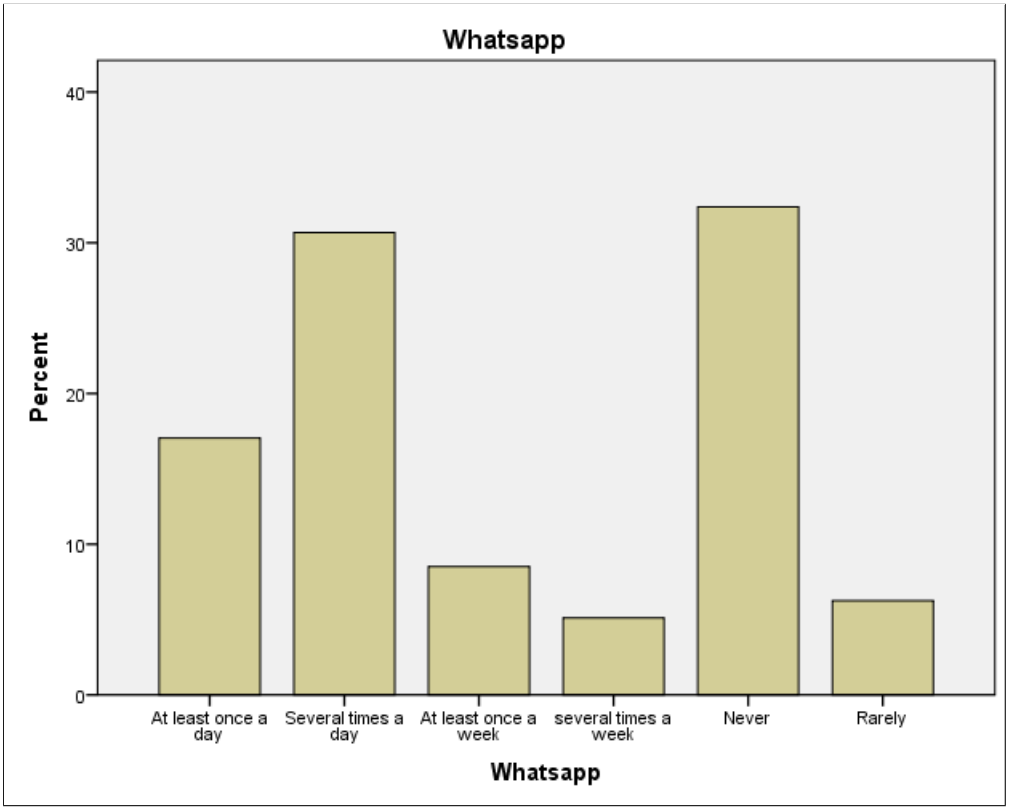

FIGURE 6.16: Usage Frequency for Whatsapp

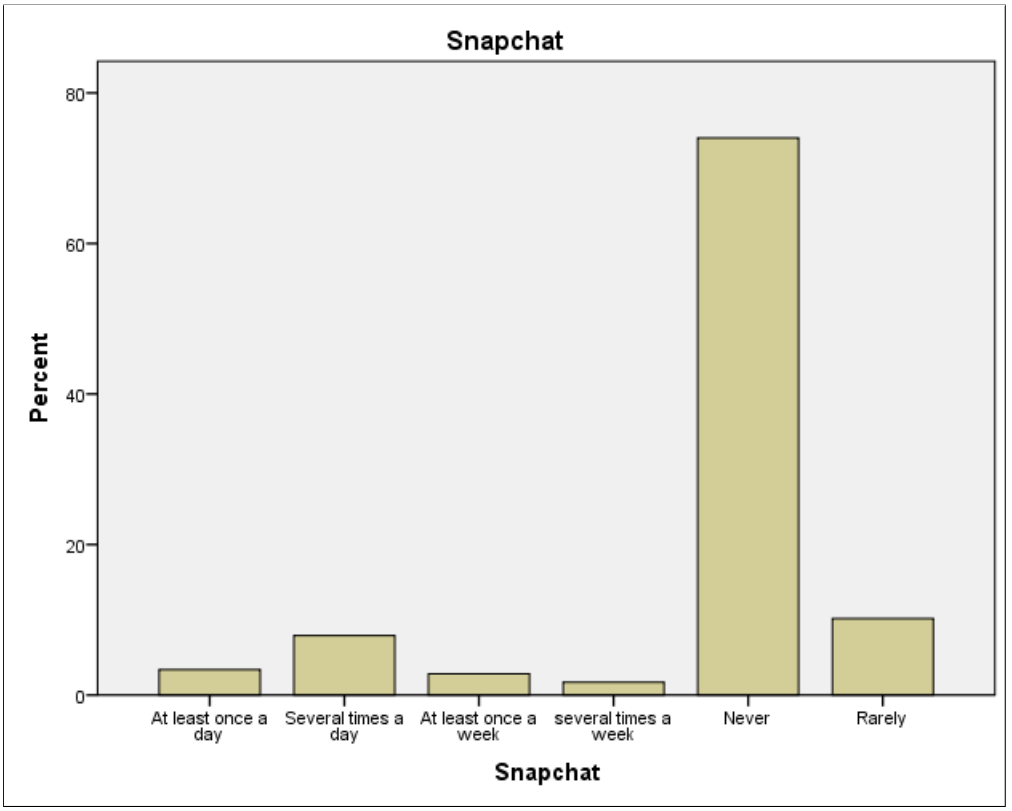

FIGURE 6.17: Usage Frequency for Snapchat

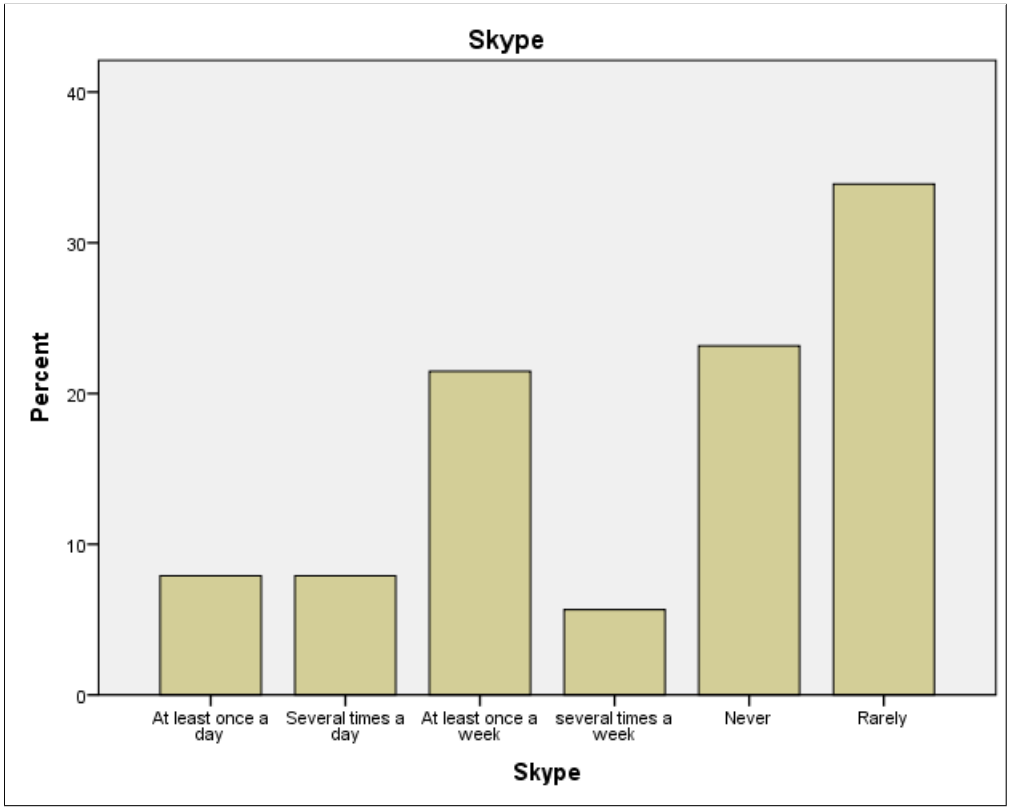

FIGURE 6.18: Usage Frequency for Skype

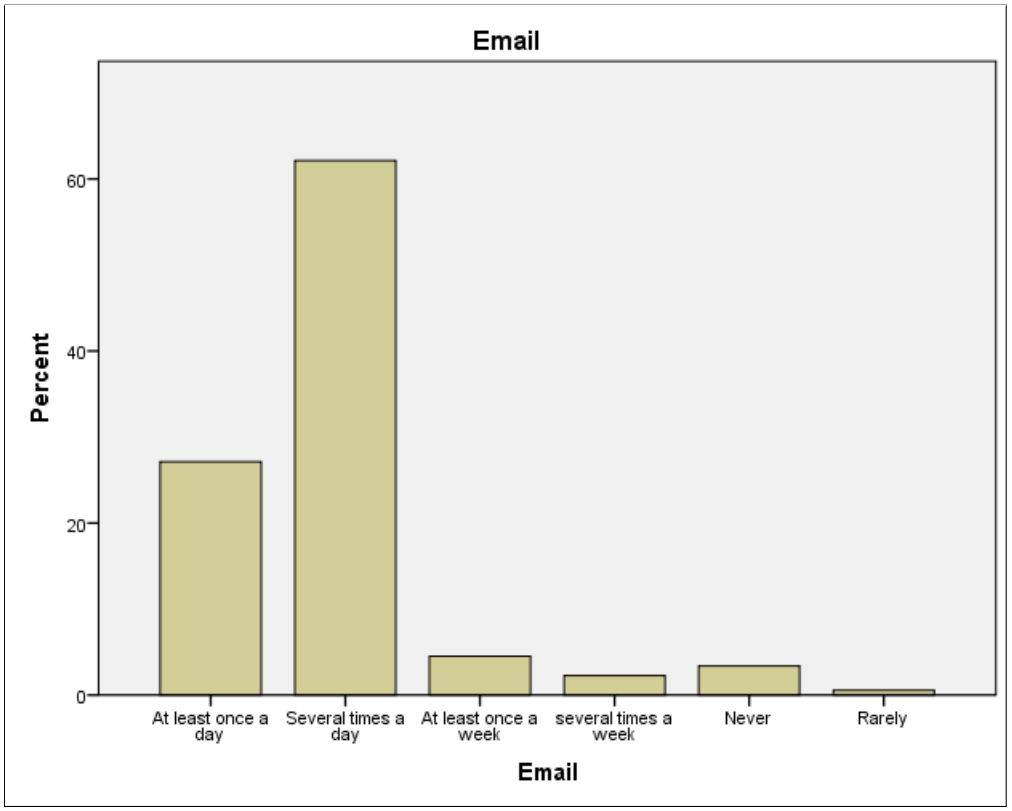

FIGURE 6.19: Usage Frequency for Email

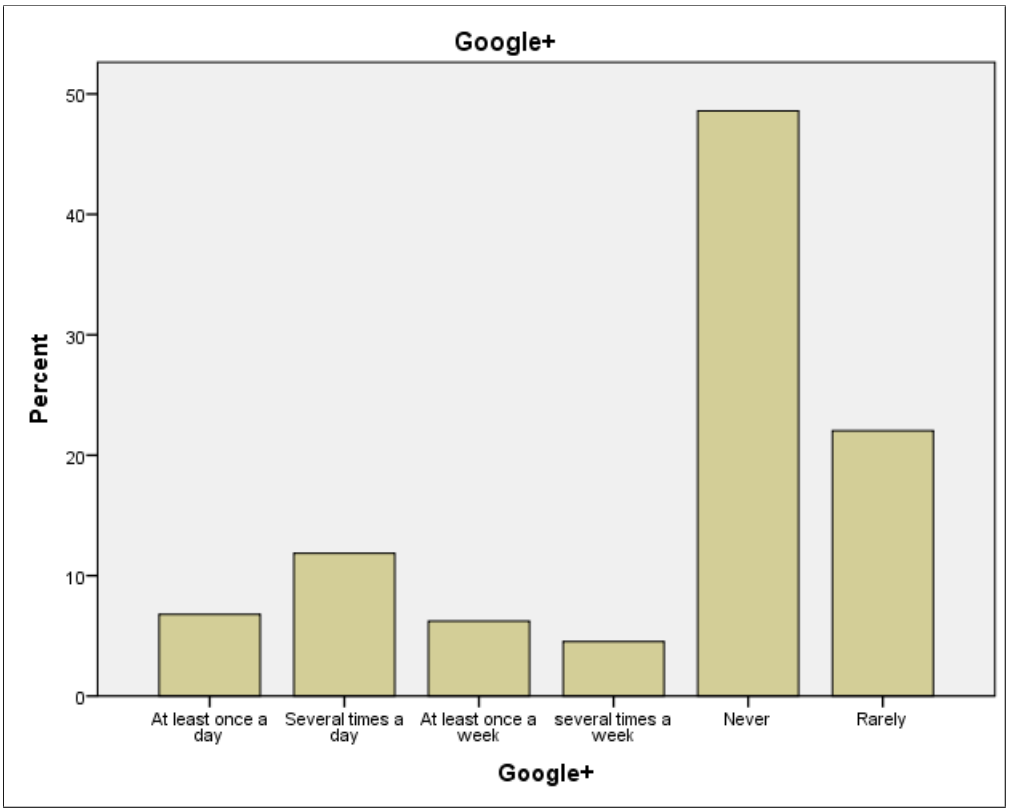

FIGURE 6.20: Usage Frequency for Google+

3. Employees are not always as happy about using their own devices at/for work as they are about using the company-provided devices.

4. The laptop and desktop are still the most widely enjoyed devices at/for work than mobile devices.

5. There is not a strong enough linear relationship to suggest causality between ownership of device (BYOD/COPE) and the satisfaction employees derive from using them at/for work.

6.6 A Review of Key Findings from Survey

In spite of the disruptive impact of social media on the telephone, email, instant messaging and event planning (Christensen, 1997), the email is still the most preferred and mostly used method of communication within one corporate organisation, as indicated by the survey data. In spite of the question of generalisability of a single case study, which critics say may be lacking, a single critical case like this could be generalised since the data and findings are replicable in similar organisation sharing the same characteristics, as discussed in Chapter 3.2.5. Moreover, it is discussed in Section 6.3, how that the broad selection of survey participants represents the University (of Southampton), and how by virtue of being a well informed and educated target population, they represent

the middle class by which the United Kingdom has been largely defined since the turn of the century. Therefore, what is true for this study is very likely to be true if the survey was administered across the United Kingdom.

In essence, social media, like Twitter and Facebook, have not been able to disruptively displace the email, which is perhaps, the most persistent digital communication technology being utilised by corporate organisations. Rather, it can be observed that social media have helped in strengthening and sustaining the use and relevance of email. This is because, for example, an email address is required for signing up to virtually every social media account, much as one is almost always used in the verification of individual and/or corporate profiles. However, the ready availability and easy accessibility of social media applications on mobile devices, like tablets and smart phones, provide an added layer of engagement within corporate employees than the email alone could have provided. This is a significant impact, and one that stretches the displacement of letter-writing beyond the ordinary technological disruption of the postal and greeting card industries (Christensen, 1997), occasioned by the advent of the email. The significance of this impact is manifest in the one-stop integrated communication solutions — for instant messaging, telephoning, event planning, emailing, group/forum discussion, private messaging, etc — provided by platforms like Whatsapp, Facebook, etc.

Moreover, the realisation that the laptop and desktop are still the most widely enjoyed devices at/for work than mobile devices is a corroboration of the assertion that the facilitation of employee engagement is not entirely brought about by mobile devices but by the social applications enabled by them. Laptops and desktops facilitate employees' operational efficiency much as several hand-held devices like the DIAD and FEDEX Mobile Solutions (see Section 4.3.1.1). However, these devices did not facilitate social interaction nor did they motivate employees to engage until the advent of the smartphones and tablets, which power social applications by which social interactions and employee engagement are amplified.

Although it is a known downside of surveys that they can only report relationship between variables that are found and not able to claim cause and effect (Rumsey, 2010, p.6), the lack of a strong enough linear relationship suggesting causality between ownership of device (BYOD/COPE) and the satisfaction employees derive from using them at/for work, is an indication of something significant. That is, enterprise mobility is no longer — and should no longer be seen — in terms of the ordinary ownership of mobile technology devices but chiefly in terms of the mobile social applications powered by the devices.

6.7 Chapter Summary

This chapter has presented the frequency at which survey participants use the devices in question. It also reveals which of the devices command the most satisfaction of employees, with a thematic analysis of the reasons why survey participants enjoy their preferred devices. The major questions from the survey questionnaire and their findings and analysis have been extensively discussed in this chapter. Given that the overall analysis indicates that the laptop and the desktop command the most satisfaction for usage at/for work, employee engagement over mobile devices like tablets and smart phones has an indication for social application upon which this assertion is based:

> *the facilitation of employee engagement is not as much a function of the mobile devices as it is of the social applications powered by them, and by which social interactions are facilitated.*

Chapter 7

Conclusion and Recommendations

7.1 Conclusion

This research is predicated upon the disruption to organisational structures and hierarchies brought about by the emergence of social media platforms like Twitter. This has created perceived tension between knowledge management and social media (Ford and Mason, 2013a). Owing to its lack of maturity and a general state of apathy (Griffiths and Moon, 2011), KM has to reposition itself and deliver measurable values (Griffiths *et al.*, 2015, p.39), if it is to remain relevant in organisational strategic planning and positioning.

Also, as hinted earlier in Chapter 2.3, page 14, the Global Knowledge Research Network (GKRN) conducted a global study to identify future research need in Knowledge Management. The study received contributions from 222 Knowledge Management experts from 38 countries comprising of diverse nationalities, industries, government, NGOs, and academic disciplines. The overall results are, as reported in *Advances in Knowledge Management* — A publication that celebrates 20 years of KM research and practice (Bolisani & Handzic, 2015), that:

1. Future research in knowledge management needs to demonstrate the value contribution of knowledge management.
2. Research should focus more on human and social factor and explore knowledge management as an organisational capability.
3. The core concepts of knowledge should be revisited to improve the understanding.
4. More critical research approaches should be employed...

Moreover, KMWorld — *the world's leading knowledge management event* — holds in Washington DC between 6th and 9th of November. The theme (People Power, thinking and tech) is aimed at exploring how KM can deliver value to restore organisations' hope in KM. The theme also focuses on the fact that people are at the core of knowledge sharing and key to high functioning organisations (Information Today, 2017).

In view of this corroborative need for the value proposition of knowledge management, this research sought to explore *how social media platforms can deliver knowledge management value to corporate organisations.* In its exploration, the research specifically sought to address the following questions:

1. What is an appropriate social framework for delivering KM values?
2. What are the intended outcomes from social media by which KM values can be measured?
3. What are the impacts of mobile devices and social applications on employee engagement?

Presented in this thesis is ***E**nterprise **M**obility and **So**cial **D**ata **(EMSoD)*** — an appropriate conceptual framework, which mediates between KM and social media, as well as places KM value at its core. By considering social media data within a Managed Platform through to the delivery of measurable KM value, this framework has helped in answering the overarching formative research question of how social media platforms like Twitter can deliver measurable values to corporate organisation. This social framework is not only appropriate for delivering KM value, it also encompasses the intended outcomes from social media by which KM values can be measured.

The intended outcomes from social media identified in this research are the two parameters that have also served as measures of the KM value delivered: (i) the discovery of *actionable knowledge* from social data, as well as, (ii) the determination and facilitation of *employee engagement.*

As the real essence of knowledge is its *actionability*, especially when it contributes to the advancement of a proposed undertaking (Cross and Sproull, 2004), each of the knowledge items discovered from the Twitter data used for the case study investigation in this research, is capable of providing significant insights that informs decision making, which impacts company's proposed undertakings at one point or the other. Some significant business decision by the case study organisation was informed by the insights gained through this research. However, the main objective of this research is the delivery of measurable KM value to corporate organisations, which the ***EMSoD*** social framework helps to deliver. Therefore, this research has devised a mechanism for measuring *actionable knowledge* as one parameter of KM value. The mechanism devised for measuring

actionable knowledge in this research is ordinarily sufficient in itself as a measure of KM value derived from such insights from social media data. Nevertheless, the ***EMSoD*** social framework — and the KM value it delivers to corporate organisations — is further strengthened by its second parameter of KM value, which is *employee engagement*. The measure of KM value is made of both parameters, as depicted in Equation 5.1 ($KMV = AK \times EW$).

7.2 Research Thesis Contribution

The unique contribution of this research, with its ***EMSoD*** framework, is not only in its capability for exploiting social media in delivering actionable knowledge and facilitating employee engagement within a corporate organisation. It is also in the measurement mechanisms devised for these deliverables as measures of Knowledge Management value. Although, as hinted earlier, many organisations have turned to storytelling and anecdotal success stories to show the value of their KM investments, there is an increasing need for businesses to show the business value of KM, in terms of normalised quantitative measures, in developing a case for Return on Investments (Vestal, 2002). This is what business managers and accountants, whose perception of realities is largely in terms of numbers, are looking for when they criticise KM for a want of measurable values.

In essence, the *EMSoD* social framework proposed in this research does not only deliver KM value but also proffers a solution for the measurement. This is an important contribution, and the first of its kind that seeks to satisfy both academic and management concerns, given that the academic is more concerned with the validity and generalisability of measures beyond the original context of a research question. The manager, on the other hand, is more than willing to use a befitting measure if it can quickly provide useful information (Melnyk *et al.*, 2004).

7.3 Discussion and Recommendations

From an inductive point of view, a mixed method approach of triangulation was adopted throughout the research, and in particular, a case study methodology was used in carrying out an investigation that demonstrates the discovery of actionable knowledge from social media data. From the literature as reviewed in Chapter 2, and extensively cited in the conceptual framework in Chapter 4, as well as the findings from the Knowledge Discovery from Social Media Data as presented in Section 5.2, there is evidence that organisations are now paying more attention to using current and emerging mobile Information Technologies for their operational efficiency and strategic sustainability. They are also concerned about how to utilise both their own primary and secondary data, coupled with other external data, for strategic competitive advantage. It is observed,

however, that many organisational implementation of these technologies exists only at the first-order state (automation) of organisational change, which offers operational efficiency but not competitive and strategic advantage. This is the state where the case study organisation studied in this research exists. This also represents the current (2016) Enterprise Mobility Exchange (2016) as highlighted in Section 4.3.1.1.

Meanwhile, merely automating with mobile devices does not warrant the business justification for an enterprise mobility investment. If organisations should stop at this first-order level of organisational change, the return on investment on such technological implementation, if any measurable returns, will sooner than later erode. This brings Knowledge Management back to square one where senior management cast an aspersion on KM for want of valuable Return on Investment, having been oversold by consultants in the 1990s. For organisations to derive value from KM efforts again, this research recommends that organisations should focus on the perceived knowledge satisfaction (Becerra-Fernandez and Rajiv, 2001), which is offered by the intended outcomes of actionable knowledge and employee engagement. Wherever there is a need for businesses to show the business value of KM in terms of normalised quantitative measures in developing a case for Return on Investments (Vestal, 2002), the measurement mechanism (see Chapter 5.1) devised in this research is recommended.

Moreover, essentially, this research conclusively asserts that the *EMSoD* framework and the measurement mechanism for KM value are possible solutions to the image problems suffered by KM and its indictment for lack of measurable values. The above recommendations are therefore, aimed at propelling and supporting the organisation through the more collaborative, engaging and people-oriented level of organisational change - Informate (Section 5.2.3, Item No. 2).

7.4 Assumptions and Limitations

It is generally assumed in this research that corporate organisations would use the public micro-blogging platform, Twitter, as a tool for social interaction between their employees. Twitter is essentially a public platform, except where the user network is explicitly declared private, precluding non-employees from joining or *following* the network. The social network and knowledge discovery in this research is based on the assumptions that any such case of Twitter being studied is based on a public Twitter network. Also, a case study organisation is studied in demonstrating the discovery of actionable knowledge from Twitter while the University of Southampton's Twitter account is studied in demonstrating how social network facilitates employee engagement. In the measurement of KM value, this research operates with the assumption that both corporate entities are one. Hence the multiplication of actionable knowledge by engaged workforce in deriving KM value.

Meanwhile, the above assumption that both corporate entities are one, arouse out of the limitation of the research. The research is limited by the challenges of getting corporate organisations to release their enterprise social data from enterprise social blogging platforms like *Yammer*, for example. Coupled with this is the challenge of obtaining survey respondents from corporate organisations. These are due to management bureaucracies and reluctance borne out of concern for the privacy and security of their employee and their corporate images. Moreover, the process of obtaining ethical approval for external data is more stringent than the limited time scope of the PhD program. However, in accordance with feedback and foresight from the course of supervision for this research, these challenges were circumvented by taking to public Twitter and seeking to recruit survey participants from within the University.

7.5 Twitter versus Email — A Caveat

It has been asserted how social media platforms like Twitter breaks the hierarchical structure, creating a lateral flow of information, which enhances the ordinary social interaction within the rank and file of the organisation.

However, one of the key findings of a survey conducted in this research is that Electronic mailing (e-mail) is still the medium/method of communication mostly used for work-related communication within the University of Southampton, as indicated by the survey data (see Chapter 6.5). It is established in Chapter 3.2.5 that a proposition that is valid for critical case study like this may be valid for many such cases. This means that the email may as well be the mostly used medium/method of work-related (formal) communication within many Universities and/or many organisations across the United Kingdom.

Nonetheless, whereas conversations over Twitter may be likened to the *water-cooler* moments that may be said to have no cost on employee productivity, the cost of email on employee productivity in terms of the time spent in answering and recovering from email interruptions, has been identified by Jackson *et al.* (2001), who conclude that "majority of email users answer the email as quickly as they answer the telephone".

The thesis in this research is not about the prevalent formal medium/method of communication like the email, but about the ordinary social interaction facilitated by social media platforms like Twitter. These are the interactions that create an engaging environment for the sharing of tacit knowledge, which has been one of the major challenges of knowledge management. This is because of the difficulty in formalising and articulating tacit knowledge, being an intrinsic possession of the individuals.

Unlike explicit knowledge that could be transmitted around by the email, for example, and can also be documented in organisational policies and procedures, process maps,

manuals, etc., tacit knowledge exists in the subconscious of the employees, who may intuitively apply such knowledge in enhancing their performance on the job. They may also express their tacit knowledge informally at the spur of the moment during social interactions with colleagues on social media like Twitter.

Capturing such employees' — and/or customer's — intuitiveness and innermost insights, and converting them into explicitly storable, retrievable and actionable pieces of knowledge that are of value and propel the organisation's competitive advantage, is one of the main thrusts of this research.

7.6 Future Work

7.6.1 Further Insights from additional Social Media Platforms

The research limitations identified in Section 7.4 provide an opportunity for further research into the extent to which corporate organisations can derive further valuable insights, in addition to *actionable knowledge* and *employee engagement*, from public and/or private social data gathered over not only Twitter but also any or a combination of Whatsapp, Facebook, emails etc. Such further insights could include:

1. Expertise location:

   The microblogging, hashtagging and re-tweeting affordances of Twitter places its contents in the public space, as opposed to emails or local files which are prone to privacy concerns. Microblogs, blogs and social networks support the identification of expertise (Miller *et al.*, 2011), and according to Guy *et al.* (2013), "the diversity of both the content type and the user associations with contents is an indication that expertise information derived from social media data can be of great value". The authors further assert that social media that resides behind a firewall [e.g., Yammer[1]] is typically used by employees to discuss internal topics, and hence reflects the organisation's unique vocabulary and areas of interest. This enables the organisation to find people (or, employees) who are knowledgeable in a given topic.

2. Public Opinion and Sentiments

   Public opinion about the organisation's image, product or service can make the difference between success and failure for the organisation. Knowing the sentiments of the public would help the organisation in responding in such a way that would promote or maintain favourable public opinion. Businesses have made efforts to find out customers' sentiments and opinion, often expressed in free text, towards

[1] Yammer is a private Twitter where only those with the same e-mail domain (ie, @yourcompany.com) can join and post updates. (Source: http://tldr.me/6sq7s6w)

company's products and services (Lin and He, 2009). Twitter enables expressions in free text, which is why the bulk of Twitter data is textual. Zikopoulos *et al.* (2012) cited a real world example of a client who introduced a different kind of environmentally friendly packaging for one of its staple brands. Customer sentiment was somewhat negative to the new packaging, and some months later, after tracking customer's feedback and comments, the company discovered an unnerving amount of discontent around the change and therefore moved to a different kind of eco-friendly packaging. They therefore, hypothesise that, "*if you dont have some kind of micro-blog oriented customer sentiment pulse-taking going on at your company, you're likely losing customers to another company that does*".

7.6.2 Dis-benefits of Employee Engagement on Social Media

When does employee engagement become a negative outcome? What impact does frequent engagement on social media have on employee productivity? Does it interrupt the flow of thoughts and performance to the extent that productivity is hampered? Apart from the benefit of knowledge sharing facilitated by the social interactions of an engaged workforce, there is need for further studies on such impact of social media like Twitter on employee productivity, similar to the research by Jackson *et al.* (2001) about email interruption, as mentioned in Section 7.5.

7.6.3 A Single Case Study for both Parameters of KMV

As stated in Section 7.4, this research assumes that the two different case study organisations are one, in the computation of Knowledge Management Value (KMV) as a product of its two parameters, *actionable knowledge* and *employee engagement*. Also, the emergent model for a knowledge social machine emanating directly from this framework is presented in Chapter 4.5. This is the model upon which the EMSoD framework can be operationalised within a corporate software environment. Further studies for the operationalisation of the EMSoD framework with the emergent model requires that a single case of an organisation is studied for both parameters in order to be able to assess the extent of the impact of the implementation (see Chapter 4.4) on a single corporate organisation.

7.6.4 Privacy and Security

As hinted in Chapter 2.8.5, the privacy and security of corporate data can easily be compromised through the liberalisation of organisational hierarchical structure to accommodate the flow of tacit knowledge over an enterprise mobility agenda. What are the actual privacy and security risks and issues involved in the adoption of enterprise

mobility? To what extent have these risks constitute a threat to corporate organisations? and, what are the mitigating factors against the risks?

Moreover, the new General Data Privacy Regulation (GDPR) of the European Union will certainly have some implications on the way social media data can be captured, analysed and exploited for organisations' competitive advantage. This is because the new rule — meant to take effect from May 2018 — empowers the individual above corporate or business aims, regardless of the legitimacy or justification for such aims (Buttarelli, 2016). How will corporate organisations handle private and/or public social media data, and what methods and research methodology will be appropriate for knowledge discovery within the context of this new law? These are research questions that further studies can seek to find answers to.

7.7 Concluding Remark

This chapter concludes the thesis by linking the entire research and drawing conclusion from the answers proffered for the research questions. Although some assumptions and limitations of the research were duly acknowledged, the chapter concludes the thesis on a high and interesting note. This is with viable recommendations on how corporate organisations can effectively apply the *EMSoD* framework propounded by this research as a model for exploiting social media data as leverage for corporate knowledge management. The researcher offers consultatory support to early adopters through the implementation of this framework and/or its emergent model within a corporate environment. Meanwhile, this research has opened up some interesting research questions for further studies, as highlighted in Section 7.6.

Appendices

Appendix A

Survey Questionnaire Sample

Please turn over for the sample survey questionnaire on Occupational Use of Mobile Devices and Applications...

University of Southampton

Occupational Use of Mobile Devices and Applications

This survey is part of a study being conducted at the Web Science Institute of the University of Southampton, on Enterprise Mobility and Knowledge Management. Your responses will contribute to an understanding of the impact of mobile devices and social applications on employee engagement and knowledge sharing, which could in turn help organisations to optimise their enterprise mobility and knowledge management strategies.

Your responses are anonymous and confidential even as they are only intended for the purposes of academic research. Meanwhile, you may be in for a chance to win one of two £25 Amazon Vouchers which serves as a token of appreciation for your completion of this survey. If you would like to be entered for this, please enter your email address in the field provided at the end of this survey. Your email address cannot be used to identify your responses in this survey neither will it be used for any purpose other than contacting you if you won the voucher. The survey may take approximately ten minutes to complete and your participation is greatly appreciated.

For further information about this survey, please see the Participant Information Sheet

☐ Please tick (check) this box to indicate that you consent to taking part in this survey

Click here to start this survey

University of Southampton

Occupational Use of Mobile Devices and Applications

Main Section

How often do you use the following devices for/at work?

	Once a day	Several time a day	Once a week	Several time a week	Once a month	Never
Pen and Paper	○	○	○	○	○	○
Desktop computer	○	○	○	○	○	○
Smartphone (iPhone/Android)	○	○	○	○	○	○
Laptop computer	○	○	○	○	○	○
Tablet (iPod/iPad/Android)	○	○	○	○	○	○

Please select one of them that you enjoy using most at/for work

Please select ▾

Please explain why you enjoy the device you enjoy using most at/for work

How would you agree or disagree with the following statements regarding the device you enjoy using most at work?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Using the device for work, I do not have to be at a desk or office.	○	○	○	○	○
It helps me do my job most effectively	○	○	○	○	○
It enables me to perform multiple tasks at a time	○	○	○	○	○
It saves me time and hassles	○	○	○	○	○
I prefer pen, paper and traditional desktop computers	○	○	○	○	○
I just like fiddling with gadgets	○	○	○	○	○

With regards to the device(s) you use at work, do you own the device or you use the one provided by your company/institution?

- ○ I use my own device
- ○ I use the company's device

With regards to the device(s) you use at work, do you own the device or you use the one provided by your company/institution?

- (●) I use my own device
- ( ) I use the company's device

In addition to using your own device for work purposes, to what personal use would you normally put your device?

	Quite often	Fairly often	Often	Rarely	Not at all
To keep updated with general news and current affairs.	○	○	○	○	○
To keep in touch with friends and family	○	○	○	○	○
For personal admin time management and organisation	○	○	○	○	○
To keep in touch with work colleagues	○	○	○	○	○
To keep updated with work news and gossip	○	○	○	○	○
For games entertainment and relaxation	○	○	○	○	○

How would you agree/disagree with the following statements with regards to using your own personal device at work, *either for personal or work-related use?*

	Strongly agree	Agree	Neither disagree not agree	Disagree	Strongly disagree
It would hinder my concentration at work	○	○	○	○	○
Personal devices should be kept away from work	○	○	○	○	○
It would keep me productive	○	○	○	○	○
One device for both work and personal use reduces the weight on me	○	○	○	○	○
It would serve as a therapy against stress at work	○	○	○	○	○
It would help me maintain work life balance	○	○	○	○	○

With regards to the device(s) you use at work, do you own the device or you use the one provided by your company/institution?

- ○ I use my own device
- ◉ I use the company's device

How do you feel about having to use the company's device?

- ○ I often feel happy to use it
- ○ I sometimes feel obliged to use it
- ○ I often feel obliged to use it
- ○ I sometimes feel happy to use it
- ○ I feel it's an unnecessary technical hassle
- ○ I am indifferent

In addition to work related use, how often do you use the company's device for the following:

	Quite often	Fairly often	Often	Rarely	Not at all
To keep in touch with friends and family.	○	○	○	○	○
To keep updated with general news and current affairs	○	○	○	○	○
For games, entertainment and relaxation	○	○	○	○	○
For personal organisation/admin and time management	○	○	○	○	○
To keep updated with work related news and gossip.	○	○	○	○	○
To keep in touch with work colleagues	○	○	○	○	○

How would you agree/disagree with the following statements with regards to putting the company's device to some personal use

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
It would keep me productive	○	○	○	○	○
It would serve as a therapy against stress at work	○	○	○	○	○
One device for both work and personal use reduces the weight on me	○	○	○	○	○
Personal devices should be kept away from work	○	○	○	○	○
It would hinder my concentration at work	○	○	○	○	○
It would help me maintain work life balance	○	○	○	○	○

University of Southampton

Occupational Use of Mobile Devices and Applications

Social sharing and applications

This section surveys your use of social apps on your personal or company's device

How important is it for you to share knowledge, ideas or information with colleagues on your job?

Please rate on a scale of 5 (Very important) through 1 (Not at all important)

Very important	5	4	3	2	1	**Not at all Important**
	◉	○	○	○	○	

How would you best describe the medium/method of communication and knowledge sharing within your company/institution?

- ○ We use Twitter/Yammer more than anything else
- ○ We use private group communication on Whatsapp/Facebook
- ○ Email is predominantly our main system of communication
- ○ We mainly use a 'communication book' where everyone writes in and reads from
- ○ Sending/recieving text (SMS) messages on our mobile phones is more prevalent
- ○ We are heavily dependent on the word of mouth through face-to-face communication
- ○ None of the above

How often do you use or access each of the following applications from a mobile device (Smartphone, tablets, etc)

(Please select an option for each row)

	At least once a day	Several times a day	At least once a week	Several times a week	Never	Rarely
Snapchat	○	○	○	○	○	○
Email	○	○	○	○	○	○
Skype	○	○	○	○	○	○
Whatsapp	○	○	○	○	○	○
Facebook	○	○	○	○	○	○
Twitter/Yammer	○	○	○	○	○	○
Google+	○	○	○	○	○	○

With regards to your use of any of the above apps, how would you agree/disagree with each of the following statements?

(Please select an option for each row)

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
My work colleagues are not in my friends/contact'	○	○	○	○	○
My friends/contact lists are made up of my work colleagues also	○	○	○	○	○
I'd rather not use any of them with anyone at work	○	○	○	○	○
I often use one or more of them to connect/communicate with co-workers at work	○	○	○	○	○
I often use one or more of them to connect/communicate with friends and family members	○	○	○	○	○
I don't mind being able to use any one of them with co-workers at work	○	○	○	○	○

University of Southampton

Occupational Use of Mobile Devices and Applications

Social sharing and applications

This section surveys your use of social apps on your personal or company's device

How important is it for you to share knowledge, ideas or information with colleagues on your job?

Please rate on a scale of 5 (Very important) through 1 (Not at all important)

Very important	5	4	3	2	1	**Not at all Important**
	○	○	○	○	◉	

You said it is not at all important for you to share knowledge and information with your colleagues at work. Is this because:

(You may select all that apply please)

- ☐ I am a lone/only worker
- ☐ I am in charge and often too busy
- ☐ I'm not bothered
- ☐ Knowledge sharing reduces my competitiveness
- ☐ It's a waste of my own time
- ☐ It jeopardises my own competitivenes

Would you like to express in your own words why it is not at all important to share knowledge with your colleagues at work?

If so, then please write in the text box below:

How often do you use or access each of the following applications from a mobile device (Smartphone, tablets, etc)

(Please select an option for each row)

	At least once a day	Several times a day	At least once a week	Several times a week	Never	Rarely
Snapchat	○	○	○	○	○	○
Email	○	○	○	○	○	○
Skype	○	○	○	○	○	○
Whatsapp	○	○	○	○	○	○
Facebook	○	○	○	○	○	○
Twitter/Yammer	○	○	○	○	○	○
Google+	○	○	○	○	○	○

With regards to your use of any of the above apps, how would you agree/disagree with each of the following statements?

(Please select an option for each row)

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
My work colleagues are not in my friends/contact'	○	○	○	○	○
My friends/contact lists are made up of my work colleagues also	○	○	○	○	○
I'd rather not use any of them with anyone at work	○	○	○	○	○
I often use one or more of them to connect/communicate with co-workers at work	○	○	○	○	○
I often use one or more of them to connect/communicate with friends and family members	○	○	○	○	○
I don't mind being able to use any one of them with co-workers at work	○	○	○	○	○

University of Southampton

Occupational Use of Mobile Devices and Applications

Demographic Information

Please select your age range

- 18-24 years old
- 25-34 years old
- 35-44 years old
- 45-54 years old
- 55 years or older
- I prefer not to say

In what industry sector do you work?

Please select

Please state whether you work part-time or full-time

- I work part-time
- I work full-time

Please state your job role

- Leader/Director
- Management staff
- Administrative staff
- Support staff
- Agency Statt
- Academic staff
- Other

Please select your gender

- Female
- Male
- Prefer not to say

Please select your location

- Asia
- Africa
- America
- Europe
- Middle East
- Oceania

As a token of appreciation for completing this survey, you will be in for a chance to win one of two £25 Amazon vouchers, if you entered your email address below. Your email address will not be used to link your answers with you neither would it be used for any purpose other than contacting you should you win one of the vouchers

Optional

Once this button is pressed you will not be able edit your responses

Appendix B

Reasons why respondents say they enjoy the device they say they enjoy using most at/for work

Please turn over to see the reasons why survey respondents enjoy the device they say they enjoy using most at/for work...

1. Reasons why Survey participants enjoy using the Laptop most at/for Work

jjjj

Its capacity fits my needs and is portable.

Size Mobility Functions

I can use my PC in four different ways laptop Stand Tent and Tablet. It provides many functions that I need. very light and thin.

It is portable

Convenience..easily work with docs and typing

it's just so easy

It does lots of things and my handwriting is terrible.

Because it is more convenient to move around and work in different places and is more compact

Power of a computer with all the applications and internet access associated while still being mostly portable as you move between places (as long as you can keep it charged).

I use the Laptop for work.

It's also my personal machine so it's configured for my preferences

Full keyboard most responsive and storage

because of the nature of my research -> I need to write codes

It's easier to handle than a desktop computer and it is easy to travel with. It can perform all the tasks that the other devices can do

Desktop-level productivity. But portable.

With Internet access it means I can do everything I want from a realtively compact machine

I can take my work with me when I move around.

It is very versatile and can be used for a wide variety of tasks. Easy to share data with others and access large amounts of data at distant locations. Laptop can be used as a portable device.

Powerful and yet lightweight enough to carry around so that it is possible to work at different locations if needed.

Convenient to continue the work from home.

Having to write code I need a computer. I prefer a laptop mainly because it may be carried anywhere in contrast to a desktop computer.

---

easier to carry around

If I compare to other devices it is mobile. And it gives me an opportunity for example to sit down on a coach and write something. Also all applications work better. Iphone has some restrictions sometimes. I also like pen and paper especially if i am thinking but paper doesnt have ctrl+f :)

I can easily log into all my accounts share information with others and I can easily carry it around.

---

easy to use easy to carry light and with good battery

Promptness Flexibility Multitasking etc.

Flexibility - allows better access to calendars and email account than iPad

---

It provides the easiest access for the greatest range of information: Larger screen than a mobile easier to use with finger presses a hard drive to save research papers documents my work MATLAB etc.

It is easy to work with.

---

most important for my work

Portability

Portable but with sufficient memory to store all my data useable screen size (and better when plugged into docking station). God battery life.

---

is more comfortable

Convenience and speed

It's practical. Tablets and Mobile devices could make difficult the process of navigation and browsing.

Most versatile

---

easy and portable but with more functionality that a smartphone or tablet

---

I use a tablet/laptop hybrid... it does everything everywhere all the time.

---

you can work and alos be connected anywhere

Laptop is the only practice device for using at work besides a desktop and I haven't been issued with a desktop PC so I use a laptop

---

can use multiple applications simultaneously

---

easy of use and size of screen

Portable Powerful Convenient and Capable Personalisable

---

mobility performance

I can take it anywhere and do anything with it.

Most convenient

---

portable and personal

Screen large enough but still portable. I can do almost everything

---

functional and portable

Flexibility and easy to do all tasks required efficiently

Can carry easily anywhere mostly to conferences meetings and seminars at work. Or at least you can carry to any other location if you need change of space for work.

Because of the flexibility

Easy to use and lots of software on it that I need

It is flexible in terms of commuting and it also provides enough hardware resources to run/develop decent programmes. I.e. Android Studio might need considerable resources

---

It is the easiest to use for most aspects of my work whether in the lab or at home.

It helps with my work and keeps me connected.

I have all functionality I need as IT Power User.

I learnt to touch-type and prefer to write from a keyboard rather than a glass display (such as those found on tablet devices). However my laptop also has a pen-input device which I use daily to sketch or share ideas or to highlight typewritten information

---

It's a device that allows you to do all the work with one single device and is completely portable.

It is the most helpful for my line of work. Can run matlab send emails access the internet. I plug it into my docking station and marvel at the spectacle of its desktop projected accross two massive 24" screens

---

Although this is not the case at the university but I would prefer to have a laptop to use wherever I go. Also it can be used with a docking station in the office.

Its easypractical and functional

Practical and helpfull

I enjoy using laptop because of its ease of use for office work such as compiling reports with MS office suite.

For screen size comfort.

It makes my work easier

Portability

Portability and access from lots of different places. Good range of software.

Everything is on it

Most productive

This is the only computer I have for work use

Because I like it.

Easiest to type with and very fast boot up and can work in comfort where I like. However my chromebook lacks desktop functionality - so I generally work on my PC at my desk so significant tasks. Please note - in later questions I'm referring to my iPod as these questions don't appear appropriate to my laptop use.

I work in the office and at home so I can transport my laptop between places. I like the size of the screen is not too small compared with a tablet and I like having a keyboard to type instead of touchscreen.

---

use of office programmes.

Practicality. My laptop is connected to a docking station and I have two screens which facilitate speed and comparability when I work

---

It's new portable perfect size for using on the train or in a meeting or at my desk.

I'm used to it and it's easy to navigate and look at attachments

---

While the laptop does everything my tablet will do the file storage and file access are much more straightforward on the laptop. I also feel that security is easier to manage on the laptop.

I have all my work on my laptop - data teaching materials journal articles etc. It's light so I can carry it with me everywhere. It's more versatile than a tablet or a mobile and it's much more comfortable to write on it.

---

efficiency of action - for example completing this survey

---

my laptop allows me to access all my files wherever I am on campus

---

Its the only device that does everything. All of the others can do parts of my job but not all.

Portable work flexibly geographically and time wise. It's a Mac much prefer than PC

It enables me to keep working wherever I am. In addition the fact that it is my personal laptop means that I have in it more work-related materials than I store in my office desktop.

Best combination of portability functionality and screen size. I use with a docking station in the office.

Can do the most on it but still portable

I do most of my work on my laptop

Power and portability.

2. Reasons why Survey participants enjoy using the Desktop most at/for Work

more functional and wide screen which is most harmless screen for eyes

---

it has facilities to do my research

Balance

Big screen.

If I am using the desktop it means I am at my work desk and not working out of hours/weekends. I have plenty of space at my desk and all the other office equipment I need to hand. I have two screens and a full size keyboard and mouse to use too.

Larger screen more comfortable working at a desk

Comfortable convenient familiar

I don't have to install apps to get things done. My computer can run multiple things at the same time and it has a larger screen.

Mobile OS devices lack proper file system and sensitive data can't just be cloud based. Laptop on a desk I normally use 1-2 addition screens to the devices own so screen size (space!) is as important as CPU/RAM. Tablets are fine for selecting music web/mail browsing whilst watching TV but aren't useful for actual work.

It's more comfortable to work at.

Most of my work requires the use of a desktop

Means I can be sat at my desk with two large monitor screens to view.

It provides more convenient especially in wide screen. Also a large number of memory can possible process large data faster.

Because it is comfortable to use and the screen is very wide and better for the eyes.

Because of the large/multiple screens

Ergonomics large displays processing power working environment.

Difficult to say which I 'enjoy' using - it depends what for. Phone is handy when I need to be on the move but it can be frustrating as not everything works as well as on a desktop which is generally more comfortable and efficient for longer periods of use

---

easiest to use large screen screen space is the most important factor also just physical space around workstation generally

---

convenient and fast

Better experience. More powerful. More workspace. More comfortable seating position.

Best performance

---

more ergonomic

Because usually when I'm working at my desktop the tasks will be of a more routine and ordered nature and I have full access to local network and online resources.

Best user input infrastructure. Keyboard for precise input mouse for fast positioning good sound infrastructure (microphone and headphones) large and multiple screens. It is just the most efficient way of working if not moving.

A desktop computer is most efficient for doing work has keyboard and mouse which means work can be done more quickly there is more screen space so multitasking is easier and it is more ergonomically comfortable to use.

Quick to utilise for all tasks.

Most powerful and most convinient

More comfortable than a laptop or a phone. Big screen so that you can work on multiple documents simultaneously.

My productivity is maximised.

---

large screen several screens at once easier to read information quickly loads faster than iphone or ipad or laptop doesn't give me problems with wifi or eduroam like my laptop does prefer to use a mouse than a mousepad

---

efficient. Does what I want

I have better posture when using a desktop over laptop.

I have two desktop computers one running Windows to read documents and the other running Ubuntu to programme and run simulations. It's much efficient this way than on laptop which runs Mac and I do love doing emails on there though.

Easy to see and use physically and quick.

Bigger screen faster internet connection.

I love working with big screen. Makes work easier for me.

Powerful useful and convenient.

I am able to use two screens so I can do two things at once

Easiest to work on

Most convenient while working. Also operates faster than other devices.

---

its easy to use

Comfort and adaptability

More flexible than pen /paper

Ease of access and most suitable for admin work.

Desktop has dual monitor set-up for best productivity

I have two screens

Convenience: the desktop is set up properly with all of the software and data I need and it is ergonomic.

I use two screens with my desktop computer

My desktop computer comes with two big screens which are very useful in my work whereas the laptop has a tiny screen.

I prefer the desktop computer because it is ergonomically positioned. I find a laptop difficult to sit in front of/work at for long periods of time because it is hard to find the optimum work position.

Allows me to use two screens to increase productivity also allows me to maintain a good sitting position to reduce aches and pains.

Big monitor and reasonable keyboard.

It has all my software and files etc. Suitable screen keyboard mouse.

the desktop computer allows for two screens which enables you to have multiple documents open and view them properly.

multiple screens big screens best working position fastest network and widest range of software tools

Because I can access information quickly eg. from the internet or shared drives

Easier (more comfortable) to use has more functionality.

Easy access to internet have dual monitors so easy to look at larger or multiple documents.

bigger screen

convenience

Most compatible with systems needed in order to do my job.

physicle keyboard large screen can run all the application i need.

Has everything I want there.

Twin screens proper keyboard know where everything is. Can get Google stuff here as well as tablet.

Larger screen and easier input device. This makes it easier to see everything you want to do all at once.

I have two screens and am a touch typist. It's easy to use the screens. Pen and paper is my next favourite.

easiest to use

I find it is the easiest and most convenient device. I have 2 screens and this improves my ability to do dual tasks that are characteristic of my work.

I prefer a stand alone screen and keyboard as apposed to a laptop or tablet

It is all I can afford that provides the programming facilities on which I rely

---

More useful - everything (all documents) is in one place.

Easy to see and work with

Most comprehensive ability. Does not tend to go wrong. Straightforward use. Compatible with everything.

3. Reasons why Survey participants enjoy using Pen & Paper most at/for Work

Fast to write down my thoughts

It is more easy to take notes and you do not have the problem that you battery run dry.

I feel ultimate control over this device I can be as free-form as possible and can work where I like when I like.

The highest flexibility to write what's on your mind down.

---

becasue chicks like guys with pens mine is very cool and i like to sharpen it at least twice a day

---

It is the most fluid responsive and has no technology overheads. It does not run out of power it keeps a log of work and has no threat of viruses

---

I like to sketch things out on paper before testing them out on a device.

It is easiest to draw diagrams

---

comfortable

It's simple to use and doesn't require a power source.

I feel more organised and it is quite quick

It doesn't get hot it isn't distracting and it is familiar (this doesn't mean it is the best just most enjoyable)

I write in Arabic it's easier without the keyboard.

I can think as I write unlike if I have to use an electronic gadget

---

I am an old school mathematician and pen and paper is my first love for communication of ideas

---

I can do maths quickly and easily using pen and paper.

4. Reasons why Survey participants enjoy using the Smartphone most at/for Work

it is more accessible at any time

Some sense of freedom

It is really easy to use as if it is a mini computer that is always next to you when needed.

I can view emails on the go.

The pictures quality and the ability to do with it what laptop does

It can serve for a lot of purpose. I use my android phone to make calls surf the net watch movies.

.

Simplicity - and ease of access - portable

It doesnt crash like my desktop and I can use it away from my desk giving more autonomy

it is light easy to access and quick

I like using my smartphone as it has all the information I need in it. Contacts Emails Music Photos Videos and my calendar.

5. Reasons why Survey participants enjoy using the Tablet most at/for Work

I extract information fast on it.

Both portable and easy to see

It convinient it has access to everything. It one source with a lot of Info

Convenient and easy to carry around

The iPad is easy to use to access email from home and also useful to carry out professional social media activities

mobility flexibility and ease of use. (it fills my requirements and is easily portable)

In my role it makes it easier to talk through web pages with my contacts and more convenient as can do anywhere on campus. The Horizon app for virtual desktop means I can log in to my desktop easily. I could potentially also work from home if necessary so very good flexibility and convenience.

Appendix C

Code references of the 5 Prevalent Themes from coded nodes

Please turn over to see the Code References of the 5 Prevalent Themes that run across reasons why survey respondents enjoy the device they say they enjoy using most at/for work...

1. Internals\\iSurvey-Desktop - § 50 references coded [66.28% Coverage]

Reference 1 - 1.19% Coverage

more functional and wide screen which is most harmless screen for eyes

Reference 2 - 0.20% Coverage

Big screen.

Reference 3 - 3.90% Coverage

If I am using the desktop it means I am at my work desk and not working out of hours/weekends. I have plenty of space at my desk and all the other office equipment I need to hand. I have two screens and a full size keyboard and mouse to use too.

Reference 4 - 0.84% Coverage

Larger screen more comfortable working at a desk

Reference 5 - 0.58% Coverage

Comfortable convenient familiar

Reference 6 - 2.09% Coverage

I don't have to install apps to get things done. My computer can run multiple things at the same time and it has a larger screen.

Reference 7 - 5.35% Coverage

Mobile OS devices lack proper file system and sensitive data can't just be cloud based. Laptop on a desk I normally use 1-2 addition screens to the devices own so screen size (space!) is as important as CPU/RAM. Tablets are fine for selecting music web/mail browsing whilst watching TV but aren't useful for actual work.

Reference 8 - 1.11% Coverage

Means I can be sat at my desk with two large monitor screens to view.

Reference 9 - 2.11% Coverage

It provides more convenient especially in wide screen. Also a large number of memory can possible process large data faster.

Reference 10 - 1.41% Coverage

Because it is comfortable to use and the screen is very wide and better for the eyes.

Reference 11 - 0.66% Coverage

Because of the large/multiple screens

Reference 12 - 1.15% Coverage

Ergonomics large displays processing power working environment.

Reference 13 - 2.11% Coverage

easiest to use large screen screen space is the most important factor also just physical space around workstation generally

Reference 14 - 3.90% Coverage

Best user input infrastructure. Keyboard for precise input mouse for fast positioning good sound infrastructure (microphone and headphones) large and multiple screens. It is just the most efficient way of working if not moving.

Reference 15 - 0.52% Coverage

Quick to utilise for all tasks.

Reference 16 - 0.58% Coverage

Most powerful and most convinient

Reference 17 - 1.89% Coverage

More comfortable than a laptop or a phone. Big screen so that you can work on multiple documents simultaneously.

Reference 18 - 3.62% Coverage

arge screen several screens at once easier to read information quickly loads faster than iphone or ipad or laptop doesn't give me problems with wifi or eduroam like my laptop does prefer to use a mouse than a mousepad

Reference 19 - 0.68% Coverage

Easy to see and use physically and quick.

Reference 20 - 0.74% Coverage

Bigger screen faster internet connection.

Reference 21 - 0.94% Coverage

I love working with big screen. Makes work easier for me.

Reference 22 - 0.56% Coverage

Powerful useful and convenient.

Reference 23 - 0.90% Coverage

I am able to use two screens so I can do two things at once

Reference 24 - 0.30% Coverage

Easiest to work on

Reference 25 - 1.25% Coverage

Most convenient while working. Also operates faster than other devices.

Reference 26 - 0.26% Coverage

its easy to use

Reference 27 - 0.80% Coverage

Ease of access and most suitable for admin work.

Reference 28 - 0.92% Coverage

Desktop has dual monitor set-up for best productivity

Reference 29 - 0.30% Coverage

I have two screens

Reference 30 - 1.73% Coverage

Convenience: the desktop is set up properly with all of the software and data I need and it is ergonomic.

Reference 31 - 0.70% Coverage

I use two screens with my desktop computer

Reference 32 - 2.19% Coverage

Allows me to use two screens to increase productivity also allows me to maintain a good sitting position to reduce aches and pains.

Reference 33 - 0.66% Coverage

Big monitor and reasonable keyboard.

Reference 34 - 1.17% Coverage

It has all my software and files etc. Suitable screen keyboard mouse.

Reference 35 - 1.99% Coverage

the desktop computer allows for two screens which enables you to have multiple documents open and view them properly.

Reference 36 - 1.75% Coverage

multiple screens big screens best working position fastest network and widest range of software tools

Reference 37 - 0.99% Coverage

Easier (more comfortable) to use has more functionality.

Reference 38 - 1.53% Coverage

Easy access to internet have dual monitors so easy to look at larger or multiple documents.

Reference 39 - 0.24% Coverage

bigger screen

Reference 40 - 0.22% Coverage

convenience

Reference 41 - 1.15% Coverage

physicle keyboard large screen can run all the application i need.

Reference 42 - 0.48% Coverage

Has everything I want there.

Reference 43 - 1.73% Coverage

Larger screen and easier input device. This makes it easier to see everything you want to do all at once.

Reference 44 - 1.75% Coverage

I have two screens and am a touch typist. It's easy to use the screens. Pen and paper is my next favourite.

Reference 45 - 0.24% Coverage

easiest to use

Reference 46 - 2.47% Coverage

I find it is the easiest and most convenient device. I have 2 screens and this improves my ability to do dual tasks that are characteristic of my work.

Reference 47 - 1.23% Coverage

I prefer a stand alone screen and keyboard as apposed to a laptop or tablet

Reference 48 - 0.97% Coverage

More useful - everything (all documents) is in one place.

Reference 49 - 0.40% Coverage

Easy to see and work with

Reference 50 - 1.81% Coverage

Most comprehensive ability. Does not tend to go wrong. Straightforward use. Compatible with everything.

2. Internals\\iSurvey-Laptop - § 68 references coded [80.74% Coverage]

Reference 1 - 0.60% Coverage

Its capacity fits my needs and is portable.

Reference 2 - 1.76% Coverage

I can use my PC in four different ways laptop Stand Tent and Tablet. It provides many functions that I need. very light and thin.

Reference 3 - 0.20% Coverage

It is portable

Reference 4 - 0.67% Coverage

Convenience..easily work with docs and typing

Reference 5 - 0.23% Coverage

it's just so easy

Reference 6 - 0.75% Coverage

It does lots of things and my handwriting is terrible.

Reference 7 - 1.29% Coverage

Because it is more convenient to move around and work in different places and is more compact

Reference 8 - 2.44% Coverage

Power of a computer with all the applications and internet access associated while still being mostly portable as you move between places (as long as you can keep it charged).

Reference 9 - 1.82% Coverage

It's easier to handle than a desktop computer and it is easy to travel with. It can perform all the tasks that the other devices can do

Reference 10 - 0.64% Coverage

Desktop-level productivity. But portable.

Reference 11 - 1.26% Coverage

With Internet access it means I can do everything I want from a realtively compact machine

Reference 12 - 0.62% Coverage

I can take my work with me when I move around.

Reference 13 - 2.59% Coverage

It is very versatile and can be used for a wide variety of tasks. Easy to share data with others and access large amounts of data at distant locations. Laptop can be used as a portable device

Reference 14 - 1.62% Coverage

Powerful and yet lightweight enough to carry around so that it is possible to work at different locations if needed.

Reference 15 - 0.60% Coverage

Convenient to continue the work from home.

Reference 16 - 1.84% Coverage

Having to write code I need a computer. I prefer a laptop mainly because it may be carried anywhere in contrast to a desktop computer.

Reference 17 - 0.32% Coverage

easier to carry around

Reference 18 - 4.02% Coverage

If I compare to other devices it is mobile. And it gives me an opportunity for example to sit down on a coach and write something. Also all applications work better. Iphone has some restrictions sometimes. I also like pen and paper especially if i am thinking but paper doesnt have ctrl+f :)

Reference 19 - 1.41% Coverage

I can easily log into all my accounts share information with others and I can easily carry it around.

Reference 20 - 0.72% Coverage

easy to use easy to carry light and with good battery

Reference 21 - 0.38% Coverage

Larger screen than a mobile

Reference 22 - 0.32% Coverage

It is easy to work with.

Reference 23 - 0.18% Coverage

Portability

Reference 24 - 2.03% Coverage

Portable but with sufficient memory to store all my data useable screen size (and better when plugged into docking station). God battery life.

Reference 25 - 1.04% Coverage

easy and portable but with more functionality that a smartphone or tablet

Reference 26 - 1.07% Coverage

I use a tablet/laptop hybrid... it does everything everywhere all the time.

Reference 27 - 0.60% Coverage

you can work and alos be connected anywhere

Reference 28 - 0.67% Coverage

can use multiple applications simultaneously

Reference 29 - 0.42% Coverage

easy of use and size of screen

Reference 30 - 0.84% Coverage

Portable Powerful Convenient and Capable Personalisable

Reference 31 - 0.64% Coverage

I can take it anywhere and do anything with it.

Reference 32 - 0.23% Coverage

Most convenient

Reference 33 - 0.32% Coverage

portable and personal

Reference 34 - 0.94% Coverage

Screen large enough but still portable. I can do almost everything

Reference 35 - 0.35% Coverage

functional and portable

Reference 36 - 0.84% Coverage

Flexibility and easy to do all tasks required efficiently

Reference 37 - 2.26% Coverage

Can carry easily anywhere mostly to conferences meetings and seminars at work. Or at least you can carry to any other location if you need change of space for work.

Reference 38 - 0.65% Coverage

Easy to use and lots of software on it that I need

Reference 39 - 2.46% Coverage

It is flexible in terms of commuting and it also provides enough hardware resources to run/develop decent programmes. I.e. Android Studio might need considerable resources

Reference 40 - 1.10% Coverage

It is the easiest to use for most aspects of my work whether in the lab or at home.

Reference 41 - 0.67% Coverage

I have all functionality I need as IT Power User.

Reference 42 - 3.55% Coverage

I learnt to touch-type and prefer to write from a keyboard rather than a glass display (such as those found on tablet devices). However my laptop also has a pen-input device which I use daily to sketch or share ideas or to highlight typewritten information

Reference 43 - 1.36% Coverage

It's a device that allows you to do all the work with one single device and is completely portable.

Reference 44 - 2.88% Coverage

It is the most helpful for my line of work. Can run matlab send emails access the internet. I plug it into my docking station and marvel at the spectacle of its desktop projected accross two massive 24" screens

Reference 45 - 2.18% Coverage

Although this is not the case at the university but I would prefer to have a laptop to use wherever I go. Also it can be used with a docking station in the office.

Reference 46 - 0.50% Coverage

Its easypractical and functional

Reference 47 - 1.54% Coverage

I enjoy using laptop because of its ease of use for office work such as compiling reports with MS office suite.

Reference 48 - 0.35% Coverage

For screen size comfort.

Reference 49 - 0.32% Coverage

It makes my work easier

Reference 50 - 0.18% Coverage

Portability

Reference 51 - 1.10% Coverage

Portability and access from lots of different places. Good range of software.

Reference 52 - 0.27% Coverage

Everything is on it

Reference 53 - 1.81% Coverage

Easiest to type with and very fast boot up and can work in comfort where I like. However my chromebook lacks desktop functionality

Reference 54 - 2.79% Coverage

I work in the office and at home so I can transport my laptop between places. I like the size of the screen is not too small compared with a tablet and I like having a keyboard to type instead of touchscreen.

Reference 55 - 0.38% Coverage

use of office programmes.

Reference 56 - 1.87% Coverage

Practicality. My laptop is connected to a docking station and I have two screens which facilitate speed and comparability when I work

Reference 57 - 1.12% Coverage

It's new portable perfect size for using on the train or in a meeting or at my desk.

Reference 58 - 0.87% Coverage

I'm used to it and it's easy to navigate and look at attachments

Reference 59 - 2.61% Coverage

While the laptop does everything my tablet will do the file storage and file access are much more straightforward on the laptop.I also feel that security is easier to manage on the laptop.

Reference 60 - 3.01% Coverage

I have all my work on my laptop - data teaching materials journal articles etc. It's light so I can carry it with me everywhere. It's more versatile than a tablet or a mobile and it's much more comfortable to write on it.

Reference 61 - 0.89% Coverage

my laptop allows me to access all my files wherever I am on campus

Reference 62 - 1.27% Coverage

Its the only device that does everything. All of the others can do parts of my job but not all.

Reference 63 - 1.17% Coverage

Portable work flexibly geographically and time wise. It's a Mac much prefer than PC

Reference 64 - 2.48% Coverage

It enables me to keep working wherever I am. In addition the fact that it is my personal laptop means that I have in it more work-related materials than I store in my office desktop.

Reference 65 - 1.52% Coverage

Best combination of portability functionality and screen size. I use with a docking station in the office.

Reference 66 - 0.54% Coverage

Can do the most on it but still portable

Reference 67 - 0.42% Coverage

I do most of my work on my laptop

Reference 68 - 0.33% Coverage

Power and portability

3. Internals\\iSurvey-Pen_and_Paper - § 5 references coded [29.25% Coverage]

Reference 1 - 7.42% Coverage

It is more easy to take notes and you do not have the problem that you battery run dry.

Reference 2 - 9.78% Coverage

I feel ultimate control over this device I can be as free-form as possible and can work where I like when I like.

Reference 3 - 2.69% Coverage

It is easiest to draw diagrams

Reference 4 - 4.62% Coverage

I write in Arabic it's easier without the keyboard.

Reference 5 - 4.73% Coverage

I can do maths quickly and easily using pen and paper.

4. Internals\\iSurvey-Smartphones - § 6 references coded [65.07% Coverage]

Reference 1 - 13.82% Coverage

It is really easy to use as if it is a mini computer that is always next to you when needed.

Reference 2 - 4.41% Coverage

I can view emails on the go.

Reference 3 - 15.16% Coverage

It can serve for a lot of purpose. I use my android phone to make calls surf the net watch movies.

Reference 4 - 6.72% Coverage

Simplicity - and ease of access - portable

Reference 5 - 5.57% Coverage

it is light easy to access and quick

Reference 6 - 19.39% Coverage

I like using my smartphone as it has all the information I need in it. Contacts Emails Music Photos Videos and my calendar.

5. Internals\\iSurvey-Tablet - § 6 references coded [93.94% Coverage]

Reference 1 - 4.28% Coverage

Both portable and easy to see

Reference 2 - 10.87% Coverage

It convinient it has access to everything. It one source with a lot of Info

Reference 3 - 5.53% Coverage

Convenient and easy to carry around

Reference 4 - 17.11% Coverage

The iPad is easy to use to access email from home and also useful to carry out professional social media activities

Reference 5 - 13.19% Coverage

mobility flexibility and ease of use. (it fills my requirements and is easily portable)

Reference 6 - 42.96% Coverage

In my role it makes it easier to talk through web pages with my contacts and more convenient as can do anywhere on campus. The Horizon app for virtual desktop means I can log in to my desktop easily. I could potentially also work from home if necessary so very good flexibility and convenience.

Appendix D

Participants' level of agreement with statements meant to check the veracity of the reasons why they enjoy the device they enjoy most

Please turn over to see respondents level of agreement with statements meant to check the veracity of the reasons why they enjoy the device they enjoy most...

```
CROSSTABS
  /TABLES=V20 V21 V22 V23 V24 V25 V26 BY V18
  /FORMAT=AVALUE TABLES
  /CELLS=COUNT TOTAL
  /COUNT ROUND CELL
  /BARCHART.
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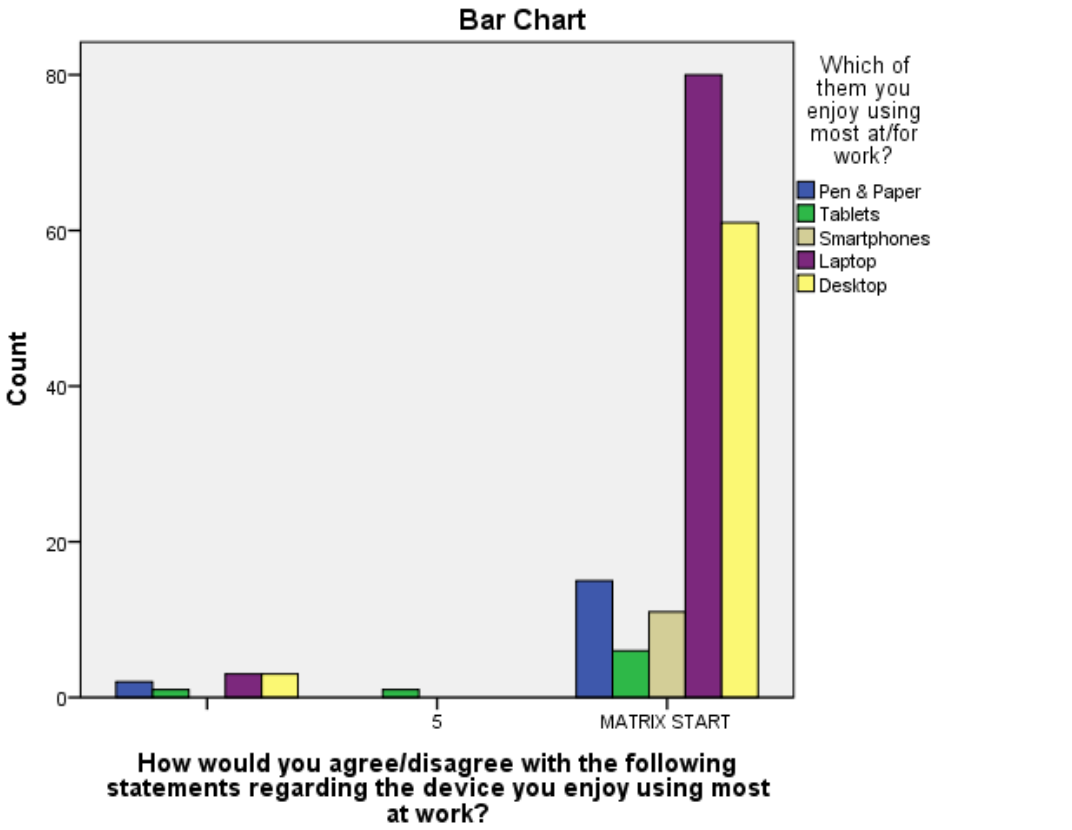
Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
How would you agree/disagree with the following statements regarding the device you enjoy using most at work? * Which of them you enjoy using most at/for work?	183	91.5%	17	8.5%	200	100.0%
It helps me do my job most effectively * Which of them you enjoy using most at/for work?	173	86.5%	27	13.5%	200	100.0%
It saves me time and hassles * Which of them you enjoy using most at/for work?	183	91.5%	17	8.5%	200	100.0%
It enables me perform multiple tasks at the same time * Which of them you enjoy using most at/for work?	183	91.5%	17	8.5%	200	100.0%
I do not have to be at a desk or an office * Which of them you enjoy using most at/for work?	174	87.0%	26	13.0%	200	100.0%
I just like fiddling with gadgets * Which of them you enjoy using most at/for work?	173	86.5%	27	13.5%	200	100.0%
I prefer pen, paper and traditional desktop computers * Which of them you enjoy using most at/for work?	174	87.0%	26	13.0%	200	100.0%

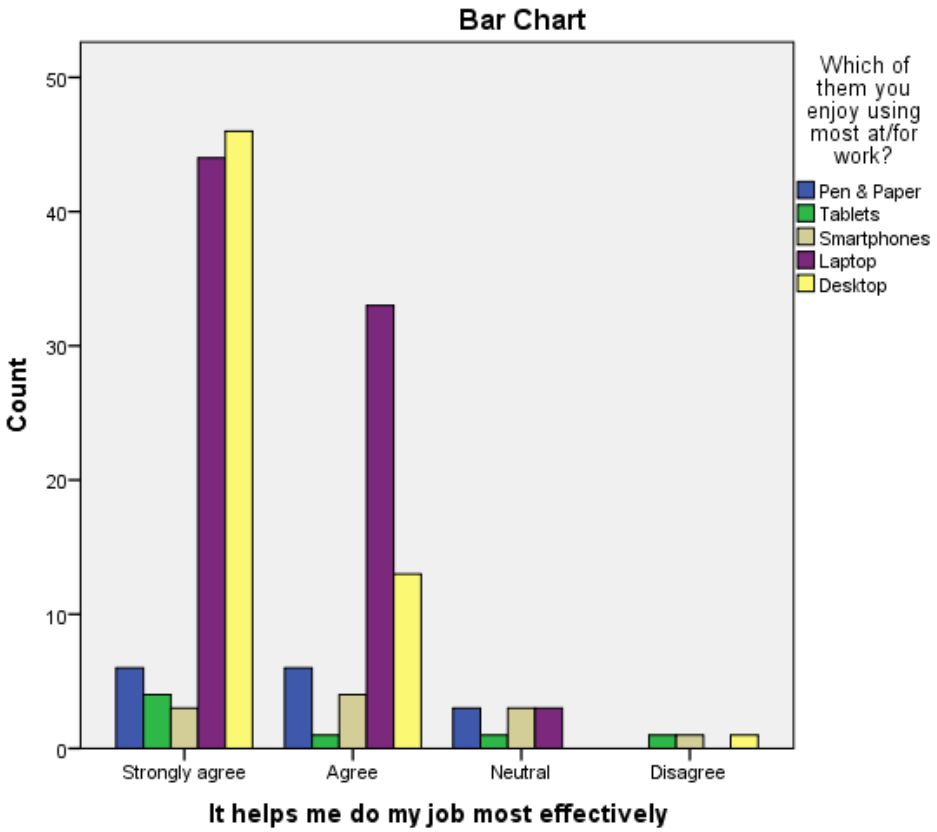
How would you agree/disagree with the following statements regarding the device you enjoy using most at work? * Which of them you enjoy using most at/for work? Crosstabulation

			Which of them you enjoy using most at/for work?					
			Pen & Paper	Tablets	Smartphones	Laptop	Desktop	Total
How would you agree/disagree with the following statements regarding the device you enjoy using most at work?		Count	2	1	0	3	3	9
		% of Total	1.1%	0.5%	0.0%	1.6%	1.6%	4.9%
	5	Count	0	1	0	0	0	1
		% of Total	0.0%	0.5%	0.0%	0.0%	0.0%	0.5%
	MATRIX START	Count	15	6	11	80	61	173
		% of Total	8.2%	3.3%	6.0%	43.7%	33.3%	94.5%
Total		Count	17	8	11	83	64	183
		% of Total	9.3%	4.4%	6.0%	45.4%	35.0%	100.0%



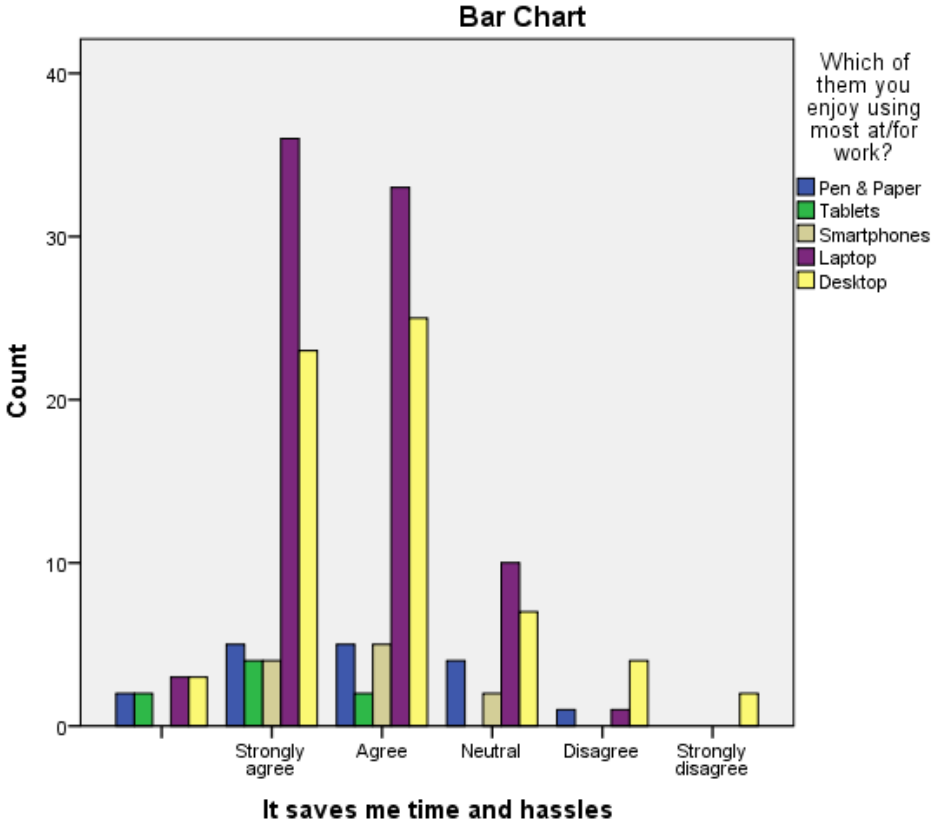
It helps me do my job most effectively * Which of them you enjoy using most at/for work? Crosstabulation

			Which of them you enjoy using most at/for work?					
			Pen & Paper	Tablets	Smartphones	Laptop	Desktop	Total
It helps me do my job most effectively	Strongly agree	Count	6	4	3	44	46	103
		% of Total	3.5%	2.3%	1.7%	25.4%	26.6%	59.5%
	Agree	Count	6	1	4	33	13	57
		% of Total	3.5%	0.6%	2.3%	19.1%	7.5%	32.9%
	Neutral	Count	3	1	3	3	0	10
		% of Total	1.7%	0.6%	1.7%	1.7%	0.0%	5.8%
	Disagree	Count	0	1	1	0	1	3
		% of Total	0.0%	0.6%	0.6%	0.0%	0.6%	1.7%
Total		Count	15	7	11	80	60	173
		% of Total	8.7%	4.0%	6.4%	46.2%	34.7%	100.0%



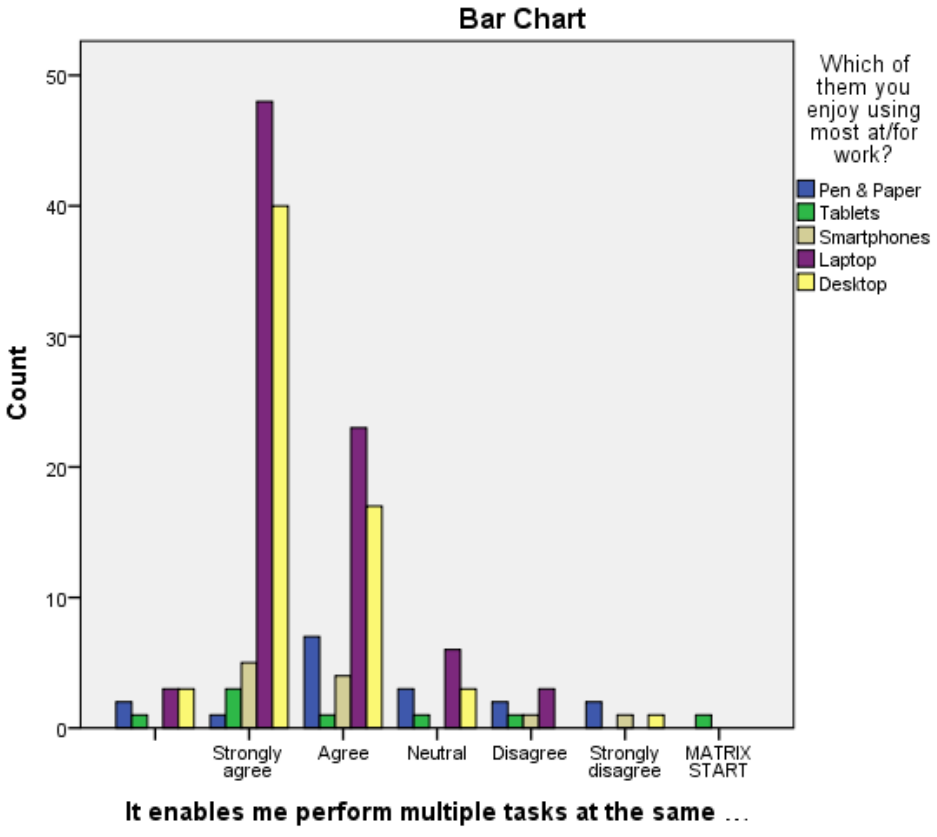
It saves me time and hassles * Which of them you enjoy using most at/for work? Crosstabulation

			Which of them you enjoy using most at/for work?					
			Pen & Paper	Tablets	Smartphones	Laptop	Desktop	Total
It saves me time and hassles		Count	2	2	0	3	3	10
		% of Total	1.1%	1.1%	0.0%	1.6%	1.6%	5.5%
	Strongly agree	Count	5	4	4	36	23	72
		% of Total	2.7%	2.2%	2.2%	19.7%	12.6%	39.3%
	Agree	Count	5	2	5	33	25	70
		% of Total	2.7%	1.1%	2.7%	18.0%	13.7%	38.3%
	Neutral	Count	4	0	2	10	7	23
		% of Total	2.2%	0.0%	1.1%	5.5%	3.8%	12.6%
	Disagree	Count	1	0	0	1	4	6
		% of Total	0.5%	0.0%	0.0%	0.5%	2.2%	3.3%
	Strongly disagree	Count	0	0	0	0	2	2
		% of Total	0.0%	0.0%	0.0%	0.0%	1.1%	1.1%
Total		Count	17	8	11	83	64	183
		% of Total	9.3%	4.4%	6.0%	45.4%	35.0%	100.0%



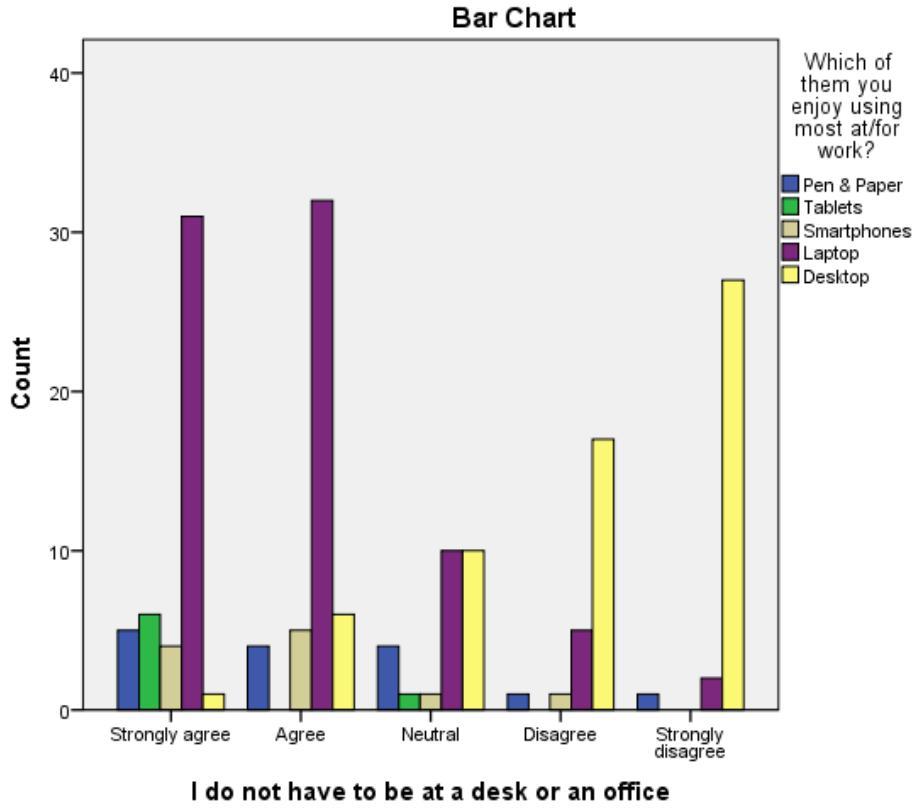
It enables me perform multiple tasks at the same time * Which of them you enjoy using most at/for work? Crosstabulation

			Which of them you enjoy using most at/for work?					
			Pen & Paper	Tablets	Smartphones	Laptop	Desktop	Total
It enables me perform multiple tasks at the same time		Count	2	1	0	3	3	9
		% of Total	1.1%	0.5%	0.0%	1.6%	1.6%	4.9%
	Strongly agree	Count	1	3	5	48	40	97
		% of Total	0.5%	1.6%	2.7%	26.2%	21.9%	53.0%
	Agree	Count	7	1	4	23	17	52
		% of Total	3.8%	0.5%	2.2%	12.6%	9.3%	28.4%
	Neutral	Count	3	1	0	6	3	13
		% of Total	1.6%	0.5%	0.0%	3.3%	1.6%	7.1%
	Disagree	Count	2	1	1	3	0	7
		% of Total	1.1%	0.5%	0.5%	1.6%	0.0%	3.8%
	Strongly disagree	Count	2	0	1	0	1	4
		% of Total	1.1%	0.0%	0.5%	0.0%	0.5%	2.2%
	MATRIX START	Count	0	1	0	0	0	1
		% of Total	0.0%	0.5%	0.0%	0.0%	0.0%	0.5%
Total		Count	17	8	11	83	64	183
		% of Total	9.3%	4.4%	6.0%	45.4%	35.0%	100.0%



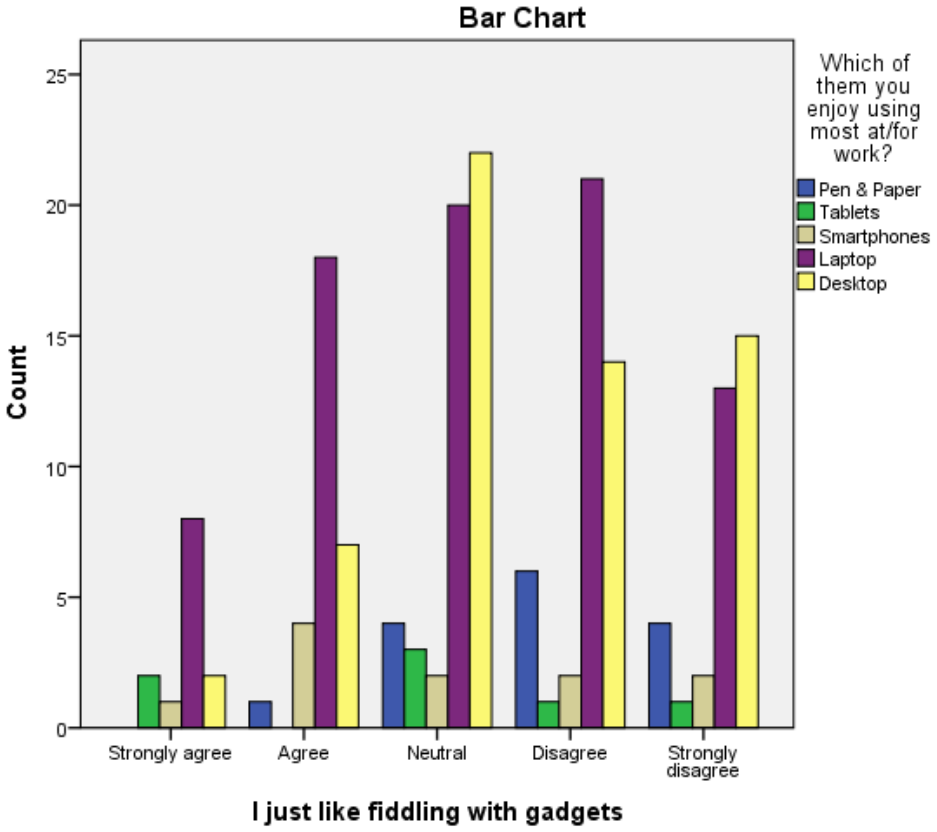
I do not have to be at a desk or an office * Which of them you enjoy using most at/for work? Crosstabulation

			Which of them you enjoy using most at/for work?					
			Pen & Paper	Tablets	Smartphones	Laptop	Desktop	Total
I do not have to be at a desk or an office	Strongly agree	Count	5	6	4	31	1	47
		% of Total	2.9%	3.4%	2.3%	17.8%	0.6%	27.0%
	Agree	Count	4	0	5	32	6	47
		% of Total	2.3%	0.0%	2.9%	18.4%	3.4%	27.0%
	Neutral	Count	4	1	1	10	10	26
		% of Total	2.3%	0.6%	0.6%	5.7%	5.7%	14.9%
	Disagree	Count	1	0	1	5	17	24
		% of Total	0.6%	0.0%	0.6%	2.9%	9.8%	13.8%
	Strongly disagree	Count	1	0	0	2	27	30
		% of Total	0.6%	0.0%	0.0%	1.1%	15.5%	17.2%
Total		Count	15	7	11	80	61	174
		% of Total	8.6%	4.0%	6.3%	46.0%	35.1%	100.0%



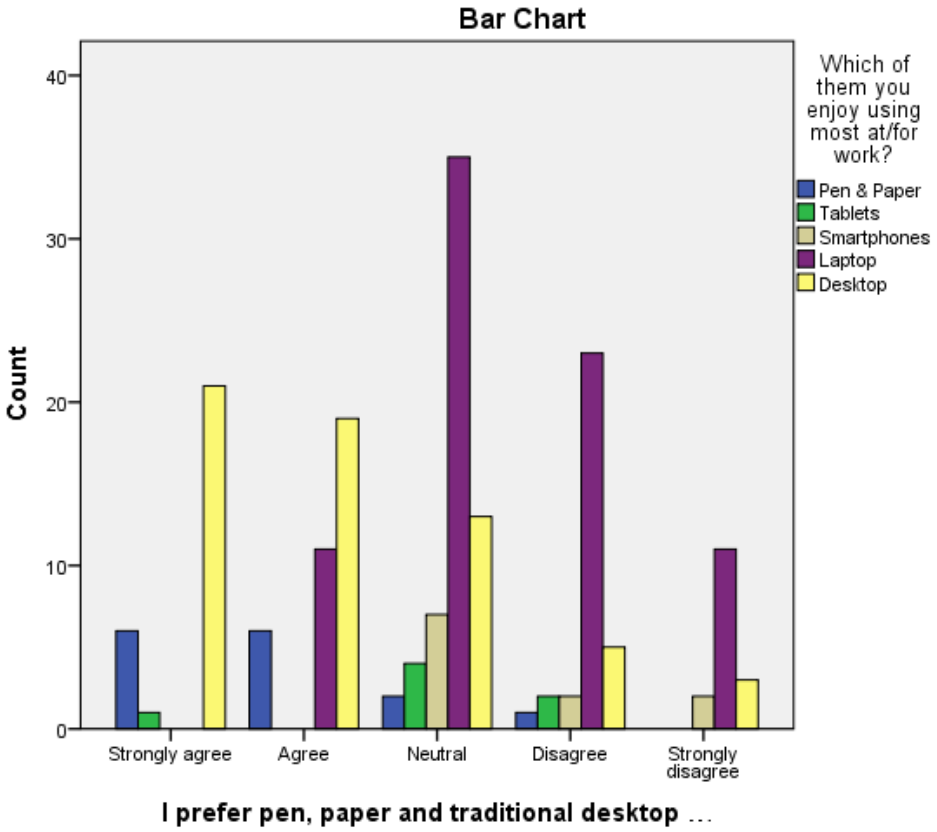
I just like fiddling with gadgets * Which of them you enjoy using most at/for work? Crosstabulation

			Which of them you enjoy using most at/for work?					
			Pen & Paper	Tablets	Smartphones	Laptop	Desktop	Total
I just like fiddling with gadgets	Strongly agree	Count	0	2	1	8	2	13
		% of Total	0.0%	1.2%	0.6%	4.6%	1.2%	7.5%
	Agree	Count	1	0	4	18	7	30
		% of Total	0.6%	0.0%	2.3%	10.4%	4.0%	17.3%
	Neutral	Count	4	3	2	20	22	51
		% of Total	2.3%	1.7%	1.2%	11.6%	12.7%	29.5%
	Disagree	Count	6	1	2	21	14	44
		% of Total	3.5%	0.6%	1.2%	12.1%	8.1%	25.4%
	Strongly disagree	Count	4	1	2	13	15	35
		% of Total	2.3%	0.6%	1.2%	7.5%	8.7%	20.2%
Total		Count	15	7	11	80	60	173
		% of Total	8.7%	4.0%	6.4%	46.2%	34.7%	100.0%



I prefer pen, paper and traditional desktop computers * Which of them you enjoy using most at/for work? Crosstabulation

			Which of them you enjoy using most at/for work?					
			Pen & Paper	Tablets	Smartphones	Laptop	Desktop	Total
I prefer pen, paper and traditional desktop computers	Strongly agree	Count	6	1	0	0	21	28
		% of Total	3.4%	0.6%	0.0%	0.0%	12.1%	16.1%
	Agree	Count	6	0	0	11	19	36
		% of Total	3.4%	0.0%	0.0%	6.3%	10.9%	20.7%
	Neutral	Count	2	4	7	35	13	61
		% of Total	1.1%	2.3%	4.0%	20.1%	7.5%	35.1%
	Disagree	Count	1	2	2	23	5	33
		% of Total	0.6%	1.1%	1.1%	13.2%	2.9%	19.0%
	Strongly disagree	Count	0	0	2	11	3	16
		% of Total	0.0%	0.0%	1.1%	6.3%	1.7%	9.2%
Total		Count	15	7	11	80	61	174
		% of Total	8.6%	4.0%	6.3%	46.0%	35.1%	100.0%



Appendix E

Participants' frequency of putting the company's device into non-work related use

Please turn over to see how often participants put the company's device to the following non work-relarted use:

1. To keep in touch with friends and family.
2. To keep in touch with work colleagues
3. For personal organisation/admin and time management
4. For games, entertainment and relaxation
5. To keep updated with general news and current affairs
6. To keep updated with work related news and gossip.

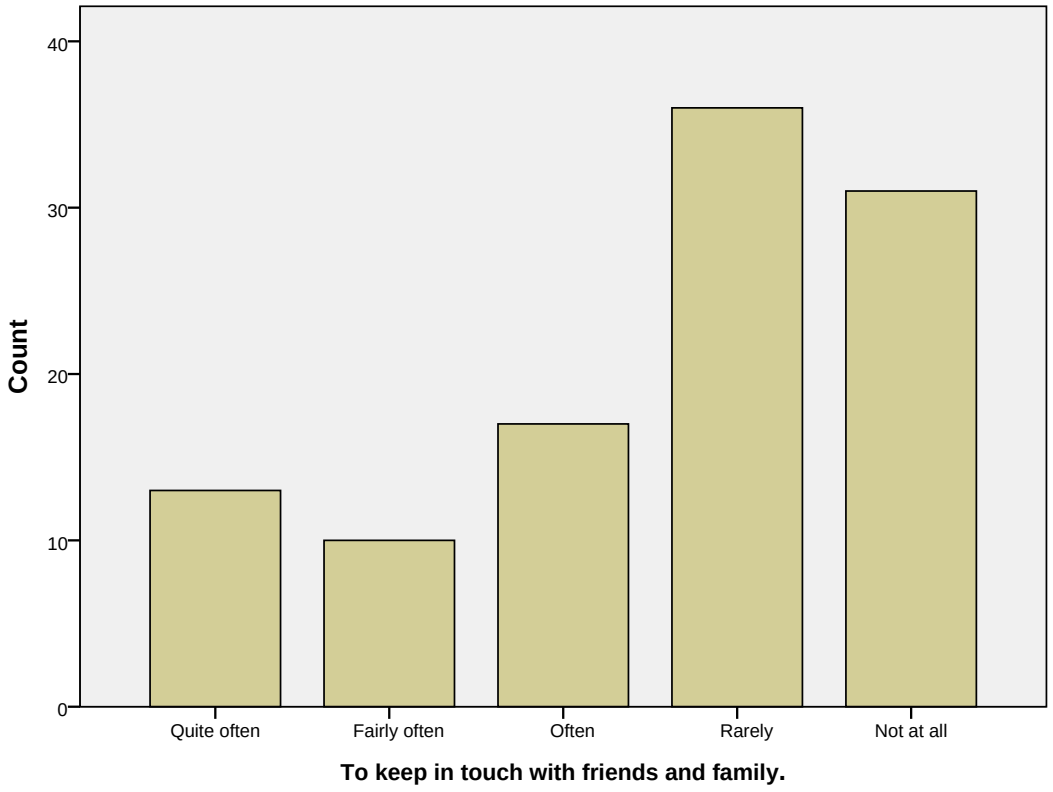
```
CROSSTABS
 /TABLES=V43 V44 V45 V46 V47 V48 V49 BY V27
 /FORMAT=AVALUE TABLES
 /STATISTICS=CHISQ
 /CELLS=COUNT EXPECTED
 /COUNT ROUND CELL
 /BARCHART.
```

In addition to work related use, how often do you use the company's device for the following: * Own Device or Company's Device?

To keep in touch with friends and family. * Own Device or Company's Device?

Crosstab

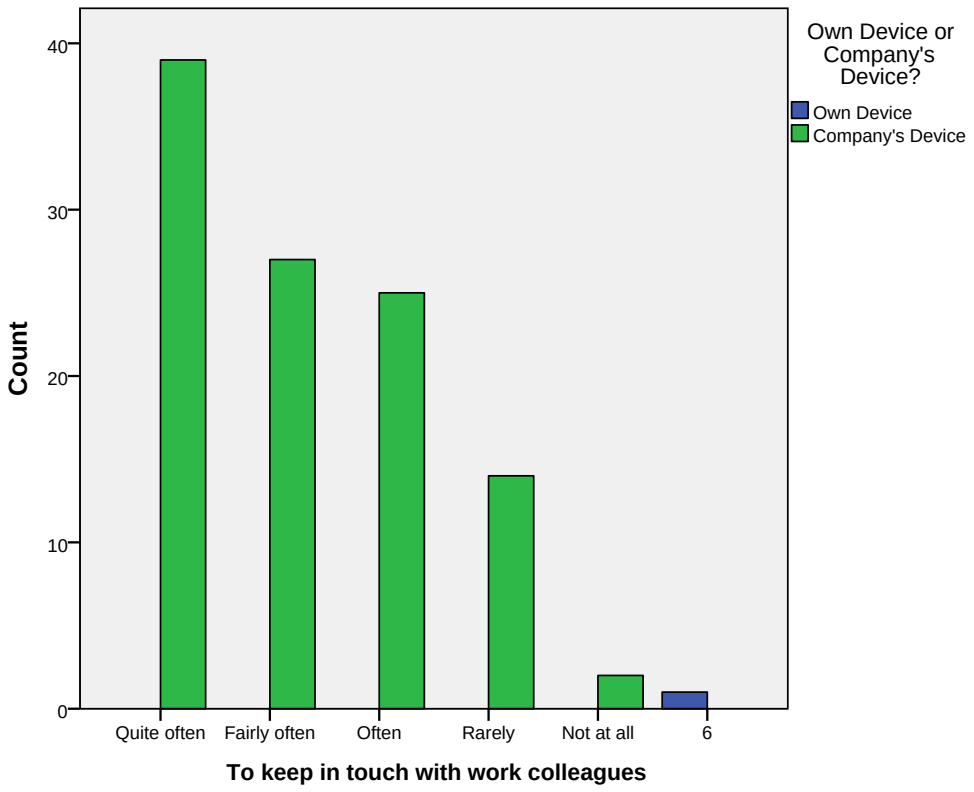
			Own Device or Company's Device? Company's Device	Total
To keep in touch with friends and family.	Quite often	Count	13	13
		Expected Count	13.0	13.0
	Fairly often	Count	10	10
		Expected Count	10.0	10.0
	Often	Count	17	17
		Expected Count	17.0	17.0
	Rarely	Count	36	36
		Expected Count	36.0	36.0
	Not at all	Count	31	31
		Expected Count	31.0	31.0
Total		Count	107	107
		Expected Count	107.0	107.0



To keep in touch with work colleagues * Own Device or Company's Device?

Crosstab

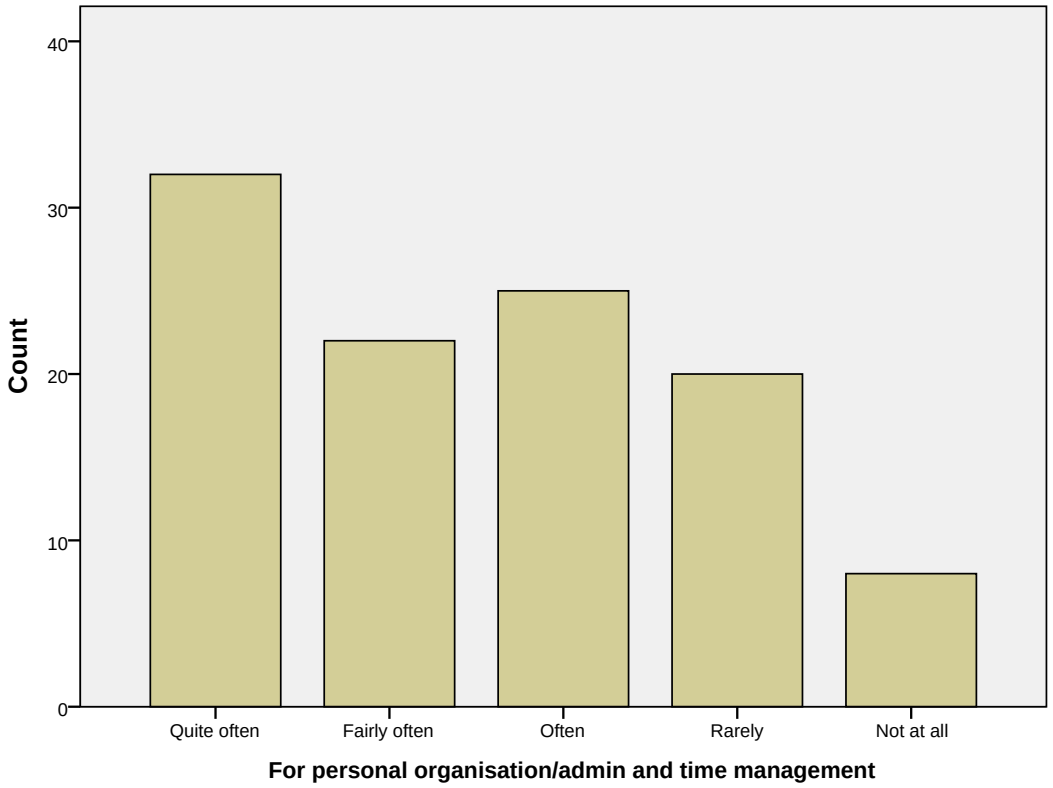
			Own Device or Company's Device?		
			Own Device	Company's Device	Total
To keep in touch with work colleagues	Quite often	Count	0	39	39
		Expected Count	.4	38.6	39.0
	Fairly often	Count	0	27	27
		Expected Count	.3	26.8	27.0
	Often	Count	0	25	25
		Expected Count	.2	24.8	25.0
	Rarely	Count	0	14	14
		Expected Count	.1	13.9	14.0
	Not at all	Count	0	2	2
		Expected Count	.0	2.0	2.0
	6	Count	1	0	1
		Expected Count	.0	1.0	1.0
Total		Count	1	107	108
		Expected Count	1.0	107.0	108.0



For personal organisation/admin and time management * Own Device or Comp any's Device?

Crosstab

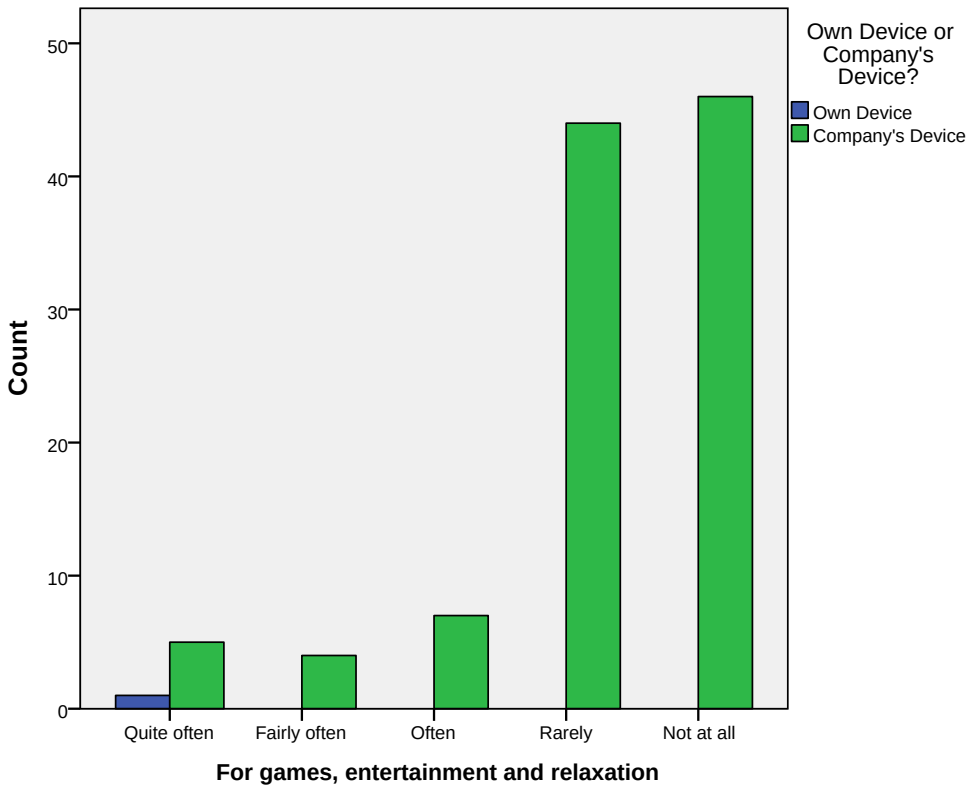
			Own Device or Company's Device? Company's Device	Total
For personal organisation/admin and time management	Quite often	Count	32	32
		Expected Count	32.0	32.0
	Fairly often	Count	22	22
		Expected Count	22.0	22.0
	Often	Count	25	25
		Expected Count	25.0	25.0
	Rarely	Count	20	20
		Expected Count	20.0	20.0
	Not at all	Count	8	8
		Expected Count	8.0	8.0
Total		Count	107	107
		Expected Count	107.0	107.0



For games, entertainment and relaxation * Own Device or Company's Device?

Crosstab

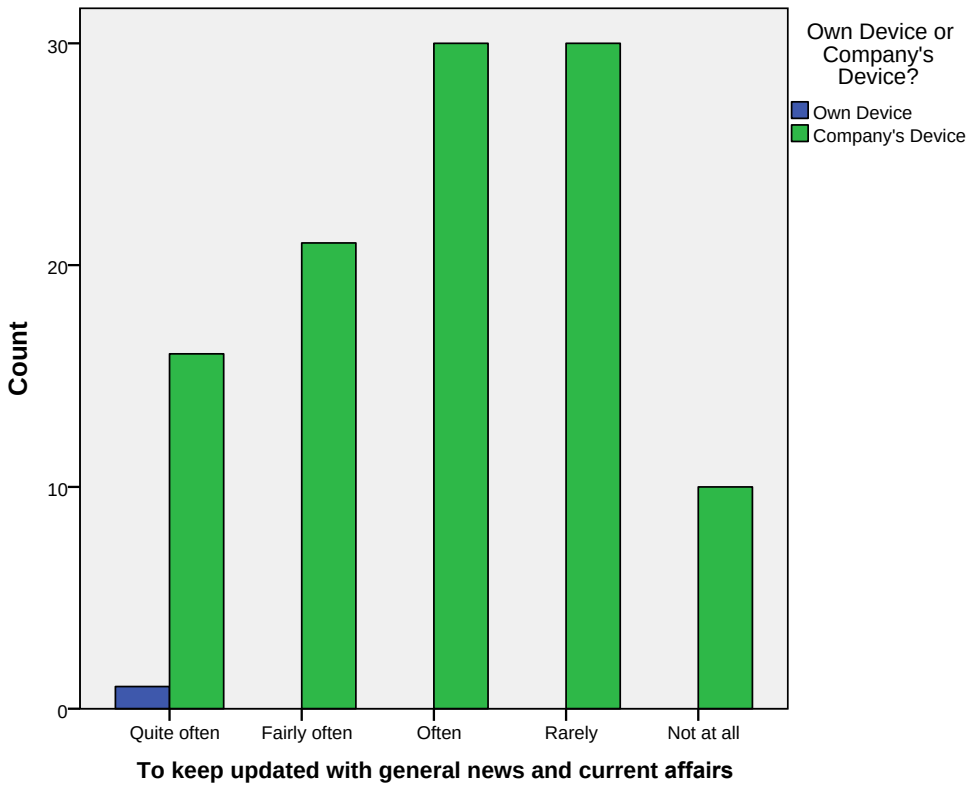
			Own Device or Company's Device?		
			Own Device	Company's Device	Total
For games, entertainment and relaxation	Quite often	Count	1	5	6
		Expected Count	.1	5.9	6.0
	Fairly often	Count	0	4	4
		Expected Count	.0	4.0	4.0
	Often	Count	0	7	7
		Expected Count	.1	6.9	7.0
	Rarely	Count	0	44	44
		Expected Count	.4	43.6	44.0
	Not at all	Count	0	46	46
		Expected Count	.4	45.6	46.0
Total		Count	1	106	107
		Expected Count	1.0	106.0	107.0



To keep updated with general news and current affairs * Own Device or Company's Device?

Crosstab

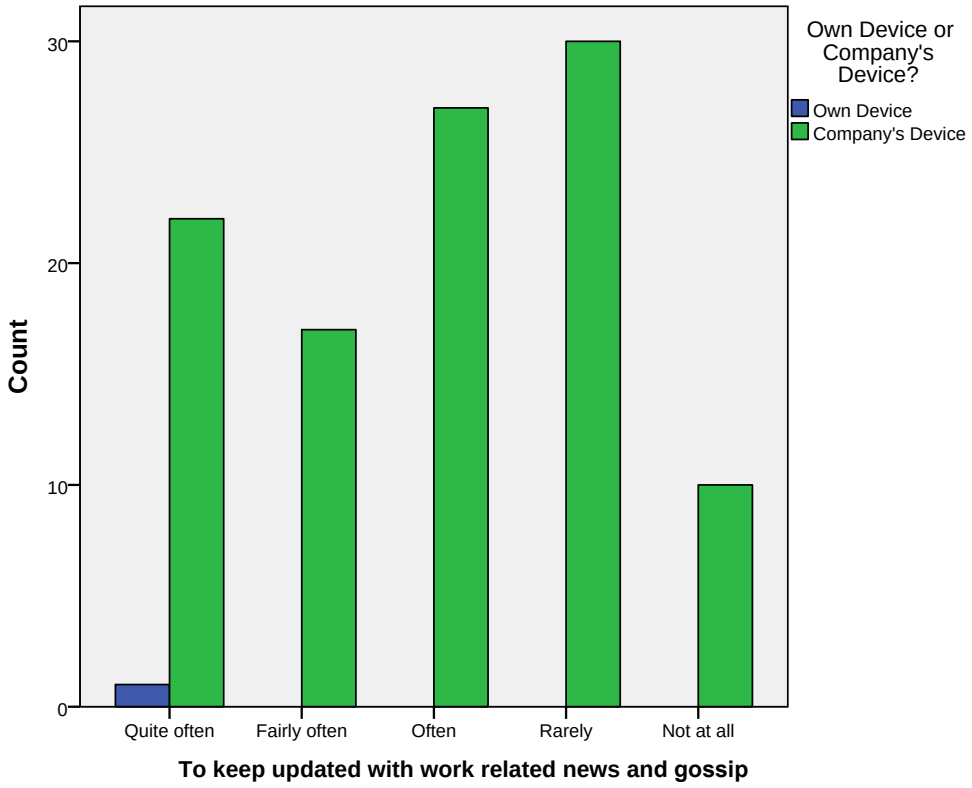
			Own Device or Company's Device?		
			Own Device	Company's Device	Total
To keep updated with general news and current affairs	Quite often	Count	1	16	17
		Expected Count	.2	16.8	17.0
	Fairly often	Count	0	21	21
		Expected Count	.2	20.8	21.0
	Often	Count	0	30	30
		Expected Count	.3	29.7	30.0
	Rarely	Count	0	30	30
		Expected Count	.3	29.7	30.0
	Not at all	Count	0	10	10
		Expected Count	.1	9.9	10.0
Total		Count	1	107	108
		Expected Count	1.0	107.0	108.0



To keep updated with work related news and gossip. * Own Device or Company's Device?

Crosstab

			Own Device or Company's Device?		
			Own Device	Company's Device	Total
To keep updated with work related news and gossip.	Quite often	Count	1	22	23
		Expected Count	.2	22.8	23.0
	Fairly often	Count	0	17	17
		Expected Count	.2	16.8	17.0
	Often	Count	0	27	27
		Expected Count	.3	26.7	27.0
	Rarely	Count	0	30	30
		Expected Count	.3	29.7	30.0
	Not at all	Count	0	10	10
		Expected Count	.1	9.9	10.0
Total		Count	1	106	107
		Expected Count	1.0	106.0	107.0


Own Device or Company's Device?
Own Device
Company's Device
Count
30
20
10
0
Quite often
Fairly often
Often
Rarely
Not at all
To keep updated with work related news and gossip

Appendix F

How often do participants use or access each of the social application presented to them from mobile devices (Smartphone, tablet, etc.)

Please turn over to see how often participants use or access each of the social applications presented to them from mobile devices (Smartphone, tablet, etc.)...

How often do you use or access each of the following applications from a mobile device (Smartphone, tablets, etc)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		22	11.0	11.0	11.0
	0	1	.5	.5	11.5
	MATRIX START	177	88.5	88.5	100.0
	Total	200	100.0	100.0	

Twitter/Yammer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	.5	.6	.6
	At least once a day	25	12.5	14.2	14.8
	Several times a day	22	11.0	12.5	27.3
	At least once a week	17	8.5	9.7	36.9
	several times a week	9	4.5	5.1	42.0
	Never	79	39.5	44.9	86.9
	Rarely	23	11.5	13.1	100.0
	Total	176	88.0	100.0	
Missing	System	24	12.0		
Total		200	100.0		

Facebook

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	At least once a day	40	20.0	22.9	22.9
	Several times a day	54	27.0	30.9	53.7
	At least once a week	17	8.5	9.7	63.4
	several times a week	9	4.5	5.1	68.6
	Never	41	20.5	23.4	92.0
	Rarely	14	7.0	8.0	100.0
	Total	175	87.5	100.0	
Missing	System	25	12.5		
Total		200	100.0		

Whatsapp

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	At least once a day	30	15.0	17.0	17.0
	Several times a day	54	27.0	30.7	47.7
	At least once a week	15	7.5	8.5	56.3
	several times a week	9	4.5	5.1	61.4
	Never	57	28.5	32.4	93.8
	Rarely	11	5.5	6.3	100.0
	Total	176	88.0	100.0	
Missing	System	24	12.0		
Total		200	100.0		

Snapchat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	At least once a day	6	3.0	3.4	3.4
	Several times a day	14	7.0	7.9	11.3
	At least once a week	5	2.5	2.8	14.1
	several times a week	3	1.5	1.7	15.8
	Never	131	65.5	74.0	89.8
	Rarely	18	9.0	10.2	100.0
	Total	177	88.5	100.0	
Missing	System	23	11.5		
Total		200	100.0		

Skype

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	At least once a day	14	7.0	7.9	7.9
	Several times a day	14	7.0	7.9	15.8
	At least once a week	38	19.0	21.5	37.3
	several times a week	10	5.0	5.6	42.9
	Never	41	20.5	23.2	66.1
	Rarely	60	30.0	33.9	100.0
	Total	177	88.5	100.0	
Missing	System	23	11.5		
Total		200	100.0		

Email

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	At least once a day	48	24.0	27.1	27.1
	Several times a day	110	55.0	62.1	89.3
	At least once a week	8	4.0	4.5	93.8
	several times a week	4	2.0	2.3	96.0
	Never	6	3.0	3.4	99.4
	Rarely	1	.5	.6	100.0
	Total	177	88.5	100.0	
Missing	System	23	11.5		
Total		200	100.0		

Google+

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	At least once a day	12	6.0	6.8	6.8
	Several times a day	21	10.5	11.9	18.6
	At least once a week	11	5.5	6.2	24.9
	several times a week	8	4.0	4.5	29.4
	Never	86	43.0	48.6	78.0
	Rarely	39	19.5	22.0	100.0
	Total	177	88.5	100.0	
Missing	System	23	11.5		
Total		200	100.0		

Appendix G

A Sample of the Survey recruitment email

Please turn over to see a sample of the Survey recruitment email...

Please Help Complete Survey

Adetunji C.

To: [redacted]

02 June 2016 11:45

- You forwarded this message on 16/08/2016 10:56.

Hello,

I'm wondering if you could kindly help complete the following survey questionnaire please:

https://www.isurvey.soton.ac.uk/18380

The study is part of a PhD research into the use of mobile devices and applications for work purposes and your responses will contribute to an understanding of the impact of mobile devices and social applications on employee engagement and knowledge sharing. This may in turn help organisations in optimising their enterprise mobility and knowledge management strategies. The survey would take approximately 10 minutes and your responses are, by default, anonymous and confidential.

Thanking you for your kind help.

Regards,

Chris Adetunji
@Christunji

Appendix H

A Copyright permission obtained from Emerald Insight

Please turn over to see a sample of the copyright permission obtained from Emerald Insight...

FW: Keenan and Shiri (2009) - Request for Permission

Chris Tutill [CTutill@emeraldinsight.com]
Sent:01 March 2016 10:47
To: Adetunji C.

Dear Chris,

Thank you for your email.

Please allow me to introduce myself, my name is Chris Tutill and I am the Rights Executive here at Emerald.

With regards to your request, providing that the content is fully referenced and gives credit to the original publication, Emerald is happy for you to include it in your dissertation.

Please note that should you wish to republish the content elsewhere (i.e. for commercial purposes/in a journal, etc.), you will need to clear permission once more.

I wish you the best of luck with your dissertation.

Kind Regards,

Chris Tutill
Rights Executive | Emerald Group Publishing Limited
Tel: +44 (0) 1274 785173 | Fax: +44 (0)1274 785200
CTutill@emeraldinsight.com| www.emeraldinsight.com

-----Original Message-----
From: Adetunji C. [mailto:ca6q14@soton.ac.uk]
Sent: 27 February 2016 09:38
To: Permissions
Cc: Leslie Carr
Subject: Re: Keenan and Shiri (2009) - Request for Permission

Dear Sir/Madama,

I have found the best definition of some terms in (Keenan and Shiri, 2009)1 for sociability, social network theory, social network sites, and social websites.

As I found the author's definitions aptly and succinctly conveyed the meanings even without resorting to the secondary sources, I would like to obtain your permission to use their definitions, with full and

appropriate attribution, in my ongoing PhD research thesis please.

Thanking you for your kind consideration.

Regards,

Chris Adetunji
Web & Internet Science Research Group
Building 32/4068
Electronics and Computer Science
University of Southampton
SO17 1BJ

1. Keenan, A., & Shiri, A. (2009). Sociability and social interaction on social networking websites. Library Review, 58(6), 438–450. doi:10.1108/00242530910969794

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