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Information technology portfolio management implementation: a case study

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Abstract

Purpose – The purpose of this paper is to examine the implementation of IT portfolio management (IT PoM) and develop a framework guided by adaptive structuration theory to describe the key structures, features, and appropriation steps needed to effectively manage IT investments and assets.
Design/methodology/approach – Using a longitudinal case study approach, data were collected over an eight-month period from a US Fortune 500 company during its IT PoM implementation effort.
Findings – The case analysis highlights three major IT PoM features appropriated by the organization: creating the portfolio; assessing and analyzing the portfolio characteristics based on risk, benefits, alignment, criticality, and cost; and balancing decisions to start projects or terminate under-performing IT assets such as servers and applications. The spirit of IT PoM was interpreted differently by different stakeholders (data providers, business units, and IT PoM team) leading to resistance to implementation. The case data underscores the importance of establishing a governance steering committee and new internal structures to help push the balancing decisions across the organization.
Research limitations/implications – The results are useful in developing guidelines and strategies to achieve successful implementation of IT PoM and to highlight critical factors that practitioners need to pay close attention to during an IT PoM implementation.
Originality/value – This study represents one of the first attempts to describe a detailed IT PoM implementation process and how IT PoM appropriation process can lead to improved decision making within the organization.
Keywords Adaptation, Implementation, Case study, Adaptive structuration theory,
IT portfolio management
Paper type Research paper

1. Introduction

Effective management of information technology systems and assets is one of the most critical issues facing information systems executives and managers today (Burger, 2014) and failure to do so can lead to missed opportunities and wasted resources (Jeffery and Leliveld, 2004; Ward *et al.*, 2005; Daniel *et al.*, 2014). IT portfolio management (IT PoM) helps organizations manage their IT assets by identifying risks, benefits, costs, and alignment of each IT asset and providing executives with holistic view of their IT assets in order to make better-informed IT-related decisions. IT PoM, if implemented correctly, has the potential to: improve visibility of IT assets and their inter-relationships; enable objective selection of the best IT projects for funding; improve strategic alignment between IT and business; and enable significant IT cost reductions (Garr, 2006).

Many organizations have undertaken IT PoM efforts (Weill and Vitale, 1999; Datz, 2003; Jeffery and Leliveld, 2004; Lwakatare *et al.*, 2015) and an increasing number of vendors, consulting services, and practitioner books offer information regarding IT PoM benefits and software solutions (Fitzpatrick, 2005; Levin and Wyzalek, 2014; Kaplan, 2005; Maizlish and Handler, 2005). In addition, Project Management Institute, an influential institution in project management, has added a PoM standard to the curriculum for its professional certifications (PMI, 2013), reflecting the increased interest among practitioners in the PoM concept. IT PoM is a systematic process to manage IT assets (e.g. projects, applications, and infrastructure) and their interdependencies using portfolio techniques (Kumar *et al.*, 2008). The goal of IT PoM is to maximize the benefits at a portfolio level rather than at an individual IT asset level, while minimizing risk and cost and, most importantly, to ensure alignment of IT and business strategy when allocating resources (Kumar *et al.*, 2008).

Even though the importance of implementing IT PoM is well acknowledged in practice, our current understanding of the adaptation of IT PoM is limited (Kumar *et al.*, 2008; Tu and Shaw, 2011; Cunha Dolci *et al.*, 2014; Lwakatare *et al.*, 2015). IT PoM is an integral component of strategic planning (Reyck *et al.*, 2005) and extant research rarely offers deep insights into organizational forces, which impact the outcomes of the IT PoM implementation. The current literature also lacks insights into the processes in adapting IT PoM, including stakeholder perspectives, resistances, affordances, and negotiations, which need detailed study of individual case (Daniel *et al.*, 2014). To address this gap, the following two research questions are asked in this study:

RQ1. What does it mean to adapt IT PoM?

RQ2. What are the pre-implementation structures of IT PoM and the potential outcomes of a successful adaptation?

The above research questions need an understanding of the key structures, features, and appropriation steps involved during IT PoM implementation. Hence, the adaptive structuration theory (AST), which examines organizational changes facilitated by different types of structures, is considered an appropriate theoretical framework for this study. However, given the context of IT PoM implementation, the diffusion of innovation theory is combined with AST to better illuminate the adaptation process and the emergent structures. Adaptation is the process of changing IT PoM structures (such as resource availability, culture, and organizational readiness) to align them with the needs of stakeholders and organizational environments. The IT PoM black box is opened in this study and its underlying structures, features, interactions, and impact on organizational benefits are identified. The study results are useful in developing guidelines and strategies to achieve successful implementation of IT PoM and to highlight critical factors that practitioners need to pay close attention to during IT PoM implementations.

The rest of the paper is organized as follows. The next section presents a review of the related literature, which is followed by the methodology and the case study results. This is followed by a discussion of results implications and conclusions.

2. Theoretical background

In order to study organizational change and information technology, researchers have used different theoretical lenses. One perspective is diffusion of innovation, which focuses on different diffusion stages of the innovation such as initiation and implementation (Rogers, 1983). This perspective typically focuses on examining

contextual factors that are important during the different stages of innovation diffusion such as organizational factors, technology factors, or environmental factors (Chau and Tam, 1997; Iacovou *et al.*, 1995; Lee *et al.*, 2015; Zhu *et al.*, 2006).

Another perspective is the socio-technical view of IT PoM, which focused on the human aspects as influencing and influenced by the technical aspects (Daniel *et al.*, 2014). The structurational model (Orlikowski, 1992) and AST offer frameworks to understand and combine the influence of technology on existing social structures. AST is a variation of Giddens' (1984) structuration. Organizational changes are facilitated by different types of structures provided by advanced technologies, processes, and the organizational environment, as well as structures that actually emerge in social action.

In this paper, the innovation and structuration perspectives are combined to analyze the changes an organization goes through when adapting IT PoM by examining three implementation stages – pre, during, and post, and by paying close attention to the social interactions during these implementation stages. IT PoM is intertwined in the organization and it impacts the organizational structures in which it is being implemented and adapted by different groups of users throughout the organization. In order to examine factors important at the different stages of implementation as well as the organizational social structure, diffusion of innovation and AST are used. IT PoM diffusion and AST are discussed in the following sections.

2.1 IT PoM diffusion
PoM techniques have been used to manage different types of assets, such as financial assets, R&D and new product projects, and IT assets. Peppard (2003) suggested that managing IT as a portfolio of services can help organizations achieve the focus needed to deliver business value from their IT investment. In a comprehensive literature survey study, Kumar *et al.* (2008) focused on different types of IT assets: applications, projects, and infrastructure and suggested a decision-making framework for managing the different assets in a portfolio. Their framework covered the entire life cycle of an IT asset, from project proposal to IT application and infrastructure maintenance and termination decisions. Although their framework covered the decision-making cycle of IT PoM, they provided no insights on how IT PoM could be implemented in an organizational setting.

Other studies have examined the use of IT PoM within the organization. Cunha Dolci *et al.* (2014) analyzed IT PoM practices in four different companies in Brazil and found that companies use IT PoM planning process to prioritize and justify their IT investments. Several of the companies studied used IT PoM to evaluate and monitor alignment of the portfolio with the planning phase and for benchmarking with competitors. Lwakatare *et al.* (2015) explored the implementation challenges of IT PoM and found that there is a large gap between the literature of IT PoM and its practice. In their study, they found companies implemented IT portfolios that were too broad and they rarely used post-implementation portfolio evaluations, which often resulted in suboptimal resource utilization. Jeffery and Leliveld (2004) linked use of IT PoM to benefits and found that an organization's PoM could be at one of four stages of maturity: ad hoc, defined, managed, and synchronized. At the ad hoc stage organizations make IT investment decisions in uncoordinated ways resulting in missed opportunities. At the defined stage all the key components of IT are documented along with estimates of benefits and costs. At the managed stage IT assets are linked with the business strategy and an objective process to select projects is used. At the synchronized stage, all portfolio investments are aligned with business strategy and their risk, value, and option value are

constantly assessed at different stages of the IT asset life cycle. These differences in maturity leading to different levels of benefits highlight the importance of finding out what IT PoM processes are necessary to yield higher levels of returns for the organization.

The literature on IT diffusion defines IT implementation as a procedure directed by a manager to install planned change in an organization (Nutt, 1986). Klein and Sorra (1996) define implementation as the process of gaining targeted organizational members' appropriate and committed use of an innovation. The implementation of IT PoM not only provides the organization with better visibility of all its IT assets (Garr, 2006), but helps improve IT and business alignment, reduce costs, reduce redundancy, and improve projects' outcome as well (Cunha Dolci *et al.*, 2014; Jeffery and Leliveld, 2004; Reyck *et al.*, 2005; PMI, 2013). Establishing the PoM approach requires the implementation of a set of processes and tools, which include collecting IT asset information, assessing the portfolio health (using financial, risk, and benefit analysis), and managing dependencies among the different assets (Datz, 2003; Reyck *et al.*, 2005). Despite some understanding of IT PoM, the current literature on IT PoM lacks a theoretically grounded framework to describe the processes that constitute IT PoM. Similarly, while there is some anecdotal evidence that IT PoM results in new structures in the organization, the literature lacks a description of what those structures are and when they are needed. This study attempts to fill these gaps by identifying the structures, appropriation, and outcome of IT PoM based on data collected from a fortune 500 company during its IT PoM implementation. In this paper the organizational change is traced and described prior, during and post-implementation of IT PoM.

2.2 AST

AST posits that the way technology is adapted by an organization is determined by several interacting forces: the technology itself, the organization's environment, the perceived social/normative pressures, the task, and the way structures emerge and update throughout the appropriation process (Orlikowski and Robey, 1991; Orlikowski, 1992; Desanctis and Poole, 1994; Bostrom *et al.*, 2009; Cao *et al.*, 2009). Although, AST focuses on structures provided by technologies, structures can also be provided by processes and organizations (Desanctis and Poole, 1994). Past literature has considered two sources of structures: one that is embedded in the artifacts (such as technologies and processes) and the other that is embedded in social actions of the participants and their context (Desanctis and Poole, 1994; Cao *et al.*, 2009; Liang *et al.*, 2015). It is necessary to understand the interaction between the structures and the social actions in order to understand organizational change (Desanctis and Poole, 1994). Structures are represented by the features (capabilities, resources, and rules) of the artifact and the spirit (the general intent of the features) of the artifact. Further, the spirit of these features may be open to competing interpretations. There are also other possible sources of structures such as an organization's environment where the artifact is embedded (Cao *et al.*, 2009).

According to AST, structuration is the act of bringing processes, resources, and other structures into appropriation (Desanctis and Poole, 1994; Cao *et al.*, 2009; Liang *et al.*, 2015) and appropriation improves the decision processes in the organization. In this paper appropriation is defined as the extent to which structures in use are consistent or aligned with innovation spirit (Desanctis and Poole, 1994).

AST has been applied to study the adaptation of group decision support (Dennis and Garfield, 2003), although it can be used in the context of a broader set of advanced information technologies (Desanctis and Poole, 1994). For example, AST has been used

to examine the implementation of medical electronic billing system (Schwieger *et al.*, 2004), the adaptation of agile development methodologies (Cao *et al.*, 2009), and the use of computer-mediated communication within an organization (Peters, 2006). Our paper takes the view that implementations of process innovations such as IT PoM are socio-technical and structured by their contexts of implementation and use. Two major sources of structures that influence IT PoM appropriation are the focus of this study: internal structure, which includes cultural beliefs and norms and resources availability within the organization; and IT PoM processes defined through their structural features and spirit. Structural features within IT PoM include practices such as consideration and management of alignment, risks, costs, and benefits of IT assets. The spirit of IT PoM covers its intended values such as improved alignment, enhanced visibility, and reduced risk. However, these values may be unclear, may not be equally perceived by all stakeholders, and may change over time as discussed in this paper. In applying AST in this study, the analysis: depicts the dynamic nature of the interaction between the organization and IT PoM; identifies possible sources of resistance; and more importantly demonstrates how the users engage in the organization when they interact with the IT PoM.

3. Research method
A longitudinal case study is conducted to understand the dynamics of IT PoM adaptation. The case study method is best suited to develop an understanding of the interactions among information technology innovations and organizational context (Yin, 1994). Case study is defined as a research strategy that can be used to examine a contemporary phenomenon in its real-life context (Yin, 1994). During early stages of implementing a complex technology innovation, the complexity of technical and social interactions among the players involved in the implementation are difficult to capture in traditional survey kind of research – hence case study methodology was appropriate.

IT PoM is a contemporary real-life phenomenon and there is a gap between expectations of the benefits from IT PoM and the actual results that organizations are experiencing (Jeffery and Leliveld, 2004). Single case studies have been used in prior literature to develop an in-depth understanding of other contemporary phenomena, such as ERP implementations (Akkermans and Van, 2002) and management of inter-related projects (Elbanna, 2010). Lee and Baskerville (2003) argue that the rich descriptions provided by a single case study are perhaps more valuable than the need for generalizability of the results. The research design and analysis are summarized in Figure 1.

3.1 Overview of study site
The organization studied for our research is a Fortune 500 company that operates in multiple industries, including real estate and energy, and in multiple markets in North and South America. The company was selected because it was at an early stage of implementing an IT PoM approach and it because its division and organizational structure is similar to a typical Fortune 500 company. The name AlphaCo is used to represent the research site in order to preserve confidentiality. Data were collected over an eight-month period from IT and business functional groups within the organization. During this period AlphaCo launched a pilot project to implement IT PoM. The key stakeholders represented executives, business unit personnel, data providers, and ITPM team members directly involved in or affected by the IT PoM implementation process and its governance. The informants were selected based on their role as
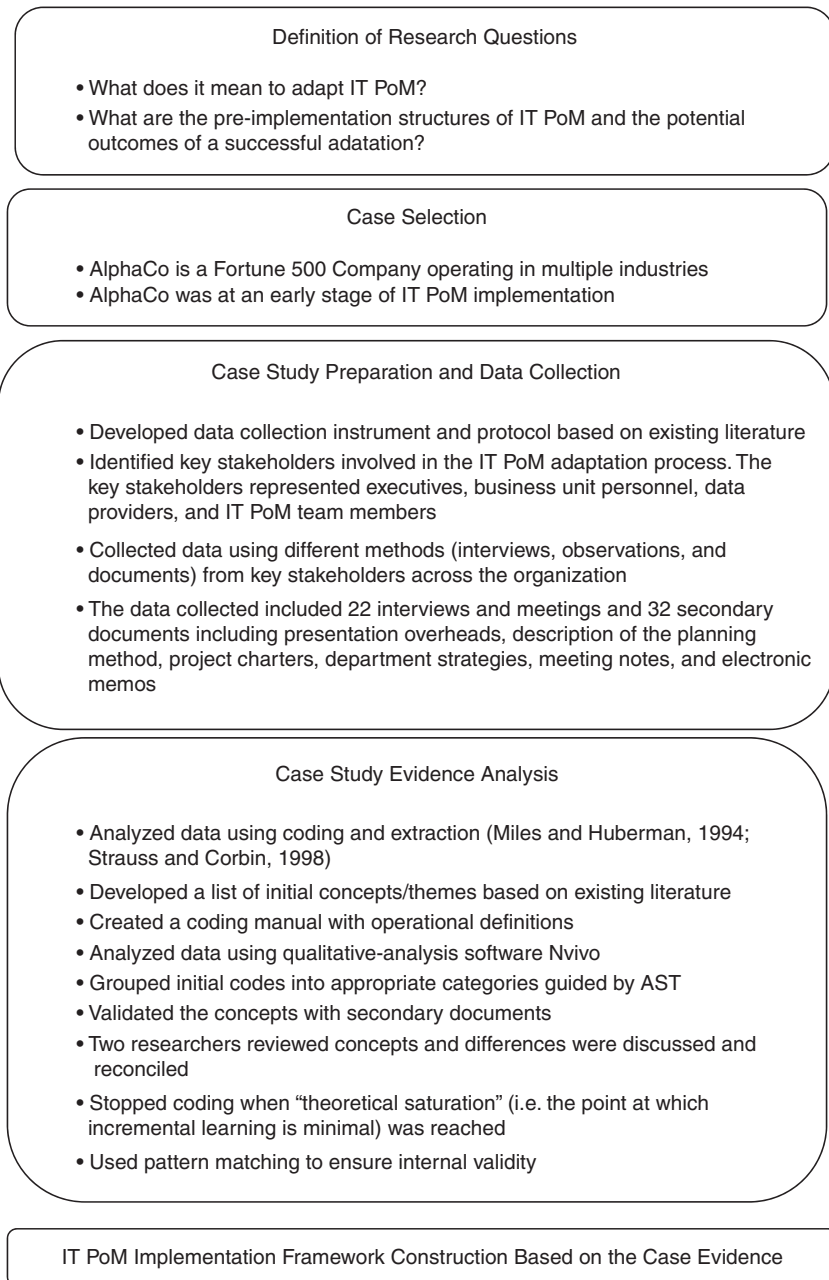
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Definition of Research Questions

- What does it mean to adapt IT PoM?
- What are the pre-implementation structures of IT PoM and the potential outcomes of a successful adatation?

Case Selection

- AlphaCo is a Fortune 500 Company operating in multiple industries
- AlphaCo was at an early stage of IT PoM implementation

Case Study Preparation and Data Collection

- Developed data collection instrument and protocol based on existing literature
- Identified key stakeholders involved in the IT PoM adaptation process. The key stakeholders represented executives, business unit personnel, data providers, and IT PoM team members
- Collected data using different methods (interviews, observations, and documents) from key stakeholders across the organization
- The data collected included 22 interviews and meetings and 32 secondary documents including presentation overheads, description of the planning method, project charters, department strategies, meeting notes, and electronic memos

Case Study Evidence Analysis

- Analyzed data using coding and extraction (Miles and Huberman, 1994; Strauss and Corbin, 1998)
- Developed a list of initial concepts/themes based on existing literature
- Created a coding manual with operational definitions
- Analyzed data using qualitative-analysis software Nvivo
- Grouped initial codes into appropriate categories guided by AST
- Validated the concepts with secondary documents
- Two researchers reviewed concepts and differences were discussed and reconciled
- Stopped coding when "theoretical saturation" (i.e. the point at which incremental learning is minimal) was reached
- Used pattern matching to ensure internal validity

IT PoM Implementation Framework Construction Based on the Case Evidence

Figure 1.
IT PoM case study
design and analysis

sponsors, implementers, or IT/business users of IT PoM. The primary data collection method was the use of structured and unstructured on-site interviews and observations during a series of bi-weekly meetings with key stakeholders in the organization. A set of open-ended questions (e.g. "Why was the IT PoM project started?" "What are the

long-term goals of IT PoM?" "What are the major issues related to implementing IT PoM?") was posed to each participant at the start of the interview. The aim of the open-ended questions was to allow involved stakeholders to express beliefs freely based on their personal experience. After the initial round of interviews, a new set of questions was added to reflect additional concepts that emerged. Follow-up interviews were conducted to collect data on emerging concepts that were not considered in original interviews. In order to manage interpretation bias, secondary sources were carefully reviewed to corroborate observations and triangulate our findings (Eisenhardt, 1989; Miles and Huberman, 1994). On-site interviews lasted between one and two hours and were taped and later transcribed for analysis. Secondary sources included presentation overheads, description of the planning method, project charters, department strategies, meeting notes, and electronic memos were reviewed. The data collected include 22 interviews and meetings and 32 documents. A more detailed description on the data collection methodology is outlined in the next section.

3.2 Data collection by interviews
The on-site interviews were with the IT PoM project team members, a business unit manager (whose future responsibilities would include balancing the portfolio for his functional area), and two experienced project managers who were part of the pilot IT PoM team. The first site visit prior to pilot commencement included unstructured interviews with the pilot IT PoM project leader and one member of the initiation team. That meeting helped clarify relevant background data on the organization including why the IT PoM project was started, the scope of the project in terms of what IT assets to capture, and the long-term goals of the implementation.

Another set of interviews were carried out during and after the project implementation. In these interviews the authors met with representatives of different data sources such as the contract manager, infrastructure manager, cost allocation manager, software licensing manager, and helpdesk data manager. All interviews started with the purpose of the IT PoM project, followed by open-ended questions to understand IT asset data availability in the organization and to understand the roles and responsibilities of the respondents in the organization. These interviews had three purposes: to understand the conditions leading to IT PoM implementation; to understand the role of different stakeholders involved in the IT PoM process and their interests in the IT PoM outcome; and to understand the major issues related to an IT PoM implementation and its outcomes. The interviews helped us collect information regarding IT PoM activities, structural factors, appropriations, and decision processes.

3.3 Data collection by observations
Data were also collected via observations of bi-weekly meetings of members of the IT PoM team over the eight months period. The meetings included project managers representing different functional areas in the organization, prospective portfolio managers from different functional areas, senior managers, and future operational-level users of the IT PoM system. Meeting sessions lasted between one to three hours and were taped and later transcribed for analysis. The observations took place during the project planning phase and during the project implementation progress meetings over an eight-month period. Observing the meetings helped us understand the dynamics of the organization, the priorities, and conditions when implementing IT PoM, the interests in IT PoM of the different groups involved, and the overall goal of the IT PoM implementation.

Collecting data using multiple methods and from multiple respondents, both IT and non-IT specialists in different functional roles (managers vs non-managers) have helped us ensure construct validity (Yin, 2003). We used a case study protocol that included the general objectives of the case study project "understanding the implementation process and issues," and a list of potential sources to address questions arising during the data collection to ensure case reliability (Yin, 2003). Finally, we ensured internal validity by using pattern matching when analyzing our results (Yin, 2003; Miles and Huberman, 1994).

3.4 Data analysis
The data analysis of the qualitative data collected was done through coding and extraction (Miles and Huberman, 1994; Strauss and Corbin, 1998). A list of initial concepts/themes based on the diffusion of innovation, AST, and IT PoM literature was used to guide coding. To ensure consistency, a coding manual with operational definitions was used. Also, a qualitative-analysis software called Nvivo 8 was used to facilitate the coding.

After several iterations of initial coding, the labels identified in the first stage were then grouped into appropriate categories guided by AST (Figure 2). Interpretation bias was managed by continuously comparing and reconciling evidence from interviews, observations, and reports. Finally, the relationships among these theoretical concepts were established to organize our findings. The concepts identified in our analysis corresponding to structures, appropriated practices, characteristics of appropriation, and outcome are described in the next section. The concepts were validated in the subsequent iterations with secondary data. The analysis concluded when no new themes or relationships emerged during analysis or when "theoretical saturation" (i.e. the point at which incremental learning is minimal) was reached. The coding was conducted by one researcher and reviewed by another and differences were reconciled based on discussion.

4. Findings
Diffusion of innovation and AST were intertwined in the following section to explain the organizational structure and appropriation processes prior to implementing IT PoM, during implementation, and post-implementation.

4.1 Pre-implementation structures
According to AST, structures in the organization can be provided by advanced technologies, new processes, the organizational environment, and social interactions. The data collection has revealed several important pre-implementation structures.

4.1.1 Internal structure. Internal structure, in the form of stakeholder support, resource availability, culture, and organizational readiness, had a major influence on the IT PoM adaptation process. The IT PoM project had the support of the CIO and the CEO. However, it was one of many other projects in the organization that were competing for resources and management attention, key personnel involved in the project agreed that stakeholder support was considered critical for its success. Availability of funds and personnel relative to the expected time for project implementation was a continual concern. The IT PoM team consisted primarily of personnel who were allocating a small proportion of their time to this project on part-time basis. In addition, personnel from different departments, who could provide data
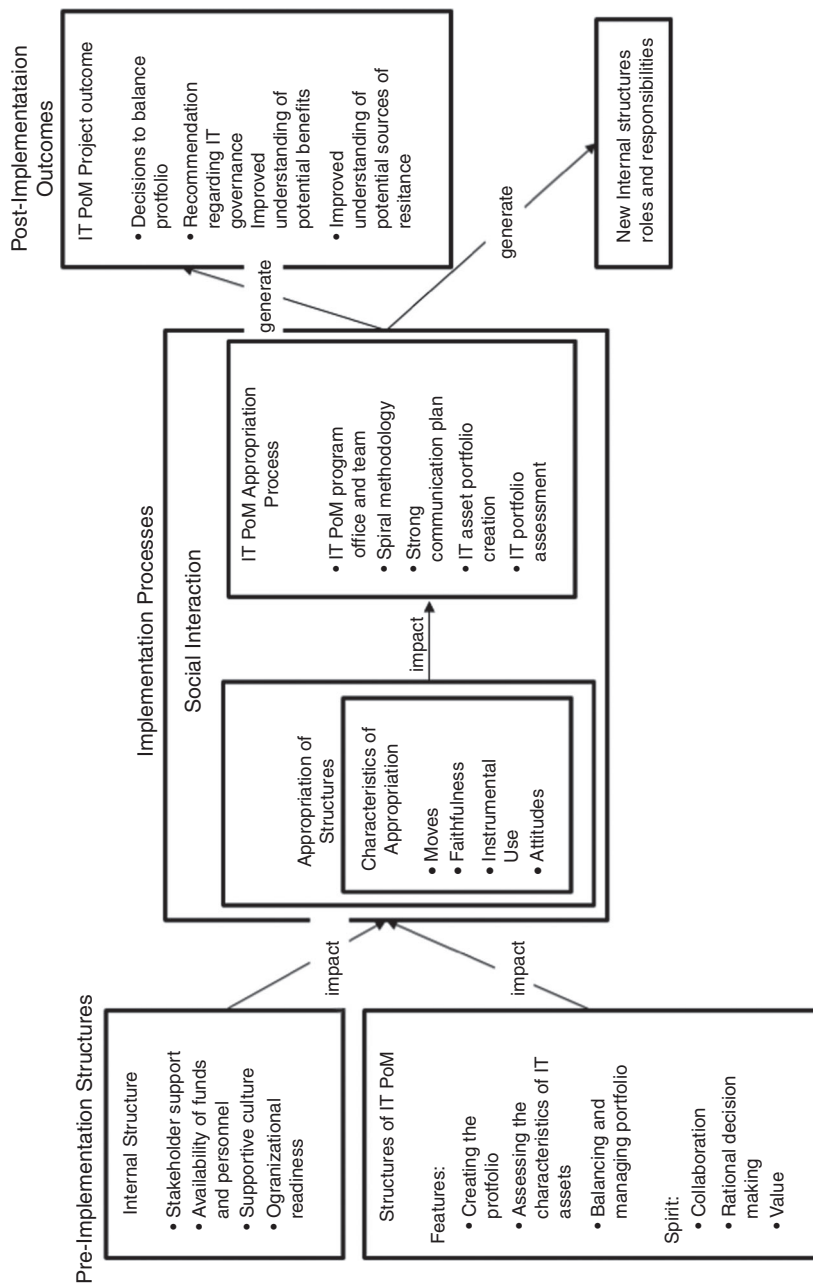
Figure 2.
IT PoM
implementation
framework

needed in the portfolio, were consulted as required. However, such a team organization resulted in conflicts between commitment to the IT PoM project and other competing projects within the organization.

In order to start implementing IT PoM within the organization, senior management wanted to start with a phased implementation. The IT PoM team chose a unit with high organizational readiness to start implementing IT PoM project. The business personnel in the selected unit were motivated and involved in the initiation of the IT PoM project. The selected unit team had very little oversight over their IT assets and their needs were visible in the organization. The IT PoM team members paid close attention to how the organization adapts to changes produced by IT PoM. To facilitate organizational readiness, AlphaCo initiated a comprehensive IT assets data collection plan, a new IT PoM process training, and a communication and notification plan of any visible process and administrative changes. One IT PoM member noted "Enhancements under portfolio management will be rolled out using an organized organizational readiness approach which will include proper training and notification of any visible process changes, administrative changes, or application support changes."

The IT PoM team members understood that when implementing IT PoM, it was important to create a supportive culture by showing users that IT PoM implementation was important to the organization and will be beneficial in their daily work. The existing culture in the organization did not promote updating important data regularly. One IT PoM team member said "We are good at getting data collected but bad at keeping the data updated." The team felt that if upper management pushed for IT PoM and if people see its value by reviewing output reports, they will be more likely to participate in updating and providing the data. These actions might help change the existing culture. The readiness of the organization and the existing culture structures impacted how the organization appropriated the IT PoM processes.

4.2 IT PoM structure

The technology structure includes its features (characteristics) and spirit (values promoted). The IT PoM team defined IT PoM's spirit as "ensuring that IT is aligned and integrated with the business strategy by managing all of IT from a value perspective, providing investment advice, and appropriately managing risk." Thus, the spirit described by the team is a result of rational, collaborative decision making which would benefit the enterprise in terms of value. However, not all stakeholders perceived this spirit, as will be described later in the paper. IT PoM features include the ability to create, assess, and balance the different components in a portfolio. IT PoM involves collecting IT assets data from across the organization and creating an IT asset holistic view. IT PoM assess and balance processes involve analyzing the characteristics of IT assets (i.e. risk, benefit, cost, alignment, and interdependency) and then taking actions (balancing) to manage the portfolio. Balancing actions include project selection, project termination, application retirement, project risk reduction, and project resource allocation. The choice of specific techniques and processes for assessing and balancing a portfolio is how the organization appropriated IT PoM, and is discussed in the following section.

4.3 Implementation: appropriation and decision-making processes

AlphaCo adapted IT PoM by establishing the following five processes: IT PoM program office and team; IT PoM implementation methodology; IT PoM communication plan; IT PoM portfolio creation; and IT PoM assess processes.

An IT PoM program office was created by the CIO office at AlphaCo and staffed with IT and business executives and managers. The program office was also charged with creating and managing the IT PoM project team, tracking progress of IT PoM implementations, establishing an IT PoM council which would assess and balance the portfolio, and working with business units to ensure enterprise-wide integration of the IT PoM efforts. The IT PoM program office designed several tasks during the implementation effort such as reviewing IT PoM pilot results, carrying IT PoM organizational readiness campaign, beginning training programs for IT PoM, integrating IT PoM with strategic planning within the organization, integrating IT PoM council with operational planning and managing IT PoM tool selection.

The program office charged the IT PoM team consisting of key business managers, IT executives (belonging to the IT PoM program office), and IT personnel with implementing an IT PoM pilot project. The business managers validated business requirements and plans, provided sources of information for IT PoM, established communication with the business stakeholders regarding any implementation changes and requirements, and represented the business stakeholder in identifying required processes needed by the business. IT executives were responsible for controlling and reviewing IT PoM implementation, approving a project charter and plan, and tracking IT PoM action items. IT personnel were responsible for developing and executing the IT PoM project plan, tracking and resolving any IT PoM project issues, change management, and ensuring technical quality of the project. The different members of the IT PoM team worked together to establish the IT PoM implementation methodology presented next.

The IT PoM team decided to use a spiral model implementation approach (Boehm, 1988), by which they start with one pilot in order to learn the IT PoM implementation process and then move to subsequent areas in the organization. One IT PoM team member stated "For our implementation approach I would like to see spiral (whirlpool) model starting small and then going out to the organization" The purpose of the pilot was to establish the process of IT PoM and gain the buy-in from the rest of the organization. As one IT PoM team member stated "We are looking for validations to continue through to subsequent pilots. This is the objective of the pilot."

The team decided to implement IT PoM subprojects for each asset type: applications, projects, and infrastructures. One IT PoM team member explained the process as follows: "The scope of this project is defined as implementing the IT PoM approach or framework for applications, infrastructures, and projects. So when we complete applications, infrastructures, and projects for one business unit we could move on to the next business unit and may be before we move on, we have a review meeting to discuss what we have learned from the pilot and what has worked or didn't work." The IT PoM pilot plan was finalized and communicated to all stakeholders involved in the implementation.

Communication was an important factor to prepare stakeholders for change and to increase their buy-in in the project. The IT PoM team emphasized the need to maintain communication with different stakeholders – business users, IT PoM team members, project sponsors, and senior managers – through the different stages of the project. A business manager commented that it was important to communicate with application owners prior to contacting them for IT asset information "I need to get this communication out there in the department […]. I'll call the application owners in the business that will be the best to answer these [IT PoM related] questions." To maintain open communication between the IT PoM team members and senior managers, bi-weekly written and verbal status reports were delivered on regular basis. In addition, at the end of every major

milestone in the project, an IT PoM team member sent a written communication to all IT PoM members, senior management, business users, and sponsors informing them of the progress status as well as next steps to be taken by the project team. Communications to the IT PoM team and users also included feedback from sponsors. For example, an IT PoM team member stated in his communication "The sponsors are impressed with the team's results and the value the IT PoM process can bring in making better IT decisions."

Data collection was part of creating the IT asset portfolio. During the first few meetings, the IT PoM team decided to define the output reports needed in order to control the scope of the IT assets data collection. Four workshops with business managers were conducted to determine the types of reports they would like to see and the type of data needed for the reports. The outcomes from the workshops were shared with the project sponsors and IT PoM council for approval. Two types of data were needed to complete the reports: technical such as IT asset start date, technical specifications, server information, and operational such as IT asset alignment, benefits, cost, business criticality, and risks. The source of data for the technical information was existing systems. While, a survey designed for business and IT experts was used to collect the operational data.

Once data collection was complete, an assessment session was scheduled with a business manager responsible for the IT assets collected. During the assessment, assets in needs for attention were identified. For example, the team identified applications with poor functionality utilization, poor business user satisfaction, and even applications that were supported by IT but in reality were no longer used by the business unit. The data collected was then shared with a business manager, who was surprised by some of the results and expressed that the assessment will allow her to do her job better "I look at something in need of attention I will go to the business and IT experts and tell them that they need to pay attention to a specific IT asset."

4.4 Characteristics of appropriation

Here, the characteristics of appropriation as it is impacted by the structures mentioned earlier are described. AST suggests four characteristics: appropriation moves, faithfulness of appropriation, instrumental uses, and attitude toward appropriation (DeSanctis and Poole, 1994).

4.4.1 Appropriation moves. The IT PoM implementation team adopted most of the proposed IT PoM structures. However, when the same team members moved to the implementation phase they realized that some of the features were harder to implement than they expected. For example, creating the portfolio involved multiple systems that were not integrated and different stakeholders with some that were not willing to share information. Thus, the IT PoM team adjusted the size of the pilot project to include only key IT assets in order to demonstrate the value of IT PoM and achieve buy-in throughout the organization.

4.4.2 Faithfulness. The faithfulness of appropriation is concerned with whether the appropriation is consistent with the spirit and structure of the implementation (DeSanctis and Poole, 1994). One business manager explained the following expected use of IT PoM: "Based on my IT PoM assessments I want to be able to identify opportunities and then make some recommendations for future projects. Do I keep them alive? Do I combine them? Do I replace them or retire them?" However, it was important to note that there were concerns about resource availability, data availability and organizational readiness as discussed in the preceding section on internal structure. Hence, the spirit with which IT PoM was implemented was not clear to all stakeholders. An IT PoM team member said "One thing that we need to be careful about. We need to show that IT PoM

is value added, not 10 tons of administrative work." Table I illustrates different dimensions of spirit (collaboration, rational decision making, and value) and perceptions of different stakeholders.

4.4.3 Instrumental uses. At AlphaCo the purpose of appropriating IT PoM was to benefit the organization as detailed in the case study. The CEO charged the CIO with better management of IT assets and consequently IT senior management at AlphaCo felt the pressure to better manage its IT assets. In order to maintain the organization's interests of effective and efficient IT management and to sustain long-term viability, AlphaCo decided to implement the concept of IT PoM in the organization. The IT PoM team decided to appropriate all the IT PoM features to fully benefit from the approach. The IT PoM team reasoned that the adaptation of IT PoM will help AlphaCo improve IT budget control, increase IT asset transparency, and enable business to view IT as investment. IT PoM process would be expected to provide the organization with an opportunity to improve their decision-making process, as one ITPM team member puts it "We will come up with the list showing your healthier applications, your riskiest applications, your applications that are well aligned with your strategy. Those are the kind of things that we could talk about based on the reports we generate."

4.4.4 Attitude. This is the last aspect of the appropriation construct in AST and it includes: the extent to which groups are comfortable with using the technology; the extent to which groups perceive the technology to be valuable; or the group's willingness to work hard at using the system (DeSanctis and Poole, 1994). The attitudes for the IT PoM implementation were mixed. Most of the IT department stakeholders, business owners, and IT PoM team were very supportive of the IT PoM adaptation, other stakeholders such as infrastructure stakeholders, support group, and IT financial stakeholders that had to change their business processes and share their information were less supportive as they viewed the process as extra work that they did not need. For example, some of the support personnel complained to their management about the time required to provide IT asset information needed to support IT PoM. Others just took several weeks to provide the information resulting in a slow data collection process.

Dimension of spirit	CEO and CIO	Business units	Data providers	IT PoM team
Collaboration	Expected collaborative decision making	Not always collaborative depending on whether some units were used to getting it their way Possible conflict and defensive behavior were observed	Workload, sensitivity of data, and prior history of employee moral including layoffs affects collaboration	Affected by how many other projects personnel were involved in
Relational decision making	Expected	Expected and reinforced by reports generated by IT PoM	Not directly impacted	For the most part
Value	Expected	Initially unsure, greater awareness as project progresses	Unsure since they are not impacted Perceived as overhead	Concerns about administrative overhead and under pressure to demonstrate value to business units

Table I.
Stakeholder perceptions of IT PoM spirit

4.5 Post-implementation outcomes of the IT PoM project
The IT PoM project resulted in different types of outcomes. These included decisions to balance the IT portfolio, recommendations regarding IT governance, definition of roles and responsibilities, improved understanding of potential benefits from IT PoM, and improved understanding of potential sources of resistance for future implementations.

First, the business manager involved in the IT PoM team realized that she could take different types of balancing actions to deal with the assets highlighted in the reports. Her actions ranged from conducting a meeting with appropriate stakeholders to formalizing new projects to deal with any issues with these assets. For instance, a decision was made to remove any unused applications from the server in order to reduce server and support costs. Another decision was made to replace one stand-alone application with enterprise-wide software to leverage existing technologies in the organization. The business manager was frustrated that the functionality of one application was poorly utilized by the users "We had a license for a year and nobody is using the extra functionality" As a result, she decided to initiate training sessions to help users understand the available functionalities of that application. To deal with an application with low usage, the business manager decided to keep it running but not to invest any more money in it. Finally, to deal with an application that had support personnel change frequently, it was suggested that cross-training should be used to minimize support personnel turnover for critical applications. It was important to note that some managers exhibited defensive behavior whenever new actions were suggested. There was concern that the IT PoM process might highlight deficiencies in their current management.

Another project outcome was a recommendation to establish an IT PoM council to govern IT PoM. This council was made up of several of the IT PoM team members, prospective portfolio managers, individuals who were part of strategic initiatives and could coordinate IT PoM processes with the strategic initiatives, and executives representing different business and IT areas in the organization. The IT PoM council would be responsible for reviewing the portfolio to ensure its alignment with the organization's strategic objectives, for approving balancing actions to improve cost, benefits, risks, and service levels of IT assets, and for communicating IT PoM decisions to all relevant stakeholders.

There was agreement that IT PoM provided the organization with a systematic process to make better IT decisions in the future. The IT PoM process allowed the organization to identify legitimate reasons to initiate a project or to kill an existing asset. While there was an agreement on the positive impact of IT PoM on organizational decision making, the project also served as a significant source of learning for future implementations of IT PoM. There was recognition that the pilot project had identified some possible sources of resistance to organization-wide implementation. There was recognition that significant data collection effort was required and that the required personnel were not always available to provide data. In some cases, there was resistance to providing data, because of workload, history, or sensitivity of the data to be provided. The team discussed the fact that possibly including a senior financial expert, who had access to sensitive financial and IT assets' contract data would be an important success factor for an organization-wide implementation. The team also discussed the need for better integration of IT PoM with organization-wide strategic planning.

There was a concern among the IT PoM team members that IT PoM should not result in excessive additional administrative work. Some executives felt that "Because of IT PoM we will not increase headcounts, it becomes part of jobs." One IT PoM team member

answered saying "Someone's job description then has to change if you do not hire anybody." The team agreed that the way to carry IT PoM processes in the future may require changing someone's job description if necessary. The IT PoM team stressed that one important outcome of the IT PoM project was to define roles and responsibilities in the organization for effective IT PoM. To ensure data collection is done properly, the IT PoM team defined the role of a survey administrator as follows: "The administrator needs to administer the survey to all units, compile what they get back, and then send report of the results back to these units." In addition, to ensure that the data are updated frequently, the IT PoM team also recommended the data updates process to be carried out routinely by the personnel responsible for the IT assets.

5. Discussion

The implementation of an IT PoM solution constitutes not only a large and complex effort for an organization but requires major changes in business processes and organizational structure. Given the growing pressure to improve management of IT assets within organizations, it is important that researchers and practitioners understand what features make up IT PoM and what factors are important to implement IT PoM within an organization. A longitudinal case study methodology was used to describe how one large organization implemented IT PoM. Concepts from AST and innovation theory were used to construct a framework (Figure 2) that can be used for further theory development regarding IT PoM, as well as to guide practical implementation.

This study describes a detailed IT PoM implementation process. Such descriptive case studies are particularly valuable when the phenomenon being studied is relatively new and not well understood (Yin, 1994). It illustrates that IT PoM implementation can be conceptualized as a social process that focuses on the interplay between forces supporting IT PoM and forces opposing IT PoM. The identified structure, appropriation process, and outcomes can serve as the basis for a deeper understanding of the organizational wide implementation of IT PoM, spirit interpretations, and resistance issues that arise when implementing IT PoM. In addition, it uncovers important features that make up IT PoM, and relationship between structures and actual appropriation of processes within the organization. The uncovered features and processes in this paper can be extended and validated empirically using IT portfolio professionals.

5.1 Research implications

From a research perspective, concepts such as spirit of implementation have considerable scope for further research. Our results indicate that IT PoM spirit may not be perceived equally by all stakeholders involved in the implementation and may change over time leading to different levels of IT PoM maturity. Additional research could explore how to sense and manage the spirit of an IT PoM implementation in order to successfully implement IT PoM. It is important to realize that organizations could differ considerably in terms of how they appropriate (e.g. what reports they use or how they manage the portfolio). IT PoM and consequently have different levels of IT PoM maturity and IT PoM outcomes (Cunha Dolci et al., 2014). It is possible that some balancing decisions, such as retiring an application or reorganizing support could have significant political implications, thus, requiring strong senior management support. Understanding and tracking the spirit of the implementation, as perceived by different stakeholders, over time could help to better manage IT PoM implementations. Future research could also consider validating and/or extending the framework presented in this paper using additional data.

The study results indicate that IT PoM features are made up of three processes: creating the portfolio; assessing and analyzing the portfolio characteristics based on risk, benefits, alignment, criticality, and cost; and balancing decisions to start projects or terminate under-performing IT assets. The case data underscores the importance of establishing program office made up of executives from different functional areas across the organization, and a project team that represent the different stakeholders involved in the organization. In addition, a spiral methodology was recommended to implement the IT PoM features within the organization to establish and validate the process of IT PoM and gain the buy-in from the rest of the organization. Implementing the IT PoM processes start with collecting data from across the organization and then assessing the health of the different IT assets in the portfolio. The outcome of the pilot included decisions to balance the portfolio, in addition to the establishment of governance steering committee to help push the balancing decisions across the organization. Given the importance of data in the IT PoM processes, changing the way employees around the organization collect and manage data was found to be essential to maintain data quality needed for IT PoM.

Finally, the case study data illustrates how resistance to IT PoM implementation could come about, and highlights the need to manage this resistance proactively. In addition, the rich longitudinal case data and framework presented in this paper could help organizations better understand sources of resistance, and the spirit of the implementation, and differences in stakeholder perception. Such and understanding could result in better management of the politics of an IT PoM implementation.

5.2 Practical implications

The guidelines for adapting IT PoM can help different stakeholders in their role with the IT PoM implementation process. For senior management, the findings indicate that successful IT PoM implementation requires senior management support. Senior management approval was also necessary to diffuse the communication plans within the organization regarding the IT PoM process to achieve the buy-in of users. For IT PoM team members, they should recognize the need to adapt the IT PoM methodology to fit the business unit it is being implemented in and to understand factors that may result in resistance such as lack of communication of IT PoM plans as it relates to progress and value. The results highlight specific practices that adaptation of some practices may be interpreted differently among the stakeholders involved, the challenges to appropriation such as resistance, lack of information availability, poor communication are also important.

6. Conclusions

Despite the increased interest in and the popularity of the PoM concept in managing IT assets, little research exists on the implementation process organizations follow to appropriate IT PoM and the structures needed to be setup within the organization (Lee, 2001). This study makes the following contributions:

- It proposes a research framework based on diffusion of innovation and AST to describe the implementation process of IT PoM.
- It generates an in-depth understanding of internal and technological factors and processes (i.e. create, assess, and balance) associated with implementing IT PoM using rich data from one Fortune 500 organization.

- It develops a general framework that could help integrate academic and practitioner perspectives (Teubner, 2007).

- It helps sensitize researchers and practitioners about different types of structures, including spirit as perceived by different stakeholders and, how organizations appropriate these structures, and the consequences of appropriating these structures in the context of IT PoM.

Using one case study is a limitation of this research since it limits the generalization of the results. However, it allowed us to explore in-depth the rich themes and interactions across departments evolving during the implementation. Managers could use the IT PoM framework as well as the rich detail in this case study to plan for and guide their IT PoM implementation process. Researchers could use or enhance our framework with other theories and using multi-case approach in order to add to our understanding of IT PoM implementations.

References

Akkermans, H. and Van, H.K. (2002), "Virtuous and vicious cycles in ERP implementation: a case study of interrelations between critical success factors", *European Journal of Information Systems*, Vol. 11 No. 1, pp. 35-46.

Boehm, B.W. (1988), "A spiral model of software development and enhancement", *IEEE Computer*, Vol. 21 No. 5, pp. 61-72.

Bostrom, R.P., Gupta, S. and Thomas, D. (2009), "A meta-theory for understanding information systems within socio-technical systems", *Journal of Management Information Systems*, Vol. 26 No. 1, pp. 17-47.

Burger, K. (2014), "The 5 biggest challenges facing IT professional", *Information Week: Insurance and Technology*, available at: www.insurancetech.com/the-5-biggest-challenges-facing-it-professionals/d/d-id/1315108? (accessed April 27, 2015).

Cao, L., Mohan, K., Xu, P. and Ramesh, B. (2009), "A framework for adapting agile development methodologies", *European Journal of Information Systems*, Vol. 18 No. 4, pp. 332-343.

Chau, P.Y. and Tam, K.Y. (1997), "Factors affecting the adoption of open systems: an exploratory study", *MIS Quarterly*, Vol. 21 No. 1, pp. 1-24.

Cunha Dolci, P., Carlos Gastaud Maçada, A. and Grant, G. (2014), "IT investment management and information technology portfolio management (ITPM) Brazilian case studies", *Journal of Enterprise Information Management*, Vol. 27 No. 6, pp. 802-816.

Daniel, E.M., Ward, J.M. and Franken, A. (2014), "A dynamic capabilities perspective of IS project portfolio management", *The Journal of Strategic Information Systems*, Vol. 23 No. 2, pp. 95-111.

Datz, T. (2003), "Portfolio management: how to do it right", available at: www.cio.com/archive/050 103/portfolio.html (accessed March 12, 2015).

Dennis, A.R. and Garfield, M.J. (2003), "The adoption and use of GSS in project teams: toward more participative processes and outcomes", *MIS Quarterly*, Vol. 27 No. 2, pp. 289-323.

Desanctis, G. and Poole, M.S. (1994), "Capturing the complexity in advanced technology use: adaptive structuration theory", *Organization Science*, Vol. 5 No. 2, pp. 121-147.

Eisenhardt, K.M. (1989), "Building theories from case study research", *Qualitative Market Research: An International Journal*, Vol. 3 No. 2, pp. 82-89.

Elbanna, A. (2010), "Rethinking is project boundaries in practice: a multiple-projects perspective", *Journal of Strategic Information Systems*, Vol. 19 No. 1, pp. 39-51.

Fitzpatrick, E.W. (2005), *Planning and Implementing IT Portfolio Management: Maximizing the Return on Information Technology Investments*, IT Economics Corporation, Gaithersburg, MD.

Garr, J.E. (2006), "Projects without portfolio?", available at: www.public-cio.com/story.php?id=2006.08.10-100526 (accessed January 04, 2015).

Giddens, A. (1984), *The Constitution of Society*, Polity Press, Cambridge.

Iacovou, C.L., Benbasat, I. and Dexter, A.S. (1995), "Electronic data interchange and small organizations: adoption and impact of technology", *MIS Quarterly*, Vol. 19 No. 4, pp. 465-485.

Jeffery, M. and Leliveld, I. (2004), "Best practices in IT portfolio management", *MIT Sloan Management Review*, Vol. 45 No. 3, pp. 41-49.

Kaplan, J.D. (2005), *Strategic IT Portfolio Management: Governing Enterprise Transformation*, Pittiglio Rabin Todd and McGrath Inc., New York, NY.

Klein, K. and Sorra, J. (1996), "The challenge of innovation implementation", *Academy of Management Review*, Vol. 21 No. 4, pp. 1055-1088.

Kumar, R., Ajjan, H. and Niu, Y. (2008), "Information technology portfolio management: literature review, framework, and research issues", *Information Resources Management Journal*, Vol. 21 No. 3, pp. 46-87.

Lee, A. and Baskerville, R. (2003), "Generalizing generalizability in information systems research", *Information Systems Research*, Vol. 14 No. 3, pp. 221-243.

Lee, A.S. (2001), "Editor's comments – research in information systems: what we haven't learned", *MIS Quarterly*, Vol. 25 No. 4, pp. v-xv.

Lee, C.Y., Tsao, C.H. and Chang, W.C. (2015), "The relationship between attitude toward using and customer satisfaction with mobile application services: an empirical study from the life insurance industry", *Journal of Enterprise Information Management*, Vol. 28 No. 5, pp. 680-697.

Levin, G. and Wyzalek, J. (2015), *Portfolio Management: A Strategic Approach*, CRC Press, Taylor and Francis Group, Boca Raton, FL.

Liang, H., Peng, Z., Xue, Y., Guo, X. and Wang, N. (2015), "Employees' exploration of complex systems: an integrative view", *Journal of Management Information Systems*, Vol. 32 No. 1, pp. 322-357.

Lwakatare, L.E., Kuvaja, P., Haapasalo, H. and Tolonen, A. (2015), "Empirical challenges in the implementation of IT portfolio management: a survey in three companies", in Zdravkovic, J., Kirikova, M. and Johannesson, P. (Eds), *Advanced Information Systems Engineering*, Vol. 9097 of the series Lecture Notes in Computer Science, Springer International Publishing, pp. 453-467.

Maizlish, B. and Handler, R. (2005), *IT Portfolio Management: Unlocking the Business Value of Technology*, Wiley, Hoboken, NJ.

Miles, M.B. and Huberman, A.M. (1994), *Qualitative Data Analysis*, Sage, Thousand Oaks, CA.

Nutt, P. (1986), "Tactics of implementation", *Academy of Management Journal*, Vol. 29 No. 2, pp. 230-261.

Orlikowski, W. and Robey, D. (1991), "Information technology and the structuring of organizations", *Information Systems Research*, Vol. 2 No. 2, pp. 143-169.

Orlikowski, W.J. (1992), "The duality of technology: rethinking the concept of technology in organizations", *Organization Science*, Vol. 3 No. 3, pp. 398-427.

Peppard, J. (2003), "Managing it as a portfolio of services", *European Management Journal*, Vol. 21 No. 4, pp. 467-483.

Peters, L. (2006), "Conceptualizing computer-mediated communication technology and its use in organizations", *International Journal of Information Management*, Vol. 26 No. 2, pp. 142-152.

PMI (2013), *The Standard for Portfolio Management*, 3rd ed., Project Management Institute, Newtown Square, PA.

Reyck, B.D., Grushka-Cockayne, Y., Lockett, M., Calderini, S.R., Moura, M. and Sloper, A. (2005), "The impact of project portfolio management on information technology projects", *International Journal of Project Management*, Vol. 23 No. 7, pp. 524-537.

Rogers, E. (1983), *Diffusion of Innovations*, 3rd ed., Free Press, New York, NY.

Schwieger, D., Melcher, A., Ranganathan, C. and Wen, H.J. (2004), "Appropriating electronic billing systems: adaptive structuration theory analysis", *Human Systems Management*, Vol. 23 No. 4, pp. 235-243.

Strauss, A.C. and Corbin, J. (1998), *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, Sage Publications, London.

Teubner, R.A. (2007), "Strategic information systems planning: a case study from the financial services industry", *Journal of Strategic Information Systems*, Vol. 16 No. 1, pp. 105-125.

Tu, Y. and Shaw, M.J. (2011), "An integrated approach to managing IT portfolio", in Sharman, R., Rao, H.R. and Raghu, T.S. (Eds), *Exploring the Grand Challenges for Next Generation E-Business*, Springer, Berlin, pp. 243-253.

Ward, K., Bowman, C. and Kakabadse, K. (2005), *Designing World Class Corporate Strategies*, Butterworth Heinemann, Oxford.

Weill, P. and Vitale, M. (1999), "Assessing the health of an information systems applications portfolio: an example from process manufacturing", *MIS Quarterly*, Vol. 13 No. 4, pp. 601-624.

Yin, R. (1994), *Case Study Research: Design and Methods*, Sage Publishing, Beverly Hills, CA.

Yin, R.K. (2003), *Case Study Research Design and Methods*, Applied Social Research Methods Series 5, 3rd ed., Sage Publications, Inc., Thousand Oaks, CA.

Zhu, K., Kraemer, K.L. and Xu, S. (2006), "The process of innovation assimilation by firms in different countries: a technology diffusion perspective on e-business", *Management Science*, Vol. 52 No. 10, pp. 1557-1576.

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