

Barriers to IT Exit

Research-in-Progress

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Abstract

All organizational information systems will at some point in time be decommissioned. Yet, current IS research is predominantly focused on the adoption and implementation of an information system. It pays scarce attention to the final phase of a working IT system and the substantial theoretical implications of its decommissioning. This research in progress draws on the broader notion of 'exit' and 'barriers to exit' to position the decommissioning of working IT systems in a wider theoretical framework. It seeks to develop a sound conceptualization of IT exit and its barriers by analyzing the exit literature from related business disciplines. The conceptualization identifies IT exit as multi-phased longitudinal process with extensible transition points. This refined understanding will provide the basis for an impending empirical investigation that identifies specific IT-specific barriers to exit and their impact on individual phases in the IT exit journey. The steps of this forthcoming investigation are outlined.

Keywords: IT exit, Decommission, Barriers to exit, System lifecycle

Introduction

When Microsoft announced in 2007 that its extended support for the operating system Windows XP would terminate in April 2014 there was widespread belief that users would have replaced Windows XP by then. Fast forward to 2015, one year after the official deadline, more than 15% of computers worldwide are still running on Windows XP. This group of XP users comprises computers from individuals and organizations, including from the UK government (Techradar 2015). These 'XP strongholds' have consciously decided to continue the use of an IT system beyond its formal end-of-life hereby incurring significant risks, costs and inconveniences (Bowman 2014). The decommissioning of an IT system is not an inadvertent or passive event but a management decision which is informed by a diverse set of rational and irrational considerations. These considerations need to be investigated in order to better explain the decommissioning decision.

The decommissioning of a working IT system is of significant theoretical interest as it touches and complements core IS theory. The IS domain has established a tradition of in-depth understanding of organizational IT adoption and diffusion (e.g. Cooper and Zmud 1990; Iacovou et al. 1995) which explains the context and factors that encourage the introduction of new IT systems in organizations. But we know very little of what happens at the end of the systems life, and importantly, how the end of a system's life impacts on the adoption of the succeeding IT system. Similarly, we have established a careful understanding of the complex institutionalization process of IT systems (e.g. Avgerou 2000; Mignerat and Rivard 2009). But we have little insights on the corresponding 'deinstitutionalisation' of IT systems (Oliver 1992). Despite the theoretical importance very few IS studies explore the end of a system's life (Furneaux and Wade 2011) which creates a significant research gap.

The current research utilizes the term 'IT exit' and 'barriers to IT exit' to connect the decommissioning of IT systems to the generic 'exit' phenomenon which captures an organization's decision to leave an unfavorable business arrangement (Porter 1976). The research examines IT exit and specifically the

barriers to IT exit as *the factors that inhibit an organization in its ability to exit an IT system*. The research is guided by the following overarching research questions:

1. How can we conceptualise *barriers to exit in an IT context*?
2. What factors create *barriers to IT exit*?
3. How do the individual *barriers* interact with each other to influence *IT exit*.

The research in progress presented here focuses on the conceptualization of the barriers to IT exit. To overcome the limited prior research on IT exit and its barriers in the IS literature, a theoretical review (Paré et al. 2014) of associated research disciplines (e.g. management science, organization studies) is conducted to gain a wider understanding of the exit phenomenon and enable the identification of the barriers to exit. This research in progress paper concludes with a well-grounded conceptualization of IT exit and its barriers and provides an account of the further research that will be carried out to investigate the specific exit barriers and their interactions in the IT domain.

IT exit and its context

The term ‘exit’ captures the decision to leave an unfavorable business arrangement. The notion of ‘barriers to exit’ refers to the factors that work against the exit decision encouraging the organization to hang on to such unfavorable arrangements (Porter 1976). In the IT context the notion of exit is applicable in three separate domains: the organizational domain (to decommission a working IT system), the individual domain (to discontinue the use of an IT system), and the software vendor domain (to withdraw an IT system from the product portfolio). The work here is focused on IT exit in the organizational domain and we point to other researchers who explore the exit phenomenon in the individual (e.g. Recker 2014) or vendor domain (e.g. Jansen et al. 2011). The focus on working IT systems also differentiates this paper from other research that explores the decision to abandon an IT project during its development phase (e.g. Pan et al. 2006). Hence, the use of the terms ‘IT exit’ and ‘barriers to IT exit’ is tightly linked to the original managerial context where the end of an integral part of the organization (a working IT system) is determined in form of a conscious management decision. The individual or committee decision will be reflective of the organizational and personal circumstances that determine the exit point.

A close examination suggests organizational IT exit to be a continuous rather than a discrete phenomenon. For illustrative purposes we have grouped the trajectory of an IT exit journey into two phases and two transition points: The **intention to IT exit phase** captures the build up of organizational commitment to terminate an IT system which ultimately concludes with the **IT exit decision**. This phase and its transition point are alternatively labelled¹ as ‘discontinuance intention’, ‘discontinuance decision’ (Furneaux and Wade 2011) or ‘decommissioning decision’ (Gangadharan et al. 2013). The subsequent **‘exiting’ phase** describes the period where organisations wind down their use and dependency on the IT system which culminates with the actual **IT exit closure**. Terminologies used to describe this phase include ‘cessation of use’ (Furneaux and Wade 2010), ‘cessation of operation’, ‘retiring’ (IEEE 1997) or ‘sunsetting’ (Jansen et al. 2011). The IT exit closure is marked by the point when the system is fully terminated and an ‘actual removal’ of the software from the organizational IT portfolio has been accomplished (IEEE 1997). The example of Windows XP outlined in the introduction indicates that the exiting phase is not a trivial intermediate stage but can stretch over years where organizations may maintain a minimum commitment to their outgoing system. Although organizations may experience some ‘subversive’ continuation of systems use the exiting phase and its time-frame is largely a managed process where organizations seek to prudently execute the exit decision (IEEE 1997).

Recognizing IT exit as a multi-phased phenomenon helps to position it vis-à-vis the well-established organizational IT adoption research which explores the beginning of a system’s life. Cooper and Zmud’s (1990) diffusion and implementation model distinguishes between system adoption, adaptation, acceptance, routinization, and infusion. Rogers’ (1995) influential diffusion of innovation (DOI) model differentiates between persuasion and adoption stages. The IT planning literature represents a more pro-active perspective on adoption which also includes considerations on the system’s life-expectancies (Rahrovani et al. 2014) and decommissioning costs (McKeen and Smith 2010) as part of the planning process. The emerging understanding of organizational unlearning in

¹ We used the term ‘exit’ to consolidate the different terminologies used across the range of disciplines considered in this study.

the IT context also recognizes how the latency in the unlearning process can impede the transition to a new system (Rezazade et al. 2012).

Considering that a large number of IT adoption and planning cases involve the replacement of a working IT system it is surprising that IS theory pays little explicit attention to the link between IT adoption and IT exit (the DOI model considers the existing system only in the variable: ‘relative advantage’). Furneaux and Wade (2011) point out that models of IT adoption only become meaningful once the intentions to exit the current IT system have been formed and alternative candidate systems have been identified. Despite the sequential relationship between adoption and exit, the exit phenomenon cannot be reduced to being the opposite of the adoption phenomenon as important status quo changes are entailed that go beyond the complexity considered in adoption theory. However, by considering IT adoption and IT exit both as multi-phased phenomena it is possible to explore the interdependencies between these two opposing ends of an organizational IT system’s life.

The importance of understanding IT exit as a multi-phased phenomenon also becomes apparent when focusing on the *barriers to IT exit*, the factors that inhibit the organizational IT exit journey. Consider these examples: due to sunk cost effects the prior investment into an IT system can conceivably be hypothesized as a factor that limits the intention to exit (Furneaux and Wade 2010). However, there are no real grounds to assume that prior investment would inhibit the exiting process once the exit decision has been made. Alternatively, incomplete systems documentation could conceivably be hypothesized as a factor that inhibits the exiting process of a component (as it creates uncertainty in the remaining system behavior once the targeted component is removed) but there are no real grounds to assume that it would inhibit the intention to exit. A multi-phased understanding of IT exit allows for a thorough investigation of the barriers that inhibit the IT exit journey of an organization.

Although IT exit and its barriers are of high theoretical and practical relevance they are only the object of a few research studies. The most comprehensive study on IT exit is provided by Furneaux and Wade (2011) who show how the system’s technical integration has a limiting effect on the intention to exit. In a prior theoretical paper Furneaux and Wade (2010) further propose system investment, embeddedness as well as mimetic pressures as barriers to exit. Swanson and Dans (2000) confirm system size and the organizations IT portfolio complexity as factors that limit intention to exit (either directly or mediated through the system maintenance effort). Ganghadran et al (2013) provide a normative view on the IT exit decision pointing to risks (e.g. systems dependency) and managerial issues (e.g. systems ownership) and suggests avenues for managing and overcoming the barriers to IT exit.

The limited scale and diversity of research focusing on IT exit creates a clear and substantial gap in the IS literature which limits the opportunity for targeted studies that seek to explore the detailed role of specific barriers and their interdependencies. The next section outlines a theoretical review of the extent exit literature in order to broaden the understanding of barriers to exit in preparation for a dedicated research on barriers to IT exit.

Theoretical review on ‘Barriers to Exit’

In order to overcome the limited diversity and restricted scope of the IS literature on IT exit, the notion of exit and its barriers in a wider range of business domains is explored. The objective and methodological approach is best captured by Paré et al’s (2014) notion of a ‘theoretical review’. A theoretical review explores existing conceptual and empirical work to provide a context for identifying, describing, and transforming a higher order of theoretical structure. A theoretical review is specifically focused on capturing a diverse range of perspectives and thereby differentiates from other types of literature reviews or meta-analysis which seek to develop a comprehensive overview within the boundaries of a theory or subject-domain.

Following Paré et al (2014) the work starts out by scoping the range of perspectives on exit and its barriers in a wider range of business domains and identifying the approaches used to investigate the exit phenomenon. In a second stage the diverse contributions are integrated to develop a comprehensive definition and conceptualization of barriers to IT exit that provides a basis for subsequent empirical investigation.

Scoping ‘barriers to exit’

To obtain a wide range of insights on the exit phenomenon and its barriers it was selected to review the core research outlets from different business disciplines that traditionally have some cross-

fertilization with the IS discipline to ensure a level of compatibility among the perspectives. The selection of business disciplines followed the work from Grover et al (2006) who identified five disciplines which have traditionally helped the IS discipline to inform its research perspectives (Computer Science, Management Science, Organization Science, Marketing, Economics). This wide range of business disciplines can be expected to capture the managerial and technical aspects that play a role in IT exit considerations and contribute to a more comprehensive understanding of the phenomenon.

Following Paré et al's (2014) recommendation of identifying authoritative publications, the 13 representative journal outlets that were previously identified by Grover et al (2006) were taken as being representative of the IS-related research domains. The publication source was further extended by including three representative journals from the strategy discipline to reflect the disciplinary importance of the concepts of exit and barriers to exit (see Appendix 1). Importantly, the objective for drawing on related disciplines was to enrich the diversity of perspectives on exit and its barriers in order to obtain a more comprehensive understanding of the phenomenon, not to compare the different perspectives on the basis of their originating business domains.

For each of the 16 core journals, the following search terms were used in different combinations to identify articles that would yield interesting insights on exit and its barriers: *exit, barrier to exit, discontinuance, replacement, retirement, end of life, upgrade, continuance, sunseting, decommissioning*. Among the articles that were identified through these search terms the researchers carefully studied their abstracts to be able to exclude those that were not related to the exit decision or the process of exiting. The remaining range of papers were carefully studied in full text to identify to which extent they offer insights on the exit phenomenon and specifically on barriers to exit. A further range of papers was excluded as their contribution was too limited to consider them as 'authoritative' on the exit phenomenon. A remaining total of 21 articles formed the body of literature used to develop a more diverse and wider scope of notion of barriers to exit.

The first element that stems from the examination of the five disciplines is that there are two different views of "exit". In Management Science (Bensoussan and Sethi 2007), Computer science (Shaul and Tauber 2013), or Economics (Cooper et al. 1999; Feldstein and Rothschild 1974; Jovanovic and Lach 1989; Rust 1987; Samaniego 2008), exit is conceptualized as a replacement. One new piece of equipment or software is replacing an older piece of equipment. Therefore, the exit equates a "replacement". The decision to replace depends on present value and uncertainty (Rajagopalan et al. 1998). Therefore one could look at the exit decision as an optimization problem. The challenge is to find the optimal point of exit. When considering barriers, the managerial elements (available resources, corporate priorities) are considered (Kremers and Van Dissel 2000), as well as tax implications (Feldstein and Rothschild 1974) or macro-level developments (Cooper et al. 1999). Economics will formally look at the trade-off between using capital for replacement or using capital for alternative uses. Feldstein and Rothschild (1974) remind that exit is often an economic choice and not a technological necessity. In the case of computer science, because the replacement is mostly considered with a view of a software upgrade, the release calendar of the software upgrade is a consideration (Kremers and Van Dissel 2000) .

The second view of exit is found in the articles coming from Strategy and Organization Science. In this case, exit is not seen as a replacement, but as an isolated process. Companies look at exit as a divestment, which is dependent on expectations of future market conditions (Gaba & Terlaak 2013) or on the current performance which is also a determinant of the exit decision (Shimizu 2007). Exit is from product or market segments (Gaba and Terlaak 2013) or even exit from organization units (Feldman 2013). Within these articles exit is portrayed as a decision (Davis 1974; Elfenbein and Knott 2014), a complex development (Fortune and Mitchell 2012), or an iterative multi-stakeholder deliberation (Burgelman 1996). Since the notion of 'barriers to exit' is part of the core of the strategy literature (Porter 1976) it is of no surprise that the Strategy outlets offer a considerable number of articles dealing with exit in the wider sense. They explored factors that create an exit delay (Elfenbein and Knott 2014) or inertial tendencies that oppose the impetus for exit (Burgelman 1996). There are comprehensive analysis of exit integrating rational, behavioral, or organizational factors which lead to a particularly wide array of barriers to exit (Elfenbein and Knott 2014). Specific barriers to exit identified include sunk costs, integration with firm operations, policy stability (Berry 2013), cognitive bias of decision maker (Duhaime and Schwenk 1985), organizational inertia (Brauer 2006), limited managerial capability (Fortune and Mitchell 2012) and lack of experience (Baden-Fuller and Longley 1988).

When assessing how to adapt these two views of exit (replacement or divestments) to information technology, it seems that both can be helpful. Sometimes the IT exit is a replacement. One version of a system is replaced by another one. However, often different systems are layered, and do not replace each other. For instance, in the example of Windows XP discussed earlier, most organizations end up with more than one version of Windows being used at the same time. So the decision to introduce a new version does not mean that the old one is decommissioned. They may live side by side for a long time. This means that in some cases the “divestment” view will be more appropriate than the replacement view.

It is interesting to note that articles identified from marketing outlets were largely limited to the decisions of individual end-users to exit from consumer products, which is outside the scope of our review.

The next section consolidates the insights from this corpus of diverse perspectives to help expand the notion of exit and barriers to exit for the IT context.

Determination of the problem

The review of the different research outlets reveals a variety of terminologies to describe exit and its barriers (e.g. inhibitors to migration (Kremers and Van Dissel 2000), factors suppressing replacement investment (MacMillan and Meshulach 1983), factors altering the planned life of equipment (Feldstein and Rothschild 1974). Yet, underlying these diverse terminologies there is a considerable shared understanding among the disciplines about the essential nature of exit and its barriers: technology assets by their very nature will eventually be decommissioned and are therefore all subject to an inevitable exit trajectory (this does not necessarily apply to other organizational resources). For such assets exit is therefore not a decision about ‘if’, but ‘when’ the exit decision and eventual technology decommissioning is taking place (Kremers and Van Dissel 2000). Hence, an operational technology asset is permanently subject to forces that have an accelerating impact on the exit trajectory and forces that have a delaying impact on the exit trajectory (Furieux and Wade 2011). In this conceptualization barriers to exit are those factors that have a delaying impact and therefore extend the remaining life of the asset (Swanson and Dans 2000).

The review has shown differences with regards to how the exit phenomenon is understood. Different perspectives illustrate different facets of the exit phenomenon.

The studies dealing with technology assets are either approaching the decision from a normative perspective (e.g. determining when the exit-decision **should** be made in a particular context) (Bensoussan and Sethi 2007; Feldstein and Rothschild 1974; Rajagopalan et al. 1998; Rust 1987) or from an empirical perspective (e.g. determining when or how the exit-decision **will** be made in a particular context) (Cooper et al. 1999; Furieux and Wade 2011; Swanson and Dans 2000). In the case of an industrial machine replacement the gap between the exit decision and its actual decommissioning is likely to be rather short and is of little concern. However, in the IT context, where systems and business processes are tightly interwoven a substantial delay between exit decision and concluding exit can be observed. Hence, a research focus on the long exiting phase would represent an important extension of the current studies exploring the IT exit decision (Furieux and Wade 2011; Swanson and Dans 2000).

This dominant focus on the exit decision among technology based studies is in contrast to the studies that investigate exit in the case of an organizational venture which focuses on the point in time when the organization ceases to control the venture (Brauer 2006; Elfenbein and Knott 2014; Shimizu 2007). This imbalance can at least partly be explained by the nature of the available data source (e.g. divestiture records). It also reflects the fact that in those cases it is not a replacement decision but rather a divestment.

When looking at factors influencing the decision to exit a technology asset, some factors were linked with the technology itself, some concerned the linkages between the technology and its environment, and some were associated with the wider context in which the technology was used.

The articles identified several characteristics of the technology that influence the decision to exit: its age (e.g. Swanson and Dans 2000), performance decay (e.g. Feldstein and Rothschild 1974) and remaining support guarantees (Shaul and Tauber 2013). In a number of articles this narrow focus on the individual technology asset in question is expanded by taking into consideration how aspects of the related technology assets impact on the exit decision. Factors such as technology embeddedness (Furieux and Wade 2011), portfolio complexity (Swanson and Dans 2000) or technology standards

(Kremers and Van Dissel 2000) address the relationship with other technology assets that can represent viable barriers to exit.

The inclusion of non-technology aspects and their impact on the exit decision represents a further extension of the barriers to exit scope considered. Organizational factors such as capacity demand (Rajagopalan et al. 1998) and financial ability (MacMillan and Meshulach 1983) are identified as factors that delay the exit decision. In addition, the wider business context with factors such as economic climate (Cooper et al. 1999) and tax and interest rates (Feldstein and Rothschild 1974) are discussed as factors that negatively influence an organizations exit decision.

A small number of articles further recognize that the exit decision is ultimately done by an individual or committee, who will interpret the technology and its wider context. Hence, the biases of the decision makers (Duhaime and Schwenk 1985) and especially factors such as sunk costs (Feldstein and Rothschild 1974) or overall inertia (Brauer 2006) point towards the decision maker as a likely barrier to exit. Interestingly, articles focusing on non-technology related exit decisions point to a comparable range of barriers to exit (Elfenbein and Knott 2014). The categories of exit barriers encountered are summarized in table 1.

Categories identified	Applied to the IT context
Incumbent technology	System attributes can create barriers to exit. These may include particularly critical features, adequate performance and viability of the incumbent system.
Technology environment	Interplay between incumbent system and the technology context can create barriers to exit. These aspects may include system embeddedness or the enforcement of tight technology standards.
Managerial environment	Managerial considerations can serve as barriers to IT exit. Considerations may include state of business finances or business capacity demands.
Business environment	The economic and legal environment in which the business operates can represent a viable barriers to IT exit. Specific factors may include the economic climate, tax laws and legal frameworks.
Decision maker	Aspects of the decision making entity may create barriers to IT exit. The assumptions, interests and biases of the decision maker can impede the exit trajectory.

Of particular interest is the difference in exit scenarios encountered and its wider implications for the scope of exit barriers to be considered. A range of studies limit their scope to the exit of the technology (e.g. Swanson and Dans 2000) or organizational venture itself (e.g. Fortune and Mitchell 2012) while other studies examine a replacement scenario which takes into consideration aspects of the incumbent technology and the new technology (e.g. Rajagopalan et al. 1998). Hence, in these scenarios the timing of the exit decision and eventual decommissioning is not only determined by the incumbent technology and its context but also by aspects of the incoming technology that is to act as replacement. A replacement scenario represents a particular case of exit scenario where additional barriers to exit such as the availability of the new technology (Rajagopalan et al. 1998) or its cost (Kremers and Van Dissel 2000) are considered with their delaying effect on the exit decision as well as the actual exiting process. Figure 1 illustrates how additional barriers to exit can apply in a replacement scenario and its subsequent substitution process.

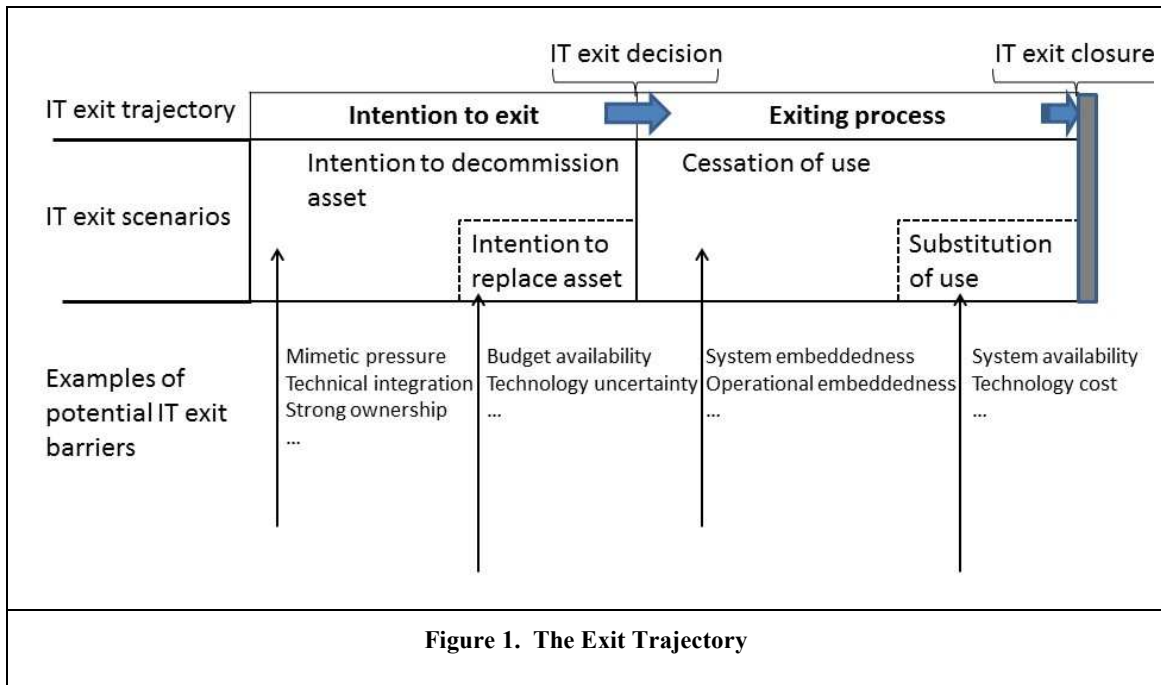


Figure 1. The Exit Trajectory

A further point of differentiation among the selected articles is the extent to which the interactions among the exit barriers are considered. In some papers the focus on the key direct effects of the exit barriers is either explicit (e.g. Furneaux and Wade 2011) or implicit (e.g. Kremers and Van Dissel 2000). However, in other articles the interaction effects among the exit barriers are treated as essential for understanding the exit phenomenon. In these studies the ability to make informed exit decisions is dependent on recognizing the interdependencies between factors such as technology age - maintenance effort - exit decision (Swanson and Dans 2000), or technology capacity - new technology availability - replacement decision (Rajagopalan et al. 1998). The exit decision and the subsequent exiting process seems to be not only affected by diversity of barriers (and accelerators) but their interactions which adds a further complexity to understanding the exit decision.

Discussion & further research

The review of a wide range of business disciplines has helped to develop a refined understanding of exit and its barriers, and apply it to the IT context. We conceptualize the IT exit phenomenon as a multi-phased longitudinal process with extensible transition points. Barriers to IT exit represent the factors that have a delaying effect on the exit-journey and not only cover different technological, organizational and economic aspects but also characteristics of the replacement technology. This conceptualization extends the current focus on IT exit intentions (Furneaux and Wade 2011) or the IT exit decision (Swanson and Dans 2000) by considering aspects of the new technology and the impact of organizational and economic constraints.

Our conceptualization of the IT exit phenomenon based on the review of different disciplines was essential to facilitate the inventory and the presentation of definitions, and the understanding of the different views of barriers to exit. It enabled comparisons of concepts that may be related, and provided the necessary background for reorganizing the ideas by relevant themes in subsequent work. This refined understanding of IT exit and its barriers developed here provides the basis for an empirical investigation that identifies the individual barriers, their impact on the individual phases in the IT exit journey and their interaction.

The impending empirical study will employ a qualitative case research method to reflect the type of research questions investigated. The goal is to identify as many relevant factors as possible, and to understand how they interplay with each other. This type of questions is better investigated with case studies, which could contribute to theory building (Eisenhardt 1989). Case descriptions will be built from interview data and documents to identify the rationale for extending the life and exiting process of long-established systems within medium to large organizations. Case selection will focus on working

IT systems that have been considered for decommissioning (pre-exit considerations) as well as systems that are in the process of being decommissioned (post-exit considerations).

A literature based coding scheme will be developed prior to the data analysis. In addition, room for additional codes that are uncovered during data analysis phase will be provided. The data analysis will focus on extracting the salient themes from the interview data and case descriptions and will identify common themes or patterns to ensure data triangulation (Benbasat et al., 1987; Yin, 2003). At the point of writing this research in progress document data on five IT exit cases originating from two organizations are being collected. The unit of analysis is the system being decommissioned. This means that several cases can be extracted from one organization. It is the initial objective to develop a total of 20 decommissioning cases to obtain a comprehensive range of IT exit scenarios for cross-case analysis (Miles & Huberman, 1994) in order to identify the overarching patterns among the barriers to IT exit. The data collection will enable the analysis of the cases individually, the comparison of the decommissioning cases within an organization, and a comparison of the various cases and their patterns between organizations.

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Appendix 1. List of reviewed journals (based on Grover et al. 2006)

Academy of Management Journal
 Academy of Management Review
 ACM Computing Surveys
 ACM Transactions on Information Systems

American Economic Review
Decision Sciences
Econometrica
Global Strategy Journal*
Journal of Consumer Research
Journal of Marketing
Journal of Marketing Research
Journal of Political Economy
Long Range Planning*
Management Science
Organization Science
Strategic Management Journal*

(*additional Strategy-focused journals added)