THE AMBIGUIOUS BOUNDARY BETWEEN PROFESSIONAL AND PRIVATE USE OF INFORMATION SYSTEMS: A BIBLIOMETRIC ANALYSIS

Research paper

Kupfer, Anna, University of Bamberg, Bamberg, Germany, anna.kupfer@uni-bamberg.de

Tiefenbeck, Verena, ETH Zurich, Zurich Switzerland and University of Bonn, Bonn, Germany, vtiefenbeck@ethz.ch

Staake, Thorsten, University of Bamberg, Bamberg, Germany, thorsten.staake@uni-bamberg.de

Abstract

Traditionally, Information Systems (IS) research focuses on the use and development of IS within and between organizations. This lens dates back to when IS use was mostly confined to professional contexts. Over the last decades, the application of IS has experienced a strong expansion to private contexts, where a large share of IS investments, increase in computing power, and interaction with IS – in the form of PCs, smartphones, tablets, wearables, etc. – takes place today. Senior scholars have highlighted the need to acknowledge the relevance of private contexts for theory building and to redefine the intellectual core of IS. Therefore, we conducted a bibliometric analysis of the entire set of articles (n=737) published in the top IS outlets for the years 1995, 2005, and 2015. The results suggest that the share of articles focusing on the private context is still small, yet, it has quintupled (from 2 to 10 %) in the past twenty years. Moreover, 11% of the articles analyzed investigate topics that involve both professional and private contexts. The findings contribute to the general discussion on boundaries and trends in IS research and serve as motivation in particular for scholars conducting research on the private use of IS.

Keywords: Private IS, Bibliometric Analysis, IS Research Boundaries, Research Context

1 Introduction

In 1975, the computer industry started selling personal computers (PCs) – since then, PCs have conquered households (The-Economist-Online 2012). Almost 35 years later, in 2010, Eurostat found that two thirds of Europeans used a PC at home, compared to only 31% at work (Eurostat 2016). Likewise, Urban et al. (2011) report a 75% ownership rate for desktop computers and 63% for notebook computers in U.S. households in 2010. Over the past decades, "with the development of the Internet and the ubiquity of devices such as smartphones, the volume of information outside the boundaries of the firm has escalated" (Lee 2016, p. 2), and the application of IS has expanded beyond the professional use. In fact, a large share of overall spending, computing power, and interaction with IS – in the form of home PCs, phones, tablets, wearables, smartwatches, smart sensors, etc. – is now taking place in private contexts, and ubiquitous IS are increasingly collecting data on various aspects of our private lives. A growing variety of devices and applications facilitate communication (e.g., via social media), support behavior change (e.g., via fitness, health, and sleep gadgets), optimize resource consumption (with smart meters, thermostats, etc.), and simplify various transactions (e.g. via shopping assistance systems, tax declaration, purchasing of household articles) in our private lives. Practitioners predict an even greater importance of IS in the consumer sector with the increase of connected devices such as cars, smart home

appliances, and wearables (up to 40.9 billion wireless connected devices, see Press (2014)). These developments offer new possibilities for companies to gather customer insights; at the same time, they enable new applications that support individuals in their daily decision-making. Thus, private individuals tend to introduce aspects such as performance and productivity (Lupton 2014) in their private lives.

While IS research has traditionally focused on the use of IS in professional contexts - both within and between organizations (Baskerville 2011a; Beath et al. 2013; Crowston et al. 2010; Glass et al. 2004) - Hess et al. (2014) find that "research questions are shifting more and more towards the use of information and communication technology in physical, real-world everyday environments, that is outside of offices, production halls and warehouses". Prior to that, several scholars have called for more research on the use of IS also in a private context. As Baskerville (2011a, p. 6) points out, the IS community still perceives individuals mostly as "clients, customers, or consumers of the organizational IS". Compared to professional contexts, the role of IS and the circumstances that shape the adoption and usage of those systems are fundamentally different in private contexts (Baskerville 2011b; Brown and Venkatesh 2005). The differentiation of such contexts is also suggested by the distinction of IS as hedonic, mandatory or mixed (Heijden 2004; Middleton et al. 2014; Venkatesh et al. 2012). Thus, while scholars have recognized the relevance of revisiting IS theories and models in the new private context, research is still in its infancy even though IS researchers are "uniquely equipped to deal with the broad transformations […] in a way no other discipline can" (Beath et al. 2013, p. ii). Several IS scholars have pointed out that the IS community still almost exclusively focuses on professional usage (Baskerville 2011b, 2011a; Crowston et al. 2010; Gaß et al. 2015; Glass et al. 2004; Liang and Tanniru 2007). Some literature reviews made the attempt to quantify the professional context by mentioning the part of papers concerning organizational issues within their data sample rather as a side-mark. For example, Glass et al. (2004) note that 2/3 of all observed papers (488 articles from five years) of IS journals fall into a professional context. Likewise, Sidorova et al. (2008), who analyzed 1,615 articles from IS journals from the previous 22 years identify a stable core of IS research, and attribute that core to reside within the professional context. Neither of the two studies covers the private context – both studies distinguish only between professional and societal (non-professional and professional) issues. This ignores the distinction of private and professional contexts suggested by Baskerville (2011a, 2011b) and Crowstone et al. (2010) for example.

While various senior scholars have expressed that the IS community needs to expand its focus to the private context (see related work section), there is little quantitative evidence on whether these calls for actions have spurred more research activities in that domain, and whether articles resulting from such activities have made their way into top IS outlets. Furthermore, it becomes more and more difficult to differentiate private and professional information systems usage, as many new business models involve private individuals (e.g., social communities, open source projects). Overall, we identified three gaps: (1) the need for a comprehensive study on the status quo of IS research that also takes into consideration purely private contexts of IS use, thus challenging and helping to redefine the core and boundaries of IS research, (2) a quantitative trend analysis that investigates whether the expansion of IS to private contexts going on in practice is increasingly reflected in key IS outlets, (3) and the need to incorporate recent research, as several developments regarding private IS uses date only a few years back, including the rise of the Internet of Things and the increasing adoption of wearables. Based on that, we identified the following research questions:

RQ1: To what extent do top IS outlets reflect the trend in practice toward the private use of IS, in comparison to the traditional focus on professional IS usage?

As described above, the line between private and professional contexts is difficult to draw in many cases. Thus, we also investigate:

RQ2: How do private and professional IS use contexts interact or overlap in the IS field and has this changed over the last decades?

Beyond categorization efforts, most bibliometric studies also seek to gather information about the intellectual structure of the IS articles under investigation. This helps to acquire qualitative knowledge, which provides guidance and orientation for scholars and helps them identify research gaps. Questions related

to the intellectual structure encompass different aspects including the research method (Glass et al. 2004), core topics (Sidorova et al. 2008), cumulative tradition and typical authors (Culnan 1987), or journal nationality (Galliers and Meadows 2003). Scholars may benefit from insights on which topics are relevant to the community or under-researched or which journals may be more open to publish articles for a specific context. Thus, we seek to answer the following question:

RQ3: In what way does the intellectual structure of articles on private IS contexts differ from those on professional IS contexts?

For this reason, we chose to undertake a bibliometric analysis. More precisely, we analyze the content of IS articles (title, abstract, keywords, full text if needed) to study which share of articles focuses primarily on private vs. professional contexts. We study the full range of articles published in a defined set of top IS journals for the exemplary years 1995, 2005, and 2015 (amounting to a total of 737 articles). Based on that categorization, we are able to make inferences on the evolution of the share of articles that focus on the private use of IS, as opposed to the traditional focus domain of IS research, i.e. the professional use of IS in settings that in most cases involve organizations. Thus, we contribute to the discussion on the core of IS and the role of IS in the private context. Moreover, we collect metadata on each article to assess general differences in the intellectual structure of those two IS application domains. The results of the study contribute to the general discussion on boundaries and trends in IS research and serve as motivation and orientation in particular for scholars engaged in research on the use of IS in the private context.

The remainder is structured as follows. Section 2 gives an overview on research studying the core of IS as well as the discussion of the private and the professional context. Section 3 describes our methodology with the categorization process and the data set. Section 4 presents the results, which we then discuss and based on which we draw conclusions on the extent how IS research reflects the ubiquity of IS in practice and elaborate on future research.

2 Theoretical Background

2.1 Studying the Core of Information Systems

IS scholars have a long tradition in studying the state of IS research itself, using both qualitative and quantitative instruments to examine the literature. Bibliometric analyses are a well-established quantitative instrument to investigate the so-called intellectual structure of IS research. Analysis encompass studies on core topics (Alavi et al. 1989; Cocosila et al. 2009; Culnan 1986, 1987; Sidorova et al. 2008), diversity and research methods (Chen and Hirschheim 2004; Glass et al. 2004; Grover et al. 1993; Vessey et al. 2002), the evolution of IS research (Baskerville and Myers 2009; DeSanctis 2003), or cumulative research tradition (Farhoomand and Drury 1999; Grover and Lyytinen 2015; Hamilton and Ives 1982). All these efforts of taking a "step back periodically and think[ing] about the research which constitutes a field" (Culnan 1987, p. 341) represents a critical self-evaluation of the discipline that is supposed to legitimize the discipline and shaping its identity (Benbasat and Zmud, 2003; Agarwal and Lucas, 2005; Lyytinen and King, 2004; Wu and Saunders, 2003). Such efforts help to increase innovativeness as well as maturity of the relatively young IS discipline.

There are different perspectives on the intellectual core of IS. The debate on the intellectual structure or core of IS originates from the labour market's need for professional IS talents and the constant questioning of IS researchers engaged in education and teaching guidelines (King and Lyytinen 2006). The studies mentioned above encompass mostly issues for IS used in a professional context (software development, decision support, groupware for virtual teams, or big data concepts for companies). Given the origins of the discipline in an era when most IS applications were costly and specialized systems confined to companies or the military, the focus on Management Information Systems is hardly surprising. Yet, according to Ferstl and Sinz (2013), Tarafdar et al. (2015), as well as Avison and Elliot (2006), the key IS domains and applications are not limited any more to professional contexts. Given the increasing ubiquity of IS and the ongoing digitalization of our private everyday lives, skilled IS professionals need to be aware of the characteristics and key aspects of IS in private contexts.

2.2 Private and Professional Information System Contexts

Even though IS strongly impact our private lives (Petter et al. 2012), most articles analyzing the notion of the research domain and redefining the discipline's boundaries focus on IS in a professional context. Baskerville (2011a) and Crowstone et al. (2010) discuss the boundaries of the IS field and point out that while IS are used "beyond traditional work environments" (Crowston et al. 2010, p. 2), IS scholars have largely ignored the phenomenon so far (Baskerville 2011b, 2011a). Both articles highlight the existence of differences between personal (we use the more specific term private) and professional situations and environments for IS use.

Beyond the application of IS to fulfill economic needs in a professional context, idiosyncratic and social needs of individuals gain in importance especially in the private context (Baskerville 2011a, 2011b). This results in a high variety of products and services. Furthermore, a different societal structure accompanies IS usage. Instead of colleagues and superiors, family and friends become relevant interaction partners. In contrast to professional environments where typically managers decide which systems employees have access to and need to use to carry out their tasks, in the private context, individuals themselves (impacted by this social fabric) voluntarily decide which system to use – or not to use. Moreover, customers do not only generate data, but they collect and process information for their own purposes. Thus, different requirements exist for the management, adoption, and socio-geographic bounds of personal information (Baskerville 2011a, 2011b). For example, Brown and Venkatesh (2005) note that fundamentally different factors shape the acceptance of IS in households than at the workplace (e.g. in terms of interactions or type of tasks). These specific aspects need to be investigated at all levels – not only regarding IS adoption. Notably, within IS adoption research, scholars have started to differentiate volitional/hedonic and mandatory/utilitarian system use (Bhattacherjee et al. 2018; Hartwick and Barki 1994). The distinction is often rooted in the differentiation of system usage by employees for task fulfillment or consumers for leisure-related activities (Heijden 2004; Venkatesh et al. 2012; Xu et al. 2017). However, as Wu and Lu (2013) show, some systems are used for both pleasure and productivity reasons. Still, several scholars consider volitional and mandatory system usage only in organizational contexts (Gerow et al. 2013; Venkatesh et al. 2012; Venkatesh and Davis 2000). Yet, with the increasing relevance of productivity in our private lives (Lupton 2014), the differentiation does not properly distinguish private vs. organizational and productivity vs. pleasure. In addition, IS may infiltrate individuals' lives on another level: They may become a part of an individual's identity (Baskerville 2011a; Yoo 2010). Also, in terms of purchasing power, the private consumer environment differs from contexts of professional IS usage.

Consequently, new models and theories may be necessary to understand the role and potential applications of IS in private contexts and to guide the strategy of practitioners serving these fast-growing markets. We follow Middleton et al. (2014) and Vodanovich et al. (2010) who acknowledge the relevance of specific contexts of use for mobile computing and the IS community in general. Thus, we also use their differentiation of an organizational and private use context. We argue that the IS community needs to more actively address the theory, development, and application of IS also in the private context in order to avoid being marginalized to the declining share of IS spending in the professional context. By embracing the expansion of the IS to private contexts, the discipline - with its unique set of theories and methods - can actively contribute to shaping IS that gain an even larger impact on our private lives.

However, the distinction between private and professional contexts is often blurry and may depend on the lens of analysis. Baskerville (2011a, 2011b) puts IS into context with the overall IS architecture (hardware and software) that one individual uses – both for professional and for private reasons. He defines Individual Information Systems (IIS) as "an activity system in which individual persons, according to idiosyncratic needs and preferences, perform processes and activities using information technology, and other resources to produce informational products and / or services for use by themselves or others"(Baskerville 2011a, p. 1). This perspective, which focuses on the individual, highlights the difficulty to differentiate between private and professional use of IT. Baskerville (2011a) draws an exemplary IIS architecture to explain the complexity of the topic. Even though the focus of Baskerville's (2011a) article seems not to develop a holistic or archetypical architecture, the system description in that article is a helpful framework to differentiate system usage in both contexts. Therefore, we depart from

that framework and expand it (Figure 1). According to Baskerville (2011a), some IIS can be clearly allocated either to the category professional (white part) activity system or to the category personal activity systems (yellow part). Baskerville includes entertainment systems (video on demand and games) and personal communication systems (email, Voice over IP, social networking) in the latter category. By contrast, systems such as shared folders or virtual meeting rooms that increase office productivity and ease communication belong to the professional systems category. Some components, however, are used in both, private and professional contexts. Such systems include computing systems (desktop, laptops, smartphones) and network systems (service providers, access points, firewalls, etc.). Likewise, some office productivity and personal finance systems are also used in both contexts (from office suites to tax software). Due to the increasing usage of systems in private environments, we added home/private productivity systems to Baskerville's (2011a) IIS architecture.

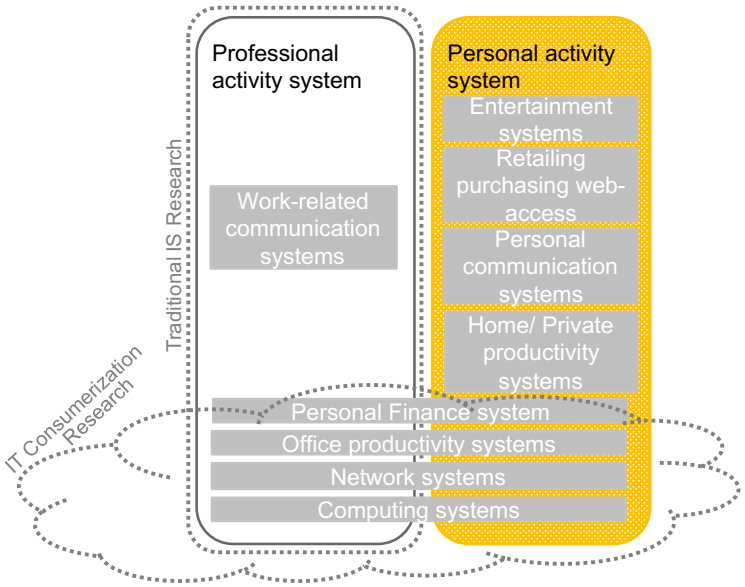


Figure 1. Conceptualization of the Traditional IS Boundaries and Personal Activity System (Inspired from Baskerville (2011a,b))

We incorporated current research streams engaged in the differentiation of professional and personal activity systems in Figure 1: The rectangle with dotted lines depicts the traditional IS research focus that investigates IS usage in the professional domain (Glass et al. 2004; Sidorova et al. 2008). The dotted cloud contains research that takes into consideration personal activity systems, but does not consider the usage of IS in purely private contexts. Those articles mostly focus on topics such as IT Consumerization (which refers to co-usage of privately owned IS for professional reasons (Niehaves et al. 2012)) or consumer centricity (Spottke et al. 2015). So far, it is mainly the HCI community that studies the usage of IS in purely private contexts. In the Personal Informatics domain, they investigate artifacts that help to prepare, collect, integrate, reflect and act upon information such as weight, SMS history, electricity bills, or moods with the goal of raising awareness or inducing behavioral change (Choe et al. 2014; Froehlich et al. 2014; Li et al. 2010, 2011; Pirzadeh et al. 2013).

As Baskerville states, IS has benighted the fact that IS have conquered households and private lives and mostly perceived individuals as "retail consumers" (Baskerville 2011a, p. 7; Vodanovich et al. 2010). By using IS in a private context, obviously, there are also economic gains involved for a company that provides a service or product (e.g. Facebook, Uber) that is used in individuals' everyday lives. So, the research stream of IT consumerization manifests that in the course of increased usage of IS in a private context, it is difficult to differentiate between a private and professional focus of IS systems. This results in blurry boundaries of the IS contexts. In order to get quantitative insights on these effects, the following section describes the methodology of our bibliometric analysis.

3 Methodology

3.1 General Approach and Longitudinal Data Base

Our first goal is to quantify to what extent articles published in leading IS outlets investigate the private use of IS, as opposed to the traditional focus domain of IS research, i.e. the professional use of IS in settings that involve organizations. Given the blurry boundary between the two contexts described above, we also analyze the share of articles that fall into both categories. To that end, we analyze all articles that appeared in a defined set of top IS journals in the exemplary years 1995, 2005, and 2015 (amounting to a total of 737 articles). We evaluate the content of those articles (title, abstract, keywords, full text where necessary) to classify them into different contexts of IS use and assess the share of articles that fall into each category by year and by outlet. The adequate category is mainly defined based on the *type of artefact* and *sample composition of an article* (see Appendix for details and examples). According to the review classification by Paré et al. (2015), we conduct a scoping review that provides an indication of the potential size and nature of the available literature on the use of IS in the private consumer context. More specifically, given the broad scope of this topic, the focus on a clearly defined timeframe, and the comprehensive analysis of all articles published in the community's top outlets, our analysis follows the rationale of a mapping review (Anderson et al. 2008; Paré et al. 2015), notably a bibliometric analysis.

We focused on "top IS publication outlets" (updated but based on the example of Vessey et al. 2002, p. 136), namely the AIS Senior Scholars' Basket of Journals (AIS 2011): EJIS (European Journal of Information Systems), ISJ (Information Systems Journal), ISR (Information Systems Research), JSIS (Journal of Strategic Information Systems), MISQ (Management Information Systems Quarterly), JAIS (Journal of the Association of Information Systems), JIT (Journal of Information Technology), and JMIS (Journal of Management Information Systems).

Proceedings / Journals	Number of all Publications in			Proceedings / Journals	Number of all Publications in		
	1995	2005	2015		1995	2005	2015
ISR	16	29	48	JMIS	41	49	57
JIT	32	21	34	JSIS	30	22	19
EJIS	21	66	41	JAIS	*	14	31
ISJ	22	22	28	MISQ	24	28	42
Total for all:	186	251	300	* = founded in 2000			

Table 1. Overview on the Number of Articles Analyzed. Our Analysis Covers the Entire Set of Articles Published in these Ten Outlets in 1995, 2005, and 2015.

Given our goal of including the full range of articles published in those outlets in a predefined time period, the effort involved in the classification process, and the number of articles that appear every year in these outlets, however, it was necessary to restrict the period of observation. Rather than analyzing two or three consecutive years, we selected three isolated years spread in time as exemplary units of analysis for different periods in time. The year 2015 was chosen due to the goal of having the most recent completed year of publications (from the perspective of the classification project launch in 2016); the year 1995 was chosen due to the comparability with Vessey et al. (2002), whose analysis starts in that year. We added the year 2005 to augment the scope of analysis by an interim observation period that makes it possible to evaluate the focus of the leading IS outlets at ten-year intervals. Table 1 displays the number of articles per year and per journal or conference proceeding.

The general approach of our bibliometric analysis follows Vessey et al. (2002, p. 145), Alavi et al. (1989, p. 364), Sørensen and Landau (2015, p. 162), Grover and Lyytinen (2015, p. 276), Swanson and Ramiller (1993, p. 301), Farhoomad and Drury (1999, p. 4) and is depicted in Figure 2. The recommendations and insights of those six articles guided our approach with the goal to ensure a highly qualitative and objective categorization of the papers. First, a database containing the metadata (including source, title, authors, abstract, and keywords) was created (1) and a preliminary version of coding rules (defining the

categories and explaining the process in an explorative way as discovered from literature – see Appendix) was established (2). Three different raters categorized each the complete data which was organized in three iteration cycles (3). Between the first (3) and second (5), as well as between the second and third (7) round of categorization, the reviewers discussed the categorization based on a validation subsample of articles (steps 4 and 6). We selected the subsample based on the criterion that it should contain the same number of articles from each year and each outlet and randomly selected articles that met those diversity criteria to cover a wide spectrum. This validation step was used to update the coding rules in order to converge to a standardized understanding and process. The validation subsample also served as a training set for the reviewers of the second and third round to ensure data quality. After the completion of the final round of coding the three categorizations of an article were compared (8) and in the case the opinions differ, the researchers review the opinions and may discuss to reach consensus.

Figure 2. General Categorization Approach and Current Status of our Work.

Moreover, we collected additional metadata on each article to develop a better understanding of the intellectual structure of IS research. The metadata include for example, research methods used, continent of the first author's affiliation, and listed keywords per article.

3.2 Categorization Process

The categorization process in each round of coding consists of two to three steps. At first, the rater skims through the metadata (especially title and keywords) to get a first impression of the adequate context and category (step a). This impression may be corroborated or refuted by reading the abstract (step b). In some cases, it is possible to make the categorization based on the metadata and the information in the abstract. In other cases, that information is not enough to determine the category with high confidence. In those cases, it is necessary to include the full text, as recommended by Vessey et al. (2002). In about 50% of the cases, it was necessary to skim at least parts of the full text of the article (step c). Over time, we identified the methodology section as the part of the full text that is most informative for the categorization.

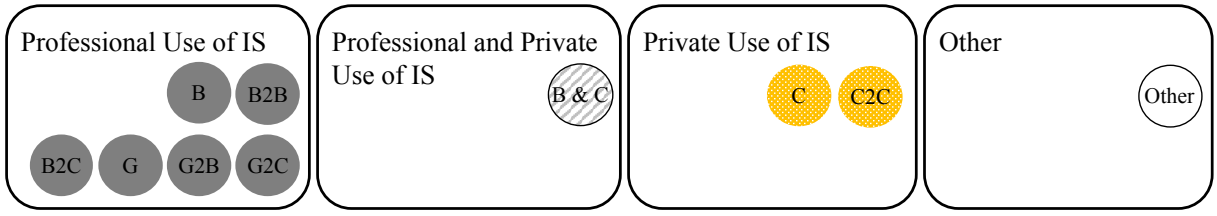


Figure 3. The Four Categories for the Final Analysis and their Subcategories.

As outlined above, the main goal of our bibliometric analysis is to assess the fraction of IS articles at different points in time that focus on the private and/or professional use of IS. The **professional use** category encompasses articles that analyze IS within companies and governments or between those organizations (business-to-business or government-to-business transactions). For example, this involves articles focusing on the design of business-related information systems or technology acceptance from employees. By contrast, the **private use** of IS category includes articles that focus on the use of IS in nonprofessional contexts, for instance the adoption of fitness trackers to monitor workout performance. Throughout the categorization and consensus building process, we came across various articles that could not be attributed exclusively to a single category. For example, articles examining interactions or activities on platforms such as eBay or crowdfunding may not give enough information if the sample or

the function of interest is only used by private or commercial buyers and sellers as well as investors and founders. Additional, articles on social networking sites are difficult to precisely allocate the article to a category when it is unclear if the social networking site is privately used or implemented for organizational networking. When it was obvious that an IS can be used in both contexts and the article lacked information on the sample composition or the type of artefact the article was allocated to the ambiguous context category (**professional and private use** of IS). Finally, the fourth category **other** contains general articles such as instrument development or editorials. All four categories are displayed in Figure 3 and the detailed classification scheme with its subcategories derived from literature is explained in the Appendix.

For the categorization of the research methods, the classification scheme follows Alavi et al. (1989), Chen and Hirschheim (2004), Cheon et al. (1993), Farhoomand and Drury (1999), Holz et al. (2006), Harrison and Wells (2001), Venkatesh et al. (2013). According to Ayanso et al. (2007) we only categorized the research method in one round, as it is a secondary analysis of our bibliometric analysis (in comparison to the contexts).

3.3 Ensuring Validity and Reliability

As a first step, we aimed to improve the validity and reliability of the categorization process by enhancing the categorization guidelines for the subsequent rounds of coding (the final version consists of 25 pages with "easy" and "difficult" classification examples as well as descriptions). For that purpose, we chose a subsample of the data set and compared the categorization of coders and researchers (Kolb 2004).

Then, after having completed the three coding iterations, we undertook final comparisons to ensure inter-rater reliability by calculating Mezzich's Kappa (Ahn and Mezzich 1989; Eccleston et al. 2001; Mezzich et al. 1981). Mezzich's Kappa has evolved from the Cohen's and Fleiss' Kappa in order to evaluate qualitative data analysis with multiple coders and overlapping categories (see the multiple subcategory in Annex 0). The Mezzich's Kappa for our three rounds of categorizations - calculated at the detailed categorization level - is 0.6 (which is considered as good agreement (Kolb 2004)) and highly significant, which confirms that the agreements were not random and that the categorization is reliable.

4 Results

4.1 Trends in Information Systems Research

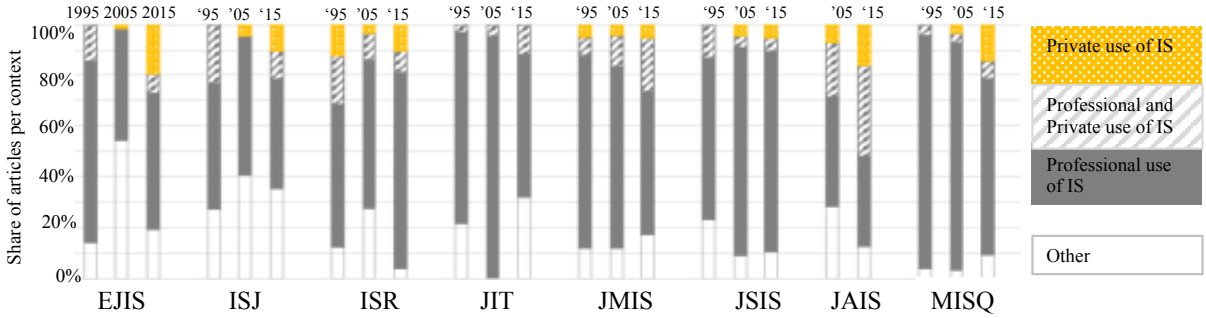


Figure 4. Share of Articles on Private and/or Professional Use of IS (Final Consensus after Three Rounds of Coding).

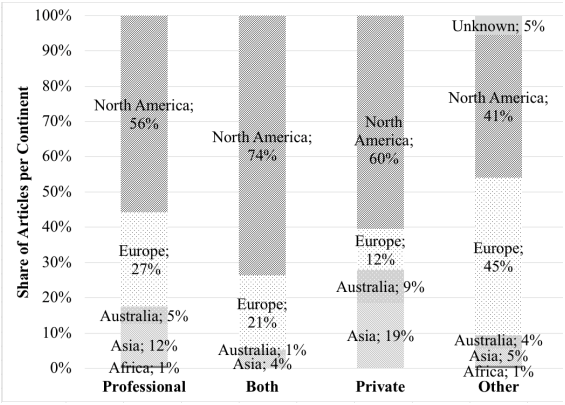
Our results suggest that despite the vast expansion of IS into our private lives in practice, only a small share (average of 5% across all three years) of articles published in top IS outlets is dedicated to the private use of IS. Overall, 67% of the articles analyzed cover purely professional contexts. These numbers are perfectly in line with Glass et al. (2004) who had attributed two thirds of the articles studied in their review to professional contexts. Across all three years, 16% of all papers are classified as "other" (meta-reviews, editorials). 11% could not be allocated to a single context. Our data suggest that the mean

share of ambiguous articles (involving both contexts) has barely changed in the three years analyzed, ranging between 8% and 14%.

As Figure 4 shows, research on the private use of IS has increased since 2005. Both EJIS (20%) and JAIS (16%) had a particularly high share of articles on the private use of IS in 2015. Remarkably, JIT has not published a single paper focusing on the private context in the three years analyzed. Another journal with a very low share or articles on the private use of IS is JSIS – a finding that is not surprising given the professional-related focus of JSIS (Gable 2010).

4.2 Article Nationality and Research Methods

Regarding the analysis of the intellectual structure, we exemplify the analysis of metadata with the continent of the first author's affiliation and employed research methods for space constraints. Additional results from the analysis of keywords (that represent topics of interest) will be summarized in the discussion. As the left part of Figure 5 indicates, the majority of journal and conference articles originate from (first) authors from Europe and North America. Remarkably, the share of North American (60%), Asian (19%) and Australian (9%) authors is disproportionally higher in the private context category than in purely professional contexts (56%, 12%, and 5% respectively). By contrast, European (first) authors, who published almost one third of the articles on professional contexts, only contribute roughly one eighth of the articles that focus on private contexts. While less than 17% of the first authors of all articles (with a professional focus) published originate from Asia and Australia, they jointly contributed almost one third of the papers allocated into the private context category.



Research Method (RM)	Professional	Both	Private	Other
Conceptual	38%	33%	40%	7%
Case Study	18%	2%	3%	2%
Survey	15%	11%	33%	0%
Field Study	6%	0%	1%	1%
Experiment	7%	21%	11%	2%
Field Study (AO)	7%	12%	9%	1%
Other	4%	15%	1%	65%
Literature Review	1%	1%	1%	4%
Opinion	1%	2%	0%	8%
Prototype	1%	1%	0%	1%
Ethnography	1%	1%	1%	0%
Literature Analysis	1%	1%	0%	5%
Action Research,	each 0,4%	each 0%	each 0%	0%, 4%
Grounded Theory, Editorial	each 0,1%	each 0%	each 0%	each 0%
n (total number of used RM)	**730**	**123**	**80**	**169**

Figure 5. Share of Articles per Continent of Origin from Articles per Usage Context and Share of Employed Research Methods per Usage Context.

Concerning the employed research methods, articles generally used one up to four research methods. We analyzed the complete number of used research methods (1076), which is greater than the number of articles analyzed. The most common research methods for the complete data set are the following: conceptual method (developing models or frameworks), other (which comprises book reviews, editorials, errata, or instrument developments), case study, survey, experiment and field studies (relating to classic observations in the real-world or automatic observations e.g. in twitter or Facebook data). Almost 80% of all articles who used a conceptual method at first also combined it with an empirical research method (survey, case study, field study, ethnography, etc.). When comparing the used methods within the categories (see Figure 5 right part), it becomes clear that the part of case studies is much smaller in the multiple and the private category. On the contrary, the most common research methods within the professional context are the following: conceptual method, case study, and survey. Especially in the private category scholars mostly use experiments instead of case studies. There is less qualitative and non-empirical research such as opinions, other methods (i.e. construct development, theories etc.), or ethnographies. Analyzing the use of research approach (qualitative vs. quantitative) and strategy (empirical vs. non-empirical) reveals that in the multiple category 32% of all articles only use pure non-empirical research methods. In the private context only 5% of all articles use exclusively non-empirical

research methods in comparison to 22% in the professional context. Purely qualitative research is greater in the organizational context (52%) than in the private context (14%), where more mixed methods are applied (67%).

5 Discussion and Conclusion

5.1 Contributions, Implications, and Outlook

Based on a bibliometric analysis of all 737 articles published in top IS journals and conferences in the exemplary years 1995, 2005, and 2015, this article analyzes to what extent top IS outlets reflect the expansion of IS use to the private consumer context in the past two decades. In particular, we create a comprehensive analysis by outlet and year of the share of articles on private contexts, as opposed to professional contexts, ambiguous articles that concern both contexts, and other articles. Our results extend, complement, and update previous studies on the status quo of IS research (Gaß et al. 2015; Glass et al. 2004; Sidorova et al. 2008) by investigating private contexts as a distinct category and by exploring the ambiguous context of many articles. Our data set enables us to analyze recent trends for both contexts and to investigate differences in the intellectual structure of the categories.

Our findings (RQ1) provide quantitative support for the observations of senior IS scholars concerning the limited research in IS in the private context (Baskerville 2011a, 2011b; Crowston et al. 2010; Gaß et al. 2015; Glass et al. 2004; Liang and Tanniru 2007). Several scholars have actively called for more IS research concerned for instance with new challenges due to Web 2.0, ubiquitous computing, and social networks in order to support the mission of IS "to improve our individual and collective lives by making the best possible use of available technologies" (Stahl 2012, p. 209, Vodanovich et al. 2010). At the same time, our results suggest that their calls may have borne fruit: from 1995 to 2015, we find a strong growth in the share of articles on IS in the private usage context: the mean share of articles covering private use of IS in 1995 is almost nonexistent with 2%, but grew to 10% in 2015. Still, this modest share does not seem to properly reflect the high rate of diffusion of IS in the private context (PC and smartphone usage). The share of articles from the purely professional context decreased from 72% in 1995 to 60% in 2015, which calls the stability of the professional core of IS (Sidorova et al. 2008) into question. Our results also highlight that more than one tenth of the articles analyzed ambiguously affect both professional and private contexts (RQ2). This number is more or less stable over the years. Interestingly, the ambiguous category increases for JIT, JMIS and JAIS, but decreases for EJIS, ISJ, ISR, JSIS. Especially JAIS published a large share of articles that belong to ambiguous contexts (over one third in 2015). Beyond that, we provide insights on the intellectual structure of each category, for instance on the geographic origin of the article (first author's affiliation), prevalent topics (keywords), and research methods (RQ3). When analyzing the keywords of the journal articles, we observed that the keyword *social media* (which was listed in 13 articles in 2015 and is one of the most often used keywords in our data set) appeared only in the sample of 2015 but not at all in 1995 and 2005. The same applies to the keywords *healthcare* (seven listings in 2015) and *information security* (six listings). Conversely, the keyword *business process reengineering* (six listings) was used only in the 1995 sample. Moreover, the results of our keyword analysis reveal that while *social media* appeared only in 2015, it is used in both, purely private and professional contexts. Our analysis of the geographic region suggests that authors from Asia-Pacific and North America are more on the forefront of IS used in purely private contexts, whereas Europeans seem to focus more on traditional IS research in professional contexts. One possible explanation might be the fact that North America and Asia are the biggest markets for privately used technologies such as fitness trackers (Lincoln 2018) and that Europeans are more reluctant to adopt tracking devices due to privacy concerns (Dogruel 2018). These tendencies could also influence scholars' research endeavors. The strong North American dominance within private IS research might also originate from the fact that European IS research is more focused on the discipline's original set of topics relating to IS management issues (management information systems) (Dwivedi et al. 2008).

Our analysis contributes to "identity construction within the IS discipline" (Sidorova et al. 2008, p. 468) by investigating contexts of IS and their evolution over time. We follow Galliers et al. (2012) and take

a critical standpoint to assess the nature of the discipline, examining to what extent the increasing ubiquity of IS in our daily lives is reflected in the top outlets of the community. We go beyond the typical differentiations (volitional/mandatory IS) and distinguish the context. Thus, our work contributes to the discussion about boundaries or the legitimization of IS (Agarwal and Lucas 2005; Benbasat and Zmud 2003) and offers a new angle on the boundaries of IS research. This may offer "another perspective of IS, which accepts a fluid and contingent notion" (Bernroider et al. 2013, p. 75) that takes into account the increasing relevance of psychology and social science within IS research.

Our bibliometric analysis extends previous attempts from scholars towards quantifying the extent of purely professional research within IS research (Gaß et al. 2015; Glass et al. 2004; Sidorova et al. 2008). However, we do not focus on the unit of analysis, but on the context, as suggested by Middleton et al. (2014), Tarafdar et al. (2015), and Vodanovich et al. (2010). Our research also contributes to research on geographic differences in IS research (Bernroider et al. 2013; Córdoba et al. 2012) with a new perspective regarding the different contexts.

Our analysis of research methods suggests that there is little qualitative and non-empirical research. This supports the results of other scholars who have observed the dominance of empirical and quantitative (positivist) research (Chen and Hirschheim 2004; Córdoba et al. 2012; Dwivedi and Kuljis 2008; Paré et al. 2015; Rowe 2012) and who called for more non-empirical research to ensure heterogeneity and to validate insights with a more holistic perspective.

Finally, our analysis is of strategic relevance for practitioners and academics who should "deal with emerging technologies likely to have strategic impact" (Gable 2010, p. 7; Galliers et al. 2012). As Lee (2016, p. 2) states, "the IT strategy outside of a company is also critical, as it relates to public policy". In this sense, he calls for more research on the impact of "IT strategy on society, and vice versa". For example, the use of IS in the private context may impact topics such as business models (value propositions), business processes, innovation (Maglio 2015; Medina-Borja 2015), IT management, or performance within the firm (Baskerville 2011b). Our findings can encourage other scholars to engage in research on the private use of IS, for instance emerging technologies such as "embedded systems, mobile applications, "smart" infrastructures, […] augmented reality, or robotics" that support "social activity, leisure, community, and nation building" (Beath et al. 2013, p. ii). Moreover, our insights help scholars to make an informed choice towards a target journal for the dissemination of their work and editors may reconsider their acceptance or review guidelines with our quantitative information at hand (depending on a journals' aims and visions).

5.2 Limitations

The results of our bibliometric analysis are subject to the choice and definition of the categorization scheme used and the categorization process itself (coder subjectivity). We aimed to increase objectivity by following an iterative process. First, we applied a categorization scheme derived from literature. Second, we seek to minimize the risk of coder subjectivity by carrying out three rounds of categorization (as also applied by Alavi et al. 1989). Third, we seek consensus through discussion of the cases where the categorization results of different coders did not match, and fourth, we established categorization guidelines based on the discussions in early stages of the process. In those discussions, we made efforts to systematically reduce the uncertainty concerning the context of a paper. We identified the methodology section as the most reliable part to infer the context of a paper: In the introduction, discussion, and conclusion section, many authors tend to place their research results (often originating from a specific issue or field of application) within a greater picture or to generalize them. This implies that these sections contain many aspects and key words that are potentially misleading. Thus, we chose to base the categorization on the methodology section, especially the level of analysis (sample composition, artefact). The level of analysis describes the exact context of the research results, which makes it much easier to understand the scope of analysis and increases interrater reliability.

Another limitation is the fact that we focus on a subset of leading IS journals and conferences. We cannot rule out that the results in other IS outlets are different. The focus on top IS outlets for bibliometric analysis is not unusual and follows the reasoning of other scholars (Vessey et al. 2002). Finally, we

cannot be sure that the three years selected for the analysis (1995, 2005, and 2015) are representative for the years in between. We cannot rule out that special issues or specific conference themes have affected the results of the particular years under investigation. However, the results are similar for conference and journal articles. Given the longer lead-time for journal publications, it is unlikely that the results are biased by a topic trending in a particular year at a particular conference, which suggests that the chosen years are a good indicator for that period in time. The selection of three years represents a limitation of the study design but as well a trade-off concerning the sample size in favour of including a variety of outlets (Basket of Eight and Conferences). Other studies' samples range between 96 and 2,098 articles and only cover one year or a shorter period of time than our study and less outlets (Ayanso et al. 2007; Chen and Hirschheim 2004; Farhoomand and Drury 1999; Vessey et al. 2002).

5.3 Outlook

As future research, we are exploring the possibility of teaming up with machine learning researchers to explore to what extent the cumbersome manual categorization process could be automated based on a set of training data (e.g. using text mining or semantic content analysis). Not only would this eliminate the risk of individual coder subjectivity (by applying a consistent set of rules to all articles), but also allow – at almost no additional effort - to a coder the years between 1995, 2005, and 2015. Yet, based on our experience as and with human coders, the categorization process can be complex: due to the professional focus of the discipline, most articles – including those that focus on private IS for - depart from business-related problems in the abstract or motivation. This represented a challenge for human coders and may be misleading in a machine learning approach as well.

References

Abramova, O., Shanvanova, T., Fuhrer, A., Krasnova, H., and Buxmann, P. (2015). "Understanding the Sharing Economy: The Role of Response to negative Reviews in the Peer-To-Peer Accommodation Sharing Network." In: *Proceedings of the European Conference on Information Systems*. Ed. by J. Becker, J. vom Brocke, and M. de Marco. Münster: Germany, pp. 1–16.

Agarwal, R., and Lucas, H. C. (2005). "The Information Systems Identity Crisis: Focusing on High-Visibility and High-Impact Research." *MIS Quarterly* 29 (3), 381–398.

Ahn, C. W., and Mezzich, J. E. (1989). "PROPOV-K: A FORTRAN Program for Computing a Kappa Coefficient Using a Proportional Overlap Procedure." *Computers and Biomedical Research* 22 (5), 415–423.

AIS, Members of the College of Senior Scholars (2011). *Senior Scholars' Basket of Journals*, http://aisnet.org/?SeniorScholarBasket (visited on 03/12/2016).

Alavi, M., Carlson, P., and Brooke, G. (1989). "The Ecology of MIS Research: A Twenty Year Status Review." In: *Proceedings of the International Conference on Information Systems*. Ed. by J. DeGross, J. C. Henderson, and B. R. Konsynski. Boston: USA, pp. 363–375.

Anderson, S., Allen, P., Peckham, S., and Goodwin, N. (2008). "Asking the right questions: Scoping studies in the commissioning of research on the organisation and delivery of health services." *Health Research Policy and Systems* 6 (7), 1–12.

Avison, D., and Elliot, S. (2006). "Scoping the Discipline of Information Systems." In: *Information Systems - The State of the Field*, Ed. by J. L. King and K. Lyytinen, Chichester: John Wiley, pp. 3–18.

Ayanso, A., Lertwachara, K., and Vachon, F. (2007). "Diversity or Identity Crisis? An Examination of Leading IS Journals." *Communications of AIS* (20), 660–680.

Baskerville, R. (2011a). "Design Theorizing Individual Information Systems." In: *15th Proceedings of the Pacific Asia Conference on Information Systems*. Brisbane: Australia, pp. 1–13.

Baskerville, R. (2011b). "Individual information systems as a research arena." *European Journal of Information Systems* 20 (3), 251–254.

Baskerville, R., and Myers, M. D. (2009). "Fashion Waves in Information Systems Research and Practice." *MIS Quarterly* 33 (4), 647–662.

Beath, C., Berente, N., and Gallivan, M. J. (2013). "Introduction to the Special Issue." *Journal of the Association for Information Systems* 14 (4), i-xvi.

Benbasat, I., and Zmud, R. W. (2003). "The Identity Crisis Within The IS Discipline : Defining And Communicating The Discipline's Core Properties." *MIS Quarterly* 27 (2), 183–194.

Bernroider, E. W. N., Pilkington, A., and Córdoba, J. R. (2013). "Research in information systems: A study of diversity and inter-disciplinary discourse in the AIS basket journals between 1995 and 2011." *Journal of Information Technology* 28 (1), 74–89.

Bhattacherjee, A., Davis, C. J., Connolly, A. J., and Hikmet, N. (2018). "User response to mandatory IT use: a Coping Theory perspective." *European Journal of Information Systems*, Forthcoming.

Brown, S. A., and Venkatesh, V. (2005). "Model of Adoption of Technology in Households: A Baseline Model Test and Extension Incorporating Life Cycle Household." *MIS Quaterly* 29 (3), 399–426.

Carter, L., and Bélanger, F. (2005). "The utilization of e-government services: Citizen trust, innovation and acceptance factors." *Information Systems Journal* 15 (1), 5–25.

Chen, W., and Hirschheim, R. (2004). "A paradigmatic and methodological examination of information systems research from from 1991 to 2001." *Information Systems Journal* 14 (3), 197–235.

Cheon, M. J., Groven, V., and Sabherwal, R. (1993). "The evolution of empirical research in IS." *Information & Management* 24 (3), 107–119.

Choe, E. K., Lee, N. B., Lee, B., Pratt, W., and Kientz, J. A. (2014). "Understanding Quantified-Selfers' Practices in Collecting and Exploring Personal Data." In: *Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems*. Toronto: Canada, pp. 1143–1152.

Cocosila, M., Serenko, A., and Turel, O. (2009). "A Scientometric Study of Information Systems Conferences : Exploring ICIS, PACIS and ASAC." In: *Proceedings of the Americas Conference on Information Systems*. San Francisco: California, pp. 1–10.

Córdoba, J. R., Pilkington, A., and Bernroider, E. W. N. (2012). "Information systems as a discipline in the making: Comparing EJIS and MISQ between 1995 and 2008." *European Journal of Information Systems* 21 (5), 479–495.

Crowston, K., Fitzgerald, B., Gloor, P., Schultze, U., and Schultze, U. (2010). "Shifting boundaries: How should IS Researchers Study Non-Organizational Uses of ICT?" In: *Proceedings of the International Conference on Information Systems*. Ed. by D. F. Galletta and T.-P. Liang. Shanghai: China, pp. 1–5.

Culnan, M. J. (1986). "The Intellectual Development of Management Information Systems, 1972-1982 : A Co-Citation Analysis." *Management Science* 32 (2), 156–172.

Culnan, M. J. (1987). "Mapping the of MIS, 1980-1985 : A Co-Citation Analysis." *MIS Quarterly* 11 (3), 341–353.

Datta, P. (2011). "A Preliminary Study of Ecommerce Adoption in Developing Countries", *Information Systems Journal* (21), 3–32.

DeSanctis, G. (2003). "The Social Life of Information Systems Research ∗ A Response to Benbasat and Zmud's Call for Returning to the IT Artifact The IS Community of Practice." *Journal of the Association of Information Systems* 4 (7), 360–376.

Dogruel, L. (2018). "Privacy nudges as policy interventions: comparing US and German media users' evaluation of information privacy nudges." *Information, Communication & Society*, Forthcoming.

Dwivedi, Y. K., and Kuljis, J. (2008). "Profile of IS research published in the European Journal of Information Systems", *European Journal of Information Systems* 17 (6), 678–693.

Dwivedi, Y. K., Williams, M. D., and Venkatesh, V. (2008). "Guest Editorial: A profile of adoption of Information & Communication Technologies (ICT) research in the household context." *Information Systems Frontiers* 10 (4), 385–390.

Eccleston, P., Werneke, U., Armon, K., Stephenson, T., and MacFaul, R. (2001). "Accounting for overlap? An application of Mezzich's Kappa Statistic to Test Interrater Reliability of Interview Data on Parental Accident and Emergency Attendance." *Journal of Advanced Nursing* 33 (6), 784–790.

Etudo, U., and Yoon, V. (2015). "Leveraging XBRL Calculation Linkbases to Overcome Semantic Heterogeneity across XBRL Fillings : The Multi-Ontology Multi-Concept Matrix (M3)." In: *Proceedings of the International Conference on Information Systems*. Fort Worth: USA, pp. 1–15.

Eurostat (2016). *Digital Economy and Society*. http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database?p_p_id=NavTreeportletprod_WAR_NavTreeportletprod_INSTANCE_pgrsK5zx6I84&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column2&p_p_col_count=1 (visited on 02/12/2016).

Farhoomand, A. F., and Drury, D. H. (1999). "A Historiographical Examination of Information Systems." *Commnications of the AIS* 1 (19), 1–27.

Ferstl, O. K., and Sinz, E. J. (2013). *Grundlagen der Wirtschaftsinformatik*. 7th Edition. München: Oldenourg Wissenschaftsverlag.

Froehlich, J., Kay, M., Larsen, J. E., and Thomaz, E. (2014). "Disasters in Personal Informatics: The Unpublished Stories of Failure and Lessons Learned - Workshop on Personal Informatics." In: *Proceedings of the ACM International Joint Conference on Pervasive and Ubiquitous Computing*. Seattle: USA, pp. 673–678.

Gable, G. (2010). "Journal of Strategic Information Systems Strategic information Systems Research : An Archival Analysis." *Journal of Strategic Information Systems* 19 (1), 3–16.

Galliers, R. D., Jarvenpaa, S. L., Chan, Y. E., and Lyytinen, K. (2012). "Strategic information systems : Reflections and prospectives." *Journal of Strategic Information Systems* 21 (2), 85–90.

Galliers, R. D., and Meadows, M. (2003). "A Discipline Divided: Globalization and Parochialism in Information Systems." *Commnications of the AIS* (11), 108–117.

Gaß, O., Ortbach, K., Kretzer, M., and Maedche, A. (2015). "Conceptualizing Individualization in Information Systems – A Literature Review." *Commnications of the AIS* 37 (3), 64–88.

Gerow, J. E., Ayyagari, R., Thatcher, J. B., and Roth, P. L. (2013). "Can we have fun @ work? the role of intrinsic motivation for utilitarian systems." *European Journal of Information Systems* 22 (3), 360–380.

Glass, R., Ramesh, V., and Vessey, I. (2004). "An Analysis of Research in Computing Disciplines."

Communications of the ACM - Wireless sensor networks 47 (6), 89–94.
Grover, V., Lee, C. C., and Durand, D. (1993). "Analyzing Methodological Rigor of MIS Survey Research from 1980-1989." *Information & Management* 24 (6), 305–317.
Grover, V., and Lyytinen, K. (2015). "New State of Play in Information Systems Research: The Push to the Edges." *MIS Quarterly* 39 (2), 271–296.
Hamilton, S., and Ives, B. (1982). "Knowledge Utilization Among MIS Researchers." *MIS Quarterly* 6 (4), 61–77.
Harrison, R., and Wells, M. (2001). "A Meta-analysis of Multidisciplinary Research." *Empirical Software Engineering* 5 (3), pp. 1–15.
Hartwick, J., and Barki, H. (1994). "Explaining the Role of User Participation in Information System Use." *Management Science* 40 (4), 440–465.
Heijden, H. van der (2004). "User Acceptance of Hedonic Information Systems." *MIS Quarterly* 28 (4), 695–704.
Hess, T., Legner, C., Esswein, W., Maaß, W., Matt, C., Österle, H., Schlieter, H., Richter, P., and Zarnekow, R. (2014). "Digital Life as a Topic of Business and Information Systems Engineering?" *Business & Information Systems Engineering* 6 (4), 247–253.
Hoehle, H., Zhang, X., and Venkatesh, V. (2015). "An espoused cultural perspective to understand continued intention to use mobile applications: A four-country study of mobile social media application usability." *European Journal of Information Systems* 24 (3), 337–359.
Holgersson, J., Alenljung, B., and Söderström, E. (2015). "User Participation at a Discount - Exploring the Use and Reuse of Personas in Public E-service Development." In: *Proceedings of the European Conference on Information Systems*. Ed. by J. Becker, J. vom Brocke, and M. de Marco. Münster: Germany, p. 30.
Holz, H. J., Applin, A., Joyce, D., Purchase, H., Reed, C., and Haberman, B. (2006). "Research Methods in Computing : What are they, and how should we teach them?" *ACM SIGCSE Bulleting* 38 (4), 96–114.
Huang, S., and DeSanctis, G. (2005). "Mobilizing informational social capital in cyber space: Online social network structural properties and knowledge sharing." In: *Proceedings of the International Conference on Information Systems*. Las Vegas: USA, pp. 207–219.
Kaba, B. (2015). "Heterogeneous Reactions to Digital Opportunities : a Field Study to Test our Assumptions." In: *Proceedings of the International Conference on Information Systems*. Fort Worth: USA, pp. 1–16.
Kim, K. K., Umanath, N. S., and Kim, B. H. (2005). "An Assessment of Electronic Information Transfer in B2B Supply-Channel Relationships." *Journal of Management Information Systems* 22 (3), 293–320.
King, J. L., and Lyytinen, K. (2006). "The Future of the IS Field: Drawing Directions from Multiple Maps" In: *Information Systems - The State of the Field*, Ed. by J. L. King and K. Lyytinen, Chichester: John Wiley, pp. 345–354.
Kolb, S. (2004). "Verlässlichkeit von Inhaltsanalysedaten - Reliabilitätstest, Errechnen und Interpretieren von Reliabilitätskoeffizienten für mehr als zwei Codierer." *Medien und Kommunikationswissenschaft* 52 (3), 335–354.
Lee, J. K. (2016). "Invited Commentary: Reflections on ICT-enabled Bright Society Research." *Information Systems Research* 27 (1), 1–5.
Li, I., Dey, A., and Forlizzi, J. (2010). "A Stage-Based Model of Personal Informatics Systems." In: *Proceedings of the 28th International Conference on Human Factors in Computing Systems CHI 10*. New York: USA, pp. 557–566.
Li, I., Dey, A. K., and Forlizzi, J. (2011). "Understanding My Data, Myself: Supporting Self-Reflection with Ubicomp Technologies." In: *Proceedings of 13th International Conference on Ubiquitous Computing (UbiComp)*. Beijing: China, pp. 1–10.
Liang, T.-P., and Tanniru, M. (2007). "Special Section : Customer-Centric Information Systems Special Section : Customer-Centric Information Systems." *Journal of Management Information Systems* 23 (3), 9–15.
Lincoln, C. (2018). *Wearables in MedTech: Past, present and future*, *Source Book, Byers Guide*,

https://www.medteceurope.com/wearables-medtech-past-present-and-future (visited on 04/17/2018).

Lupton, D. (2014). "Self-tracking Cultures : Towards a Sociology of Personal Informatics." In: *OzCHI '14 : Proceedings of the 26th Australian Computer-Human Interaction Conference: Designing Futures, the Future of Design.* Sydney: Australia, pp. 1–10.

Lyytinen, K., and King, J. L. (2004). "Nothing At The Center?: Academic Legitimacy in the Information Systems Field." *Journal of the Association for Information Systems* 5 (6), 220–246.

Maglio, P. P. (2015). "Editorial — Smart Service Systems, Human-Centered Service Systems, and the Mission of Service Science." *Service Science* 7 (2), ii–iii.

Malhotra, A., Gosain, S., and El Sawy, O. E. (2005). "Absorptive Capacity Configurations in Supply Chains: Gearing for Partner-Enabled Market Knowledge Creation." *MIS Quarterly* 29 (1), 145–187.

Medina-Borja, A. (2015). "Editorial Column - Smart Things as Service Providers : A Call for Convergence of Disciplines to Build a Research Agenda for the Service Systems of the Future." *Service Science* 7 (1), ii–v.

Mezzich, J. E., Kraemer, H. C., Worthington, D. R. L., and Coffmann, G. A. (1981). "Assessment of Agreement among Several raters Formulating Multiple Diagnoses." *Journal of Psychiatric Research* (16), 29–39.

Middleton, C., Scheepers, R., and Tuunainen, V. K. (2014). "When mobile is the norm: Researching mobile information systems and mobility as post-adoption phenomena." *European Journal of Information Systems* 23 (5), 503–512.

Nemat, R. (2011). "Taking a Look at Different Types of E-Commerce." *World Applied Programming* 1 (2), 100–104.

Niehaves, B., Köffer, S., Ortbach, K., and Katschewitz, S. (2012). *Towards an IT Consumerization Theory: A Theory and Practice Review*. ERCIS Working Paper, No. 13, Münster, Germany.

Olivera, L. C. B., and Joia, L. A. (2005). "A Model for Evaluating B2C eCommerce Websites : Application in the CD eRetailing Industry in Brazil." In *Proceedings of the European Conference on Information Systems*. Ed. by D. Bartmann, F. Rajola, J. Kallinikos, D. E. Avison, R. Winter, P. Ein-Dor, J. Becker, F. Bodendorf, and C. Weinhardt , Regensburg: Germany, pp. 1–13.

Paré, G., Trudel, M. C., Jaana, M., and Kitsiou, S. (2015). "Synthesizing Information Systems Knowledge: A Typology of Literature Reviews." *Information and Management* 52 (2), 183–199.

Petter, S., Delone, W., and Mclean, E. R. (2012). "The Past, Present, and Future of "IS Success"." *Journal of the Association for Information Systems* 13 (5), 341–362.

Pirzadeh, A., He, L., and Stolterman, E. (2013). "Personal Informatics and Reflection: A Critical Examination of the Nature of Reflection." In: *CHI'13 Extended Abstracts on Human Factors in Computing Systems.* Paris: France, pp. 1979–1988.

Press, G. (2014). *Internet of Things By The Numbers: Market Estimates And Forecasts*, *Forbes*, http://www.forbes.com/sites/gilpress/2014/08/22/internet-of-things-by-the-numbers-market-estimates-and-forecasts/#194977472dc9 (visited on 01/12/2016).

Rose, J., Persson, J. S., Heeager, L. T., and Irani, Z. (2015). "Managing e-Government: Value positions and relationships." *Information Systems Journal* 25 (5), 531–571.

Rowe, F. (2012). "Toward a richer diversity of genres in information systems research: New categorization and guidelines." *European Journal of Information Systems* 21 (5), 469–478.

Sidorova, A., Evangelopoulos, N., Valacich, J. S., and Ramakrishnan, T. (2008). "Uncovering the Intellectual Core of the Information Systems Discipline." *MIS Quarterly* 23 (3), 467–482.

Sørensen, C., and Landau, J. S. (2015). "Academic Agility in Digital Innovation Research : The Case of Mobile ICT Publications within Information Systems 2000-2014." *Journal of Strategic Information Systems* (24), 158–170.

Sourenkova, T., and Louvieris, P. (2005). "IT Outsourcing in Tourism Businesses in the UK: Decision-making Approach." In: *Proceedings of the European Conference on Information Systems*. Ed. by D. Bartmann, F. Rajola, J. Kallinikos, D. E. Avison, R. Winter, P. Ein-Dor, J. Becker, F. Bodendorf, and C. Weinhardt. Regensburg: Germany, pp. 1–12.

Spottke, B., Wulf, J., and Brenner, W. (2015). "Consumer-Centric Information Systems : A Literature Review and Avenues for Further Research." In: *Proceedings of the International Conference on*

Information Systems. Ed. by T. Carte, A. Heinzl, and C. Urquhart, Fort Worth: USA, pp. 1–12.
Stahl, B. C. (2012). "Responsible Research and Innovation in Information Systems." *European Journal of Information Systems* (21), 207–211.
Swanson, B., and Ramiller, N. C. (1993). "Information Systems Research Thematics: Submissions to a New Journal, 1987-1992." *Information Systems Research* 4 (4), 299–330.
Tarafdar, M., Gupta, A., and Turel, O. (2015). "Special issue on "dark side of information technology use": An introduction and a frame- work for research." *Information Systems Journal* 25 (3), 161–170.
The-Economist-Online (2012). *Platform wars - A history of personal computing*, http://www.economist.com/blogs/graphicdetail/2012/02/daily-chart-13 (visited on 03/12/2016).
Tung, L. L., and Rieck, O. (2005). "Adoption of electronic government services among business organizations in Singapore." *Journal of Strategic Information Systems* 14 (4), 417–440.
Urban, B., Tiefenbeck, V., and Roth, K. (2011). "Energy Consumption of Consumer Electronics in US Homes in 2010." Final Report ro the Consumer Electronics Association. Cambridge: USA.
Venkatesh, V., Brown, S. A., and Bala, H. (2013). "Bridging the Qualitative-Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems." *MIS Quarterly* 37 (3), 855–879.
Venkatesh, V., and Davis, F. D. (2000). "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies." *Management Science* 46 (2), 186–204.
Venkatesh, V., Thong, J. Y. L., and Xu, X. (2012). "Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology." *MIS Quarterly* 36 (1), pp. 157–178.
Vessey, I., Ramesh, V., and Glass, R. L. (2002). "Research in Information Systems: An Empirical Study of Diversity in the Discipline and Its Journals." *Journal of Management Information Systems* 19 (2), 129–174.
Vodanovich, S., Sundaram, D., and Myers, M. (2010). "Digital natives and ubiquitous information systems." *Information Systems Research* 21 (4), 711–723.
Whinston, A., Hämäläinen, M., Garriott, R., Lui, D., and Geng, X. (2005). "Interactive Digital Entertainment : A New Direction for Information Systems Research." In: *Proceedings of the International Conference on Information Systems*. Ed. by D. Bartmann, F. Rajola, J. Kallinikos, D. E. Avison, R. Winter, P. Ein-Dor, J. Becker, F. Bodendorf, and C. Weinhardt. Regensburg: Germany, pp. 975–977.
Wu, J., and Lu, X. (2013). "Effects of Extrinsic and Intrinsic Motivators on Using Utilitarian, Hedonic, and Dual-Purposed Information Systems: A Meta-Analysis." *Journal of the Association for Information Systems* 14 (3), 153–191.
Wu, S. P., Straub, D. W., and Liang, T. (2015). "How Information Technology Governance Mechanisms and Strategic Alignment Influence Organizational Performance: Insights from a Matched Survey of Busienss and IT Managers." *MIS Quarterly* 39 (2), 497–518.
Wu, Y. A., and Saunders, C. (2003). "The IS Core – VI: Further Along the Road to the IT Artifact." *Communications of the AIS* 12 (36), 562–567.
Xu, J. (David), Abdinnour, S., and Chaparro, B. (2017). "An Integrated Temporal Model of Belief and Attitude Change: An Empirical Test With the iPad." *Journal of the Association for Information Systems* 18 (2), 113–140.
Yi, C., Jiang, Z. J., and Benbasat, I. (2015). "Enticing and engaging consumers via online product presentations: The effects of restricted interaction design." *Journal of Management Information Systems* 31 (4), 213–242.
Yoo, Y. (2010). "Computing in Everyday Life: A Call for Research on Experiential Computing." *MIS Quarterly* 34 (2), 213–231.
Zhu, S., Tripathi, A., and Zhong, W. (2015). "How Do B2B Patterns Shape IOS Application Capabilities - The Moderating Effect on IT Capability Building." In: *Proceedings of the European Conference on Information Systems*. Ed. by J. Becker, J. vom Brocke, and M. de Marco. Münster: Germany, pp. 1–12.

Appendix: Detailed Categorization

We depart from the three major IS domains distinguished by Ferstl and Sinz (2013) and Avison and Elliot (2006): IS in businesses, in public authorities, and in households. This is also related to distinction suggested by Wu and Lu (2013, p. 155) for IS adoption research who distinguish that (1) hedonic IS are used at "home for fun and relaxation" and (2) utilitarian IS are "used in a work or education environment to improve job or school performance". Research related to IS topics within one of these three domains defines the first three subcategories: IS usage for professional reasons (B), IS within a governmental context (G), and private IS for consumers (C). Yet, in many cases, IS research investigates relations between those entities, e.g., between two or more companies (B2B), between companies and consumers (B2C), etc. This lens of categorization has been adopted by many scholars for instance in the e-commerce context: Datta (2011), Kim et al. (2005), Olivera and Joia (2005), Whinston (2005), Zhu et al. (2015). This leads us to eight different subcategories that contain the major entities (B, C, G) or interactions between them related to IS usage. In addition, we created the category "other" that contains for instance meta-studies on research in the IS discipline or editorials (as this paper). In line with Alavi et al. (1989), in the case the reviewers could not assign an article to a single category, they also had the possibility to assign it to more than one subcategory (called multiples). A special rule was introduced for articles on e-health / healthcare services and for articles on e-learning: depending on the country, e-health / healthcare services and education services may be provided by the state or by corporate organizations. Going into the country-specific legislation details would be beyond the scope of our analysis; for the sake of simplicity, those articles were allocated to both G2C and B2C. Table 2 presents the different categories, descriptions, and an exemplary article. The adequate subcategory is mainly defined based on the *type of artefact* and *sample composition*: regarding the artefact, an article on an Enterprise Resource Planning system is assigned to the professional category, whereas articles on virtual social worlds or fitness trackers are more likely to cover aspects of private IS usage. The sample studied serves as another indicator, with managers and employees representing the professional world, in contrast to private individuals like gamers or elderly residents.

Category	Description and explanation
B	Articles that discuss intra-organizational IS issues (such as software development or IT service management, see Spottke et al. (2015)). For example, Wu et al. (2015) consider the impact of alignment on organizational performance. For that end, they survey business and IT managers of a firm. Difficult cases may treat outsourcing topics. Yet, depending the focus of the paper, it is allocated to this category. For example, Sourenkowa and Louvieris (2005) focus on the decision-criteria within a firm that lead to an outsourcing decision.
G	Articles that analyze, for example, the introduction of IS within a public administration or the identification of value positions for public sector managers (Rose et al. 2015). Difficult cases integrate studies on user participation of public e-services where it is not clear what kind of users and services are of interest. Yet, the level of analysis and the system description shows that it encompasses services between public authorities and public employees (Holgersson et al. 2015).
C	Articles that focus on the IS usage in non-professional contexts, for instance of wearables such as fitness trackers or Google Glass. IS help private users to enhance their lives. Exemplary papers study for example IS adoption at home (Brown and Venkatesh 2005) or continued IS usage of Facebook users (consumers) (Hoehle et al. 2015). Difficult cases consider papers that are framed from an organizational perspective, yet, the system of interest as well as empirical insights from participants originate from a purly private context (Kaba 2015).
B2B	When commercial transactions between businesses, e.g., "between a manufacturer and a wholesaler, or between a wholesaler and a retailer" (Nemat 2011, p. 100) are in the scope of investigation – for instance in a computer-mediated supply chain or e-commerce context. For example, Malhotra et al. (2005) examine forms of partnership within supply chains with a theoretical lens on partner-enabled market knowledge creation Thus, the partnership (inter-organizational relationship) is of special interest. Difficult cases, for example only reveal in the full text that an article treating the domain of knowledge sharing and social networks is mainly concerned with inter-managerial sharing (between different firms (Huang and DeSanctis 2005)).
B2C	Articles describing products and services offered by businesses to private consumers, examples encompass e-commerce or marketing and app ecosystems or consumer-driven innovation via platforms.

	Note that our categorization does not consider the direction of those relations (e.g., B2C vs. C2B). For example, Yi et al. (2015) study consumer's reactions to different product offerings in order to improve a firm's marketing strategy. For that reason, they proceed an experiment with real customers. Difficult cases encompass services offered from consumers to companies (e.g. within mobile application ecosystems).
G2C	Articles that analyze IS that support the communication between governments or public authorities and citizens (Nemat 2011). For example, this includes articles studying the adoption intention of citizens towards e-government initiatives (Carter and Bélanger 2005).
G2B	Articles discussing topics relevant for the interaction between businesses and public entities (Nemat 2011). For example, Tung and Rieck (2005), who study the adoption of organizations of e-government services. As a difficult example, Etudo and Roon (2015) develop methods that ease the integration of reporting standards for a firm's financial statement.
C2C	Articles that investigate IS supporting and involving private individuals and in which the focus is strictly on the interaction between the private individuals and not on a third-party intermediary (Nemat 2011). Depending on the level of analysis, topics such as social media, adoption, and sharing economy are included. Such articles always focus on the interaction between private users and not between private users and service providers, for example when the influence of user comments of a hotel room on other users is of interest (Abramova et al. 2015).
Other	Papers that cannot be allocated to any of those subcategories. Meta-reviews, editorials, and methodological articles that discuss general IS issues from a more philosophical perspective.

Table 2. Description and Examples for Our Nine Subcategories.