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Academic agility in digital innovation research: The case of mobile ICT publications within information systems 2000–2014

Carsten Sørensen [a,*], Jonathan S. Landau [b]

[a] Department of Management, London School of Economics and Political Science, London WC2A 2AE, UK
[b] Tutti.ch AG (Tamedia), Zürich 8004, Switzerland

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ABSTRACT

The Information Systems (IS) field has never been more relevant as digital innovations are emerging at a rapid pace fuelled by recombinant innovations based on digital infrastructures, advanced middle-ware layers, and mobile and ubiquitous technologies. This paper argues, based on a bibliometric study of the representation of a mobile ICT discourse within the AIS Senior Scholars' 'basket' of eight IS journals over the past 15 years, that the field needs to become much more academically agile. The study showed that a mere 3.2% of all papers published during this period had any relationship to one of the key technological phenomena in the late 20th and early 21st centuries. The paper formulates the hypothesis that the relative shift in impact between European- and US-based journals within the 'basket of 8' could have been influenced by editorial strategising to further encourage academic agility exploring new horizons rather than emphasis on further exploitation of existing ground. The paper, further argues that the IS field seems to more readily engage in a debate of phenomena involving centralised and organisationally-bound technological innovations whereas distributed, decentralised and infrastructural discourses find it much more difficult to gain a foothold. So, whilst the IS field may still be stuck in the mainframe age, it needs to move beyond in order to fully engage with the world we live in.

Introduction

"In theory, there is no difference between theory and practice. In practice, there is." – Yogi Berra

The rapid digitisation of a variety or previously analogue aspects of the World, and the associated socio-technical processes of digitalisation poses both an opportunity and a challenge for the global Information Systems (IS) community – as argued by Yoo (2013), it can place the community at the centre of important discussions within and beyond academe. A complex set of inter-connected phenomena characterised in terms of digital innovation is bringing 'digitality' to the foreground, and with it the notion of recombination of digital capabilities (Yoo et al., 2010, 2012). This creates the expectation of a rapidly changing socio-technical environment where new combinations emerge and some of these become important whereas others wither away into obscurity.

* Corresponding author.
E-mail addresses: c.sorensen@lse.ac.uk (C. Sørensen), jslandau@gmail.com (J.S. Landau).

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The important changes can result in significant technological developments and industry upheaval as can be briefly illustrated from the context of mobile ICT. Whilst initial slow growth from the first mobile phone call in 1973, mobile telephony grew radically from the 1980s onwards. There are currently over 7.5 billion GSM connections, including machine-to-machine connections, and over 3.7 billion unique mobile subscribers globally.[1] The advent of internet-enabled mobile ICT through feature- and smartphones represent the most significant growth in access the past years.[2] One of the most popular Internet services is Facebook, and of the 1.44 billion monthly active Facebook users, 1.25 billion accesses are through mobile technology, and of the 936 million daily users, 798 million (85%) are mobile users.[3] Smartphones and tables invade private and working lives whilst resulting in industrial reconfiguration as old industrial giants are facing new ones. In 2008, Nokia became the World's largest camera manufacturer leaving traditional camera brands struggling with Kodak filing for bankruptcy protection in 2012 (Lucas and Goh, 2009). Microsoft then bought the handset manufacturing part of the Finnish company and both united in struggling against Apple, Samsung, Google, Xiaomei and others on the global mobile phone market. In July 2015, Microsoft wrote off the entire Nokia purchase. Apple, which in 1997 was struggling, and bolstered by a $150 million Microsoft investment was, in February 2015, deemed to be the first ever $700 billion company – mostly down to its success with various mobile ICT.[4]

These are just a very small selection of recent dramatic changes directly related to mobile ICT, and it should be fairly obvious that such dramatic changes related to a particular kind of information technology should be a particularly valuable subject of study for the Information Systems (IS) community. The phenomenon has global reach – every single country in the world has seen significant mobile telephony adoption and its implications spans individuals, teams, organisations, and entire industries.

This paper explores the important challenge for the IS field when engaging in the research of digital innovation to scan emerging developments where technologies and human practices are innovated and, through the academic process of open debate, decide upon the relative significance of these phenomena. We have chosen mobile ICT as a prototypical example of such an important challenge. Within the IS field, this debate is mainly conducted through journal publications, although books and conference papers also play an important role (Galliers and Whitley, 2007; Stein et al., 2014). Based on the notion of business agility as the ability to quickly and resourcefully adapt to environmental changes (Mathiassen and Pries-Heje, 2006), we define academic agility as *the ability of an academic field to quickly, rigorously, and resourcefully explore environmental changes within its mainstream academic debate*. This paper therefore considers the academic agility of the IS field in terms of how the field, through papers published in academic journals, engages in a debate of the relative importance of emerging sociotechnical phenomena. Past research has studied the IS field's lack of treatment of a number of issues, for example, health information systems (Chiasson and Davidson, 2004), digital convergence (Herzhoff, 2009), and digital infrastructures (Tilson et al., 2010). This paper considers a similar lack in relation to mobile technologies by investigating the result of Lyytinen and Yoo's (2002b) call to action.

Thus, this paper proposes that the configuration and dynamics of the phenomena at the centre of digital innovation imposes the central strategic challenge for the IS field to become more academically agile, should it decide to be at the centre of the study of digital innovation. The main assumption is that, irrespective of what possible impact and influence the IS field may have on such emerging phenomena, it is an essential part of the field's justification for existence to provide academically grounded treatments of the most significant socio-technical phenomena. Given the force and pace of contemporary ICT development, we assume an increasing need for the IS field to display academic agility in the way it considers emerging phenomena and either rejects or adopts them as significant for the field.

As a way of exploring the ability for the IS field to meet the strategic challenge imposed by the rapidly changing digital innovation environment, this paper explores how the IS field has reacted to the rise of mobile ICT by conducting a bibliometric study of the extent to which this phenomenon has been subjected to rigorous academic discussion within the so-called AIS Senior Scholars' 'Basket of Eight' journals during the period 2000–2014. The mobile revolution is one of the best examples of digital innovation over the past 20 years and is therefore a very good example of a challenge to the academic agility of the IS field. This paper has, therefore, chosen to explicitly follow up on Lyytinen and Yoo's (2002b) call to action, identifying a lack of IS research within mobile ICT. It explores how the IS field has responded to this call and the general technological phenomenon of mobile ICT. It is an exploration into the agility of the IS field—the speed and strength of the feedback loop from the rapidly evolving global scene of digital innovation to the main outlets of IS research findings.

There are good examples of research relating significantly to the global diffusion of mobile communications, such as the extensive body of work within the social study of mobile communication (see, for example, Katz and Aakhus, 2002; Licoppe, 2004; Ling, 2008). However, whilst these theoretical explorations will be relevant for the study of mobile ICT within the IS field, they will be based on different premises, historical contexts, theoretical aims, and therefore offer other types of outcome. As examples, these studies are, for the most part, not concerned with the materiality (Cecez-Kecmanovic et al., 2014) of mobile communications and tend to take this aspect for granted whilst emphasising the social aspects (Sørensen, 2011).

A bibliometric study retrieved 102 journal articles relating to mobile ICT from the 3180 papers published in the 'basket of eight' IS journals between 2000 and 2014, representing 3.2% of the total number of articles published in these journals during

[1] https://gsmaintelligence.com (retrieved 13/7/2015).
[2] http://www.internetlivestats.com/internet-users/ (retrieved 13/7/2015).
[3] http://newsroom.fb.com/company-info/ (retrieved 13/7/2015).
[4] http://fortune.com/2015/02/10/apple-the-first-700-billion-company/ (retrieved 13/7/2015).

that period. The bibliometric study also suggests an emerging shift in the relationship between a journal's academic agility and its impact factor.[5] Whereas the period 2000–2010 showed an inverse relationship between impact factor and propensity to publish papers on mobile ICT, the last five years have seen a much more complex impact factor distribution with the Europe-based journals challenging the previous dominance of journals mainly edited in the USA.

Comparing the social and organisational role of mobile ICT, our findings do not seem to point towards the IS field having established an agile and measured response. This paper contributes to a lengthy, on-going, debate within the IS field of its status, role and possible contributions to research at large (for example, Grover and Lyytinen, 2015; King and Lyytinen, 2006). Here, a significant body of work has for more than a quarter of a century sought to understand the possible relationships between the field and its practice context (cf. Peppard et al., 2014) and to other academic fields (Whittington, 2014). This paper contributes to the discussion of the academic agility necessary within IS to rapidly engage in a research-based debate of emerging phenomena. The paper argues that such agility is of a strategic importance for our field to remain vibrant by shaping the agenda for study and progress of digital innovation. The paper contributes to this debate of the status and strategic direction of the IS field by framing the concept of academic agility and proposing it as a strategic necessity for the IS field to comprehensively engage in the study of the rapidly changing environment of digital innovation. The paper argues for academic agility to be treated with as much importance within the IS field as academic rigor and practical impact, and discusses some of the possible paths to achieve increased academic agility within IS. It further argues that academic agility is strategically essential in order for the IS field to establish credible grand narratives, and through these engage significantly in a public debate. Based on the relative lack of agility in studying mobile ICT and the significant response to other emerging issues, such as enterprise-resource planning systems, electronic commerce, cloud computing, and big data, the IS field is possibly still stuck in a mainframe single-organisation grand narrative.

The paper is structured as follows. Section 'IS studying IS' outlines IS research in the IS field and positions this paper within this discussion. Section 'Mobility research' outlines some of the academic responses so far to the challenge of mobile ICT. Section 'Bibliometric study' presents the research approach. Section 'Results' presents the findings from our bibliometric study. Section 'Discussion' both discusses these findings and concludes the paper.

IS studying IS

The Information Systems field has been declared to be in a state of various crises for a number of years (Benbasat and Zmud, 2003; King and Lyytinen, 2004; Lyytinen and King, 2004; Agarwal and Lucas, 2005). The role of the field has been discussed widely in a number of articles and books (Baskerville and Myers, 2002, 2009; Benbasat and Zmud, 1999, 2003; Currie and Galliers, 1999; Galliers, 2003; Galliers and Currie, 2011; Gill, 2009; King and Lyytinen, 2006). Various solutions have been suggested; for example: innovativeness rated higher in academic IS journals than academic rigor (Lyytinen et al., 2007); academics caring less about the recognition of colleagues (King and Lyytinen, 2004; Lyytinen and King, 2004); turning IS into a 'proper' discipline with a focus on the 'core' (Benbasat and Zmud, 2003), and reducing the importance of peer-reviewed so-called 'A-journal' papers (Dahlbom, 1996). Equally, it has been argued that the current state of affairs with digital innovation represents a unique opportunity for our field to contribute more widely to the debate of contemporary technological developments beyond the boundaries of the IS field (Yoo, 2013).

It could be argued that, as a field, IS is too concerned about academic rigor and less about relevance, as argued within management studies (Hambrick, 2007; Mintzberg, 2005), and indeed IS itself (Galliers, 1997; King and Lyytinen, 2004; Lyytinen and King, 2004). Within several fields, Management in particular, it has been argued that a close connection between dynamic phenomena and research is critical (Gibbons, 1994; Tushman and O'Reilly, 2007; Van De Ven, 2007). Whilst most of this research has focused on the impact from IS research to practitioners engaging in digital innovation and to academics in related fields, this paper focuses solely on the feedback loop *from* the practice of digital innovation and *into* IS theory and critical debate. This paper is not arguing for full-cycle micro-organisational behaviour research (Chatman and Flynn, 2005), or action research (Mathiassen et al., 2012; Sein et al., 2011) *per se*, but merely for the strategic necessity for IS to closely *follow*, if not *shape,* both the IT artefact (in a sociomaterial sense) and the associated emerging practices within the broader emerging context of digital innovation.

The paper draws on the concept of business agility: the ability to quickly and resourcefully adapt to environmental changes (Mathiassen and Pries-Heje, 2006). Contemporary organisations subjected to changing environmental conditions must display some form of agility in order to thrive (Tallon and Pinsonneault, 2011). Similarly, and as previously noted, we define *academic agility* as the ability of an academic field to quickly and resourcefully explore environmental changes within its mainstream academic debate. Whilst realising that agility has been used within software engineering as a particular concept characterising specific techniques, whilst at the same time being a broad concept inviting a multitude of different interpretations, we believe that simply focusing on an academic field's ability to draw emerging changes in the environment into mainstream discussion offers us a sufficiently fixed meaning of agility for the purpose of this paper. The paper assumes that part of our research field's strength will increasingly emerge from its agility in absorbing, relating to and critiquing rapidly emerging digital innovations and associated practices. It is not an argument in itself that any new digital innovation immediately ought to result in new categories, conferences, journals, or indeed research fields. At times

[5] Thomson Reuters Journal Citation Reports at http://admin-apps.isiknowledge.com/JCR/JCR (accessed 20 July, 2015).

newness does not represent a difference that theoretically makes a difference (Bateson, 2000). However, the IS field critically hinges upon technological development within our empirical environment (Lyytinen, 1999), and it is increasingly argued that the speed and 'generativity' of digital innovations propose near-future significant challenges for our field (Brynjolfsson and McAfee, 2014; Tilson et al., 2010; Yoo et al., 2010, 2012; Yoo, 2013).

Mobility research

This section situates the chosen phenomenon of mobile ICT in neighbouring academic contexts as a way of understanding the diversity of responses to the strategic challenges of this example of a specific family of digital innovation. Mobile ICT has been chosen as it constitutes a prototypical case of an emerging socio-technical assemblage with considerable effect on the field of empirical study within IS. This paper considers, in particular, a specific class of information technology, broadly categorised by supporting combinations of mobile-, portable- and pervasive computing (Lyytinen and Yoo, 2002a, 2002b); in short, mobile ICT. This technology evokes theoretical notions of movement and interaction across time, space and context (Arnold, 2003; Kakihara and Sørensen, 2002).

A broad range of academic fields and disciplines have researched issues related to variations in and combinations of space, time, movement and technology. Within the interdisciplinary field of human geography these aspects have for decades formed significant themes of research (see for example Carlstein, 1983; Gregory and Urry, 1985). More recently, the increased interest in issues broadly related to movement and temporality has been labelled "the mobility turn" (Urry, 2007, p.6). The broad social science discussion on 'mobilities' assembles an interesting and rich discourse by growing tentacles that reach deep into a variety of social science issues (as illustrated in Urry, 2007). However, the discussion here tends to avoid any explicit consideration for the material aspects of how social affairs and contemporary information technology are constitutively entangled (Orlikowski, 2007) in everyday life.

Within the social sciences, an emerging and growing community of researchers is engaged in a social study of mobile communications, largely fuelled by the advent of mobile voice calls and SMS connectivity (e.g., Katz and Aakhus, 2002; Ling, 2008). This research is related to, yet distinct from, general 'mobilities' research, and has explicitly chosen mobile communications as a focal point of interest. However, characteristic of this highly interesting research is the almost entirely 'black-boxing' of the technology itself. The emphasis is largely on social behaviour under a regime of mobile phone use and not on a broader understanding of the inner socio-technical workings. Ling's (2008) exposition of rituals in the age of the mobile phone is an interesting sociological analysis that largely takes for granted the technological properties afforded by the mobile phone. Arnold (2003) investigates the phenomenology of technology, using the mobile phone as an example. Arnold refutes the notion of a simple relationship or performance between affordance and purpose, but rather a multi-faceted complex arrangement of contrary performances. Even still, the notion of affordance is not unfolded and merely represented as a 'black box'.

The social science studies of mobile ICT are largely concerned with a single technology – the mobile phone – applied within a general social context (Sørensen, 2011). There is little research on the co-construction of mobile and ubiquitous information technology and working practices within organisations, and there is only sparse research moving beyond the mobile phone to both explore complex assemblages of mobile and ubiquitous technology as well as to investigate in detail the socio-technical arrangements. The work by Manning (2003, 2008) on the use of complex technological assemblages within the police force provides an elegant exception.

Considering social science research of flexible working practices facilitated by the use of mobile ICT, there is herein a significant body of research discussing organisational practices without significantly linking it to a deeper understanding of the co-construction of these practices and specific technological choices. Felstead and colleague's (Felstead and Jewson, 1999, 2000; Felstead et al., 2005) work on shared offices, home working and mobile working is an excellent example of a highly interesting organisational discourse. Similarly, Sturdy et al. (2009) take a close look at management consultancy practices, characterised in terms of boundary spanning and knowledge flows between organisations. Dale and Burrell (2008) study the mutual construction of organisational spaces and practices by relating both to literature from organisational theory, philosophy, social geography and architecture – yet, information technology is absent.

At the opposite end of an imaginary – and in many ways problematic – socio-technical continuum, we find a broad range of research within the technical sciences that engages in the construction of socio-technical visions directly relating to 'mobilities'; for example; wearable computing (Barfield and Caudell, 2001; Mann and Niedzviecki, 2002); ubiquitous computing (Weiser, 1991); novel forms of mobile device interaction (Kjeldskov and Graham, 2003), and pervasive computing (Hansmann et al., 2003; Kourouthanassis and Giaglis, 2008). Characteristic of this technical research is an intense interest in creating technological affordances, and only to limited extent exploring these in any social contexts beyond laboratory experiments or other forms of controlled environments (Sørensen, 2011).

The existing research related to mobile ICT, as listed above, simultaneously represent an opportunity for the IS field to both connect and contribute. This does, however, require an initial agile step of relating to the primary phenomenon, exploring it, and discussing it. Some work has, of course, already been done within IS, such as: Gebauer et al.'s (2010) study of task-technology fit for mobile IS; Kourouthanassis et al.'s (Kourouthanassis and Giaglis, 2008; Kourouthanassis et al., 2010) studies of pervasiveness; Godinho de Matos et al.'s (2014) study of peer influence in 3G phone diffusion, as well as a number of studies of near-field communications (e.g., Wang et al. (2011).

Bibliometric study

The aim of this empirical study is simply to map the extent to which the IS field has engaged in a rigorous process of seeking to understand the importance of mobile ICT by studying the representation of the domain of mobile ICT within IS. Such an approach has a rich tradition in IS. Empirical analyses of articles published in one or more IS journals have become an established method of studying IS research in general (e.g., Chen and Hirschheim, 2004; Farhoomand and Drury, 1999; Grover and Lyytinen, 2015; Orlikowski and Baroudi, 1991; Orlikowski and Iacono, 2001; Sidorova et al., 2008) as well as specific topics, such as: action research (Mathiassen et al., 2012), knowledge management (Raub and Rüling, 2001; Schultze and Leidner, 2002), hospital information systems (Chiasson and Davidson, 2004), digital convergence (Herzhoff, 2009), and digital infrastructures (Tilson et al., 2010). Similarly, Gable (2010) conducts an archival analysis of research published in *The Journal of Strategic Information Systems* whilst Avison and Fitzgerald (2012) reflect on the then 25-year history of the *Information Systems Journal*. In order to draw on a representative sample of a rigorous IS debate, we focus on the AIS Senior Scholars 'basket' of eight IS journals (alphabetically ordered);

- *European Journal of Information Systems* (*EJIS*, ISSN: 0960-085X);
- *Information Systems Journal* (*ISJ*, ISSN: 1365-2575);
- *Information Systems Research* (*ISR*, ISSN: 1047-7047);
- *Journal of Information Technology* (*JIT*, ISSN: 0268-3962);
- *Journal of Management Information Systems* (*JMIS*, ISSN: 2162-9730);
- *Journal of Strategic Information Systems* (*JSIS*, ISSN: 0963-8687);
- *Journal of the Association of the AIS* (*JAIS*, ISSN: 1536-9323); and
- *MIS Quarterly* (*MISQ*, ISSN 2162-9730).

The number of articles published on mobile ICT is tallied as a measure of the representation of the extent of research on the phenomenon within mainstream IS discussion, and the bibliometric study essentially counts the number of published articles discussing mobile ICT across the 'basket of eight' journals during the period 2000–2014. Although such journal listings have been criticised (see Willcocks et al., 2008) and, by necessity, exclude parts of the IS research body, these eight journals fulfil a number of criteria. They enjoy high acceptance amongst scholars and represent a geographical and topical diversity that has been widely called for (see Gallivan and Benbunan-Finch, 2007). Furthermore, the 'basket of eight' includes only journals that are specific to IS, an important requirement for any empirical study focusing on the IS field (Chen and Hirschheim, 2004). Lastly, we stipulate that academic agility should be defined in terms of the dual characteristics of speed and rigor. Relying on 'double-blind' peer-reviewed IS journals allows us to focus on both aspects. Including outlets relying less on a rigorous peer review process may undoubtedly have demonstrated speed in exploring new phenomena but would not have allowed the study of both speed *and* rigor.

The 'basket of eight' journals are all international in their coverage but can be said to comprise four journals based mainly in Europe (*EJIS*, *ISJ*, *JSIS* and *JIT*), and four journals mainly based in the USA (*ISR*, *JAIS*, *JMIS* and *MISQ*). The corpus consisted of the publications within these eight journals within the period January 2000 up to and including December 2014. This timeframe takes into account the novelty of mobile ICT whilst allowing for sufficient temporal breadth. The analysis excluded: editorials, book reviews, opinion articles and responses, teaching cases and obituaries. However, research notes were included.

An initial screening of title and abstract, and (where available) keywords of all articles resulted in a first pool of papers. If the paper was deemed to be relevant (i.e., in some capacity exploring the issue of mobile ICT), the full paper was downloaded for further analysis. The thematic criteria for inclusion in the mobile article pool were relatively narrow, given the limited scope of this paper. Articles that specifically mention mobile ICT or related concepts such as ubiquitous computing were included. The process excluded papers that discuss wider concepts of relevance to the broader mobility discourse without explicitly referencing mobile ICT. Thus, excluded from the mobile ICT article pool were some (but not all) articles on distributed work (e.g., Kotlarsky and Oshri, 2005; Sarker and Sahay, 2004); virtual teams (e.g., Griffith et al., 2003; Schweitzer and Duxbury, 2010); telecommuting (e.g., Belanger et al., 2001; Iscan and Naktiyok, 2005), and telehealth (e.g., Klecun-Dabrowska and Cornford, 2001). The analysis also excludes meta-research papers discussing or calling for – rather than actually conducting – research on mobile technology (e.g., Lyytinen and Yoo, 2002b; March et al., 2000; Mbarika et al., 2005; Sawyer et al., 2003; Wareham et al., 2009; Yoo, 2010).

Results

Examining the titles, abstracts and keywords of all 3189 articles published in the eight 'basket' journals from January 2000 up to and including December 2014 revealed that 102 articles specifically discuss mobile ICT (see Table 1 for annual breakdown), representing 3.2% of the initial article pool. The following sections first present the response of the IS field to this external change, and thereafter focuses on the analysis of differences within the eight journals.

Table 1
Articles on mobile ICT and all articles published by year published in terms of % of total and across three 5-year periods.

Year	Mobile	Total	% Tot.	% Mob.	Period	Mobile	Total	% Tot.	% Mob.
2000	1	165	0.6%	1.0	2000–2004	6	777	0.8	5.9
2001	2	147	1.4%	2.0					
2002	1	151	0.7%	1.0					
2003	1	151	0.7%	1.0					
2004	1	163	0.6%	1.0					
2005	11	185	5.9%	10.8	2005–2009	68	1089	6.2	66.7
2006	18	210	8.6%	17.6					
2007	9	239	3.8%	8.8					
2008	12	226	5.3%	11.8					
2009	18	229	7.9%	17.6					
2010	4	215	1.9%	3.9	2010–2014	28	1314	2.1	27.4
2011	3	269	1.1%	2.9					
2012	3	293	1.0%	5.9					
2013	6	287	2.1%	5.9					
2014	12	250	4.8%	11.8					
Total	102	3189	3.2	100	00–14	102	3180	3.2	3.2

Academic agility in the IS mobile ICT discourse

The 102 articles on mobile ICT were distributed very unevenly across the 15-year sample period. The first 5-year sampling period (2000–2004) produced around 6% of the total number of publications on mobile ICT. The largest proportion, two-thirds of the 102 papers, was published in the second 5-year period (2005–2009). The last 5-year period (2010–2014) saw the publication of 27% of these papers. Thus, through these three 5-year periods, the mobile ICT percentage of the total output varied considerably, with 6 papers published in 2000–2004 (representing 0.8% of the total IS output), and 28 papers published in the last period 2010–2014 (representing 2.1% of the total IS output). The "golden period" of mobile ICT research within IS was the period 2004–2009, with a total of 68 papers (representing 6.2% of all IS papers published in that period).

Being the focus of 3.2% of the IS literature is not much for a technological phenomenon as global as mobile ICT, especially in a field that is said to be susceptible to contemporary fashions (Baskerville and Myers, 2009). Perhaps journal editors, perceiving a "causal distance" between mobility and core IS themes (Benbasat and Zmud, 2003), consider it best to leave the exploration of the concept to other disciplines. The rapid diffusion of both the basic mobile phone (1981–2000) and the smartphone (2000–) would leave IS researchers just around two decades to consider studying the subject. When Lyytinen amd Yoo's (2002) *ISR* commentary, challenging the IS community to engage in the study of mobile ICT, was published, the penetration rate for mobile telephony was around 75% in the EU, in Hong Kong, Japan and South Korea just over 60%, and in the USA around 50% (Castells et al., 2007, p. 12). The previous year, Brown et al. (2001) had published an edited book on a wireless world, and in the same year Katz and Aakhus (2002) published an edited book on social patters under mobile telephony. Ling (2004) published a monograph on the social impact of the mobile phone two years after.

It does seem therefore that the IS field, prior to 2005, did not exercise academic agility in terms of a quick and resourceful response to possibly important environmental changes in a rigorous manner. There was, of course, work being conducted 'below the radar' of the 'basket' journals, expressed, for example, in unpublished manuscripts, doctoral dissertations, and conference papers. For a range of possible reasons this work did not, however, result in more than the 6 accepted papers in 'basket' journals between 2000 and 2004. One possibility could be a lack of submissions by these active researchers to the journals. As an example, during the couple of decades from 1990s and onwards, there was a large proportion of papers on mobile ICT at the annual Scandinavian conference – IRIS. Whilst some of these were published in the associated *Scandinavian Journal of Information Systems* (*SJIS*), the local institutional context did not strongly emphasise the wider publication in international journals, rather it favoured the rapid investigation of new phenomena (Sørensen, 2003). Another possibility could be that the academic discourse on mobile ICT in its infancy found it difficult to establish clear, consistent and powerful constructs for the study of this particular set of phenomena, thereby making it difficult to present papers that would be accepted within an established discourse.

The increased interest in mobile ICT around 2005 compared to the earlier years could perhaps have signified a growing recognition of mobile technology; such expansions of scholarly attention usually lead to more mature discussions (Sidorova et al., 2008). If this is the case, then one hypothesis could be that the IS discussion of mobile ICT matured in the five-year period 2005–2009, for then to conclude that the subject did not bring with it substantial challenges to existing conceptualisations. We would, however, venture that the IS field is still searching for the essence of mobile ICT in terms of new constructs and new social categories. Furthermore, the changes brought about by feature- and smartphones starting in the mid-1990s and achieving significant adoption at the turn of the century, in effect, represented a new era of mobile ICT development. Indeed, perhaps the proper starting point for IS in terms of a relevant debate should have been in early 2000. At that point the standard mobile phone and the Personal Digital Assistant (PDA) merged into the early smartphone (Lind, 2007). The early mobile phones clearly caught the interest of researchers in Communications departments who eagerly engaged

in discussions of the phenomenon. The advent of mass adoption of the smartphone around 2000, with NTT Docomo serving around 40 million users in 2001,[6] could have been expected to catch the interest of the IS field. Perhaps the broadening of the pure communication device was the starting point for IS research, which subsequently, 4 or 5 years later, delivered a strong increase in journal publications on the subject?

This paper furthers Sørensen and Landau's (2014) study covering 2000–2010. Sørensen and Landau here categorise the unit of analysis (Lyytinen and Yoo, 2002b) and perspective on the ICT artefact (Orlikowski and Iacono, 2001) applied in IS studies of mobile ICT. Their study found that the unit of analysis, and perspectives generally, were in line with overall IS research, most visibly in the focus on a proxy view of individual-level services. Beyond that, the IS literature on mobile technology displays several approaches that account more explicitly for mobile technology and practice. These include a strong interest in inter-organisational mobile infrastructures and a surprisingly frequent conceptualisation of mobile ICT as a socio-technical ensemble—approaches that are located beyond the dominant IS paradigm (Orlikowski and Iacono, 2001; Lyytinen and Yoo, 2002b).

Mobile ICT across the senior scholars' 'Basket' of eight journals

We found a highly diverse engagement in an agile debate of mobile ICT across the eight journals, and that the representation of the mobile ICT debate clusters the journals in two groups. Table 2 highlights the distribution of mobile ICT research in the journals. Within *ISR*, *JAIS*, *JMIS* and *MISQ*, there is a representation of between 1% and 1.6% of all published papers within the 15-year period on mobile ICT. These four journals each count for between 5% and 7% of the 102 mobile ICT papers, making up a total of 23.5%. The remaining four journals – *EJIS*, *ISJ*, *JIT* and *JSIS* – each have between 5.2% and 6.3% of all papers published on mobile ICT. The mobile ICT papers within this cluster taken as proportion of the 102 papers identified amounts to a total of 76.5%, with each of the four journals accounting for between 14.7% and 31.4%. The total of 32 articles on mobile ICT published in EJIS alone represent almost a third of the mobile article pool – largely through special issues on the subject.

The difference between the two groups of journals correlates more or less to the journal impact rankings. Many scholars assert that "elite" IS journals with low acceptance rates, who play an important role in setting the IS research agenda, often display thematic and methodological conservatism (see Hirschheim and Klein, 2003; Willcocks et al., 2008; Gill and Bhattacherjee, 2009). Indeed, the four journals with low counts of mobile ICT research enjoyed the highest impact levels in 2009. Table 2 also provides an overview of the two journal groups and their respective citation data.[7]

High-ranking academic institutions are inherently conservative, and for good reason: the replacement of dominant discourses should not be achieved too easily (Lyytinen and King, 2004). But the fact that MISQ and ISR, the IS field's most highly ranked journals (as measured in 2009), jointly published only a total of 12 articles on mobile technology in over a fifteen year period demonstrates a certain disconnection between these IS outlets and "real world" of IS practice. At the same time, any journal ranking must be taken with a pinch of salt. Whilst the importance of MISQ is uncontested, many other leading IS journals are regularly misrepresented in rankings that fail to take into account, for instance, the distinctiveness of citation patterns amongst European researchers (Willcocks et al., 2008). Yet there are commonly accepted differences between American and European IS: the latter is more thematically and methodologically diverse (Avgerou, 2000) and more strongly encourages practitioner involvement in research efforts (Gill and Bhattacherjee, 2009).[8] Against this backdrop, it is perhaps not surprising that the four journals with lower impact factors (as of 2009) and high counts of mobile ICT research are the four journals based primarily in Europe, namely EJIS, ISJ, JIT and JSIS.[9] Taken together, these four journals provided 80% of the papers on mobile ICT from 2005 to 2009 (55 out of 68 articles). As noted, special issues form a major source of papers on mobile ICT in European journals (e.g., JIT, vol. 24(2), 2009). These embody specific calls from editorial decision-makers for mobile ICT research, implying a political will to expand the boundaries of IS research.

Political and institutional factors partially explain why mobile ICT research is underrepresented and unevenly distributed in IS research, especially given the perceived (in certain quarters) state of crisis in the field (e.g., Benbasat and Zmud, 2003). King and Lyytinen (2004) describe the phenomenon of "horizontal violence", in which academics deliberately promote disciplinary narrowness in order to protect their position vis-à-vis newcomers. But as mentioned above, explaining the scarcity of mobile technology research in IS is only one piece in a wider puzzle. Interestingly, as the period between 2005 and 2009 saw a majority of the articles on mobile ICT in the eight journals, the following period between 2009 and 2014 saw a relative shift in impact factor between the journals. Whereas the total five-year impact factor across the eight journals remained the same between the 2009 and 2014 measurements, the four 'European' journals all experienced an increase in the 5-year impact factor across the board, and all the US-based journals saw reduced impact. As the most dramatic example, *ISR*'s impact factor fell from 4.9 to 3.8 and that of *JIT* at the same time saw an increased impact from 2.7 to 5.4. Whilst the *JIT* issue

[6] http://en.wikipedia.org/wiki/Smartphone#Early_years.

[7] The 5-Year Impact Factor data is taken from the Thomson Reuters Journal Citation Report in 2009 and 2014 respectively at http://admin-apps.isiknowledge.com/JCR/JCR (accessed 20 July, 2015).

[8] See, for example, Galliers and Whitley (2007), Whitley and Galliers (2007) and Stein et al. (2014) for analyses of research based on the Proceedings of the European Conference on Information Systems.

[9] 'European' journals refer here to journals published in the EU and 'US' journals to those published in the US. This is a key distinction, because 'US' journals overwhelmingly publish research from US-based researchers, whilst the majority of articles in 'European' journals have in the past been written by scholars based in European institutions (Galliers and Meadows, 2003). Whilst this seems to be a blurred distinction, and the tendency is less obvious in the latter journals, we have decided to keep it for analytical purposes.

Table 2
Journals grouped by geographical origin and impact factor. Columns show 5-year impact factor in 2004, 2009, and 2014 (Thomson Reuters), and for each of the 3 five-year periods 2000–2004, 2005–2009, 2010–2014, as well as total period 2000–2014 columns show: Number of mobile ICT articles, total number of papers published, % mobile ICT papers of total, and for each journal its % of mobile ICT papers in the given period.

	5-Year impact			2000–2004				2005–2009				2010–2014				2000–2014			
	2004	2009	2014	Mob.	Tot.	%Mob.	% Tot	Mob.	Tot.	% Mob.	% Tot.	Mob.	Tot.	% Mob.	% Tot.	Mob.	Tot.	% Tot.	% Mob.
MISQ	2.9	9.2	8.5	0	88	0.0	0.0	2	144	1.4	2.9	3	245	1.2	10.7	5	477	1.0	4.9
ISR	3.5	4.9	3.8	2	107	1.9	33.3	2	121	1.7	2.9	3	209	1.4	10.7	7	437	1.6	6.9
JMIS	1.3	3.2	3.1	1	174	0.6	16.7	5	199	2.5	7.4	1	188	0.5	3.6	7	561	1.2	6.9
JAIS	0.0	3.1	2.7	0	59	0.0	0.0	4	128	3.1	5.9	1	155	0.6	3.6	5	342	1.5	4.9
USA	*7.7*	*20.4*	*18.1*	*3*	*428*	*0.7*	*50.0*	*13*	*592*	*2.2*	*19.1*	*8*	*797*	*1.0*	*28.6*	*24*	*1817*	*1.3*	*23.5*
JIT	0.9	2.7	5.4	2	96	2.1	33.3	11	110	10.0	16.2	3	95	3.2	10.7	16	301	5.3	15.7
JSIS	0.7	2.5	3.4	0	71	0.0	0.0	11	80	13.8	16.2	4	136	2.9	14.3	15	287	5.2	14.7
ISJ	0.7	2.5	2.6	1	81	1.2	16.7	8	98	8.2	11.8	6	98	6.1	21.4	15	277	5.4	14.7
EJIS	1.0	1.5	2.4	0	101	0.0	0.0	25	209	12.0	36.8	7	188	3.7	25.0	32	498	6.4	31.4
EU	*3.3*	*11.5*	*13.8*	*3*	*349*	*0.9*	*50.0*	*55*	*497*	*11.1*	*80.9*	*20*	*517*	*3.9*	*71.4*	*78*	*1363*	*5.7*	*76.5*
Total	11.0	31.9	31.9	6	777	0.8	100.0	68	1089	6.2	100.0	28	1314	2.1	100.0	102	3180	3.2	100.0

The two rows in italics highlight sub-totals for the two regions of USA and EU.

has controversially been discussed separately in terms of self-citations (Lowry et al., 2013), the decreased *ISR* and increased *JIT* impact could also tentatively and partly be attributed to differences in editorial strategising, where the a proactive editorial strategy to push boundary spanning academic agility may have created the perception of more thought provoking and relevant articles within the community. Similarly, but less markedly, the three other 'European' journals saw increased 5-year impact factors, with *JSIS*, for example, jumping from 2.5 to 3.4.[10]

It is of course likely, as a first port of call for an explanation of the shift, that the mere establishment of the 'basket of eight' journals concentrated citations as time went on, thereby impacting citation patterns. A 'basket of six journals' was established in 2007 with *JSIS* and *JIT* initially being listed as being of a similar stature but outside the 'basket'. The 'basket of eight' journals became into being in 2011. However, the total 5-year impact remained stable across all the eight journals between 2009 and 2014. The relative impact between journals has since changed and we assume a interrelationship between articles catching the imagination of academics and thereby leading to new research, which in turn then can get published in 'leading' journals.

Discussion

The mobile challenge for information systems

We perceive academic agility to be a field's ability to rapidly, yet rigorously, ascertain the important questions for further research within an emerging sociotechnical domain. The aim of this paper has been to discuss the issue of the IS field's agility in absorbing emerging socio-technical phenomena and, through a rigorous collective process driven by peer-reviews, interactively engage theory with the phenomena. The study of mobile ICT within IS was chosen as a prototypical domain of concern, and we have traced publications on mobile ICT within the AIS 'basket' of eight journals from 2000 up to and including 2014. This bibliometric study revealed that 3.2% of the published papers in the period to some extent dealt with the mobile ICT phenomenon (See Tables 1 and 2 in the previous section). The study also revealed that the period 2005–2009 constituted a ''golden age'' with two-thirds of the total pool of 102 papers on mobile ICT being published during that time. The paper also made tentative claims with respect to the relationship between journal impact factor and the propensity to publish papers on emerging phenomena such as mobile ICT related issues. Given the number of outstanding questions related to mobile ICT, we propose that the IS field has yet to establish a significantly agile response to the challenge posed by mobile ICT.

The study of mobile ICT within the field of IS does not signify a well-trodden research path. Indeed, 13 years after Lyytinen and Yoo's (2002b) call for IS academics to study mobile ICT, much is still left to be done in a topic area experiencing constant change. With a growing practitioner interest in a set of phenomena related to mobile ICT, the reasons to study and theorise the subject should in our view increase, rather than diminish, as has been the case since the period 2005–2009. As a small additional illustration, Table 3 shows Google Search and Google Scholar results from a number of searches of terms related to mobile ICT, as well as notes on the distribution of searchers on Google Trends. The table exemplifies a number of areas gaining interest within industry, and those that appear to be declining. If the IS field is seeking to assume a pivotal role where these issues are discussed in practitioner forums, then the field will need to take research in the general issue of mobile and ubiquitous information technology seriously. When the world beyond academia devotes considerable attention to a particular phenomenon then the IS field should seek to understand the significance of this as such attention can signify new socio-technical reconfigurations related to new types of technologies, social behaviours, and business arrangements.

Academic ambidexterity

Looking beyond mobile ICT and related phenomena, what are the strategic challenges for the IS field related to the ever-changing landscape of digital innovations? Information Systems is a field characterised by the need for theoretical insights in constantly shifting phenomena. With increased 'digitalisation' of a broader set of human activities, and the various forms of convergence across and within digital infrastructures, the speed of digital innovation is not set to slow down as our ability to engage in more effective recombinant innovation will increase (Brynjolfsson and McAfee, 2014, Chapter 5). If we as a field are to be exposed to increasingly sophisticated socio-technical arrangements emerging from recombinant innovation, increased academic agility will be essential in order for the community to make sense of the challenges. This is also a concern for other fields, such as statistics where Big Data has been touted as a major opportunity, and a challenge the field has admitted not to have risen to (HackerRank, 2015).

Considering the challenge as a case of ambidexterity by which we as a field need concurrently to balance the concerns for past discourses with those for new and emerging ones, then the essence of such balance will in itself be a combination of contextual ambidexterity (Gibson and Birkinshaw, 2004) whereby each individual academic makes up their own mind and makes their own choices regarding looking back to exploit existing discourses and looking ahead to explore new ones. However, in the academic context, there are also significant aspects of structural ambidexterity (O'Reilly and Tushman, 2013) in which existing communities exploiting existing research discourses are challenged by emerging groups exploiting

[10] Note also that the 2-year impact factor for, e.g., *JIT* and *JSIS* places these journals in 2nd and 3rd place behind *MISQ* amongst 'basket' journals respectively in each of the past two years (2013 and 2014).

Table 3
Sample of Google Scholar and Google Search results for areas related to an IS debate on mobile ICT. The search terms are precisely listed in the leftmost column. A note on the Google search trend curve is included in the rightmost column (www.google.co.uk/trends). Searches conducted 29/1/2015.

Search term	Google scholar search	Google search	Google search trends
"consumerisation of IT"	104	338,000	Not enough search volume
"wearable computing"	19,500 (mostly HCI)	533,000	Declining interest since 2004
"Bring Your Own Device"	4570	1,920,000	Rapid growth from 2012
"Enterprise Mobility"	1990	4,010,000	Steady growth since 2006
"smartphone app"	5860	5,530,000	Growth since 2009
"BYOD"	9060	9,190,000	Rapid growth from 2012
"mobile computing"	652,000	9,480,000	Declining interest since 2004
"Internet of Things"	63,300	21,200,000	Rapid growth since 2013

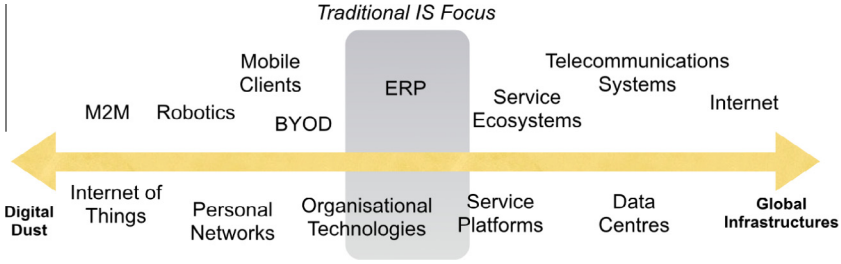

Fig. 1. Illustration of the need for the IS field to engage in the investigation of sociotechnical phenomena at greatly varying levels.

new ones. Such tensions will necessarily need to be facilitated, nurtured and supported by senior scholars in the field acting as essential gatekeepers and facilitators. The relative rise of 'European' IS journal impact since 2009 can perhaps partly be seen as a consequence of senior editors purposefully engaging in agile strategising behaviour faced with a tendency for the US-based journals to weigh exploitation over exploration. Such strategising can, for example, be executed though procuring special issues on new and emerging subjects and through sourcing thought-provoking issue and opinion pieces. The field clearly needs to continuously hone its academic ambidexterity (Markides, 2011) linking thinking and doing, and this will require a more rapid link between emerging industry and social practices and academic discourse. Whilst academics within the IS field, as indeed within Management (Tushman and O'Reilly, 2007), have the possibilities to aim for the top-right corner of Pasteur's Quadrant (Stokes, 1997) providing use-inspired basic research, such an aim can only be achieved through rapidly exploring new socio-technical configurations in order to work out which ones are particularly important.

In the balancing of exploitation of existing academic narratives and the exploration of new grand narratives, the IS field seems to us to be limiting itself unnecessarily. We would propose an initial hypothesis that the primary portfolio of grand narratives within the IS field are shaped by the established notion of the organisation being the IS laboratory (Braa and Vidgen, 1999). Within this perspective, some emerging narratives will fit well and others less well. Seemingly, IS narratives relating to the organisational context with some form of centralised provisioning of ICT more easily get a foothold than narratives relying on distributed technology. The IS field has seen healthy and emerging academic discussions of enterprise systems (Howcroft et al., 2004, 2005), Enterprise Resource Planning (ERP) software, Customer Relationship Management (CRM), supply-chain management (Gunasekaran and Ngai, 2011), knowledge management (Salmela et al., 2012), cloud computing and big data. These issues can easily be bound within the organisation and studied through an established lens. New, emerging discourses can then perhaps easily be integrated into the existing IS discourse by adhering to the existing logic, whereas technological phenomena beyond this seems to find it much less easy to gain a foothold.[11] From one end of the technological spectrum of small-scale distributed device ecologies over mobile and ubiquitous computing up to digital infrastructures (Fig. 1), the technological development challenges the middle ground of the organisation as the core-IS concern and main source of our grand narratives.

Tilson et al. (2010) state that innovation based on digital infrastructures allows for distributed actors to form new sociotechnical arrangements, which in turn may blur or redefine existing social categories. The IS field is increasingly presented with environmental changes shaped by such distributed 'generativity'. The field will find it increasingly necessary to rapidly make sense of the resulting changes as they potentially represent new categories of both technology and practices.

The IS field, we argue, needs to address the concerns seeded from developments not only situated beyond the centre ground, but increasingly also complex interrelationships between the granular and the infrastructural. Grover and Lyytinen (2015) point to the need to move from another centre ground of mid-range theory, treating the IT artefact as exogenous to theory and also reach for the edges of high-level conceptual theorising and rich inductive inquiries. We agree and

[11] Although consider the call for papers for a forthcoming *JSIS* special issue on the impacts of 'datification' (Galliers et al., 2015).

would argue that the edges of our field – both methodologically and in terms of phenomena – will be the source of grand narratives for the IS field. Yoo (2013) concludes that the present day represents a golden opportunity for our field to place itself at the centre of this discourse; however, such a position will require academic agility as a necessary but not sufficient step. In this complex scenario, the IS field will need to formulate grand narratives appealing to other fields beyond its own boundaries. Such grand narratives will need to provide compelling hypotheses about socio-technical developments relevant to a broader set of constituents. Whilst understanding how organisations can best implement ERP systems is a concern at the core of the IS field, so is the role of the mobile devices we all carry, or the increasing reliance on consumers to self-serve. For the IS field, these challenges involve dealing with highly decentralised and distributed phenomena challenging boundaries of employment and non-employment, human versus non-human agency and a wide array of unanticipated consequences. For any of this to come to fruition, academic agility is at the core of the challenge.

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