

Deriving Information Systems Innovation Execution Mechanisms

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Abstract

Despite a wealth of studies focusing on innovation, types of innovations and their outcomes, the process of innovation has largely been under studied. In 2010, Swanson calls for researchers to address the 'innovation process black box', to better understand how IT innovation potential can be exploited upon. This study derives and instantiates three unique and mutually exclusive innovation execution mechanisms: Continual, Progressive and Plug and Play. The innovation execution mechanisms of this study are developed with reference to Swanson (1994) Information Systems innovation types.

Keywords

Enterprise Systems, Innovation Execution, Innovation Execution Mechanisms.

INTRODUCTION

Researchers have established the potential of Information Systems (IS) to introduce innovation (Clemons 1986; Swanson and Ramiller 2004). Over the years, organizations have invested substantial resources with the expectation of receiving the benefits of innovation through the adoption of IS (Swanson 2007; Swanson and Wang 2005). Corporate IS, of which Enterprise Systems (ES) are an archetype, have been especially touted as a key driver of delivering benefits through innovation (Shang and Seddon 2002). There is much evidence of how organizations have innovated through ES, yielding increased efficiency and effectiveness through better governance, platform flexibility, best practices and integration of business processes (Gable et al. 2008; Seddon et al. 2010; Sedera and Gable 2010). In addition, scholars recognize the potential of ES innovation (Rajagopal 2002; Seddon et al. 2010). Swanson and Dans (2000) explained that systems deteriorate over time and eventually must be retired or upgraded. Thus, we argue that the effective management of innovation execution leads to high system life expectancy. Such a system not only provides the innovation potential at the time of its introduction to the organization, but also provides a vital lifecycle-wide platform for future innovation potential. It has also been recognized that for continuous innovation through IS, organizations must seek a lifecycle-wide innovation strategy (King and Burgess 2006).

Further, the advancements in IS have provoked organizations to constantly improve their IS (Wiredu 2012). The upsurge of digital transformation, globalization and changes in the socio-economic landscape have made continuous innovation a necessity for the survival and growth of organizations (Gorodnichenko et al. 2010). Such changes in the IS landscape are manifested as products and services that provide further opportunities for organizations to innovate through *new IS* (Lyytinen and Newman 2008).

In IS research, a wealth of studies spanning two decades has adequately addressed the types of IS innovations (Grover 1997) as well as their outcomes (Pil and Cohen 2006; Tufano 1989). However, to date, no study has explored the execution of IS innovation. In an input (i.e., IS innovation types) to output (i.e., outcomes of innovation) model, we herein refer to the 'process' or how IS innovations can be enacted to yield the desired outcomes in an organization. In this research, we attempt to reveal the components of this "black box of innovation process" (Swanson and Wang 2005, p.29) by developing three mechanisms through which IS innovations can be executed. Our research-in-progress findings are instantiated by data gathered from four case organizations.

We define innovation execution as the ways in which the innovation potentials are enacted, that is *how* and *what* execution mechanisms operate. This phenomenon of innovation execution is different to innovation diffusion,

adoption and innovation implementation for the following reasons. The innovation diffusion literature focuses on the dissemination and transfer of innovation to the end users (Mahajan et al. 1990; Rogers 1983), whereas innovation adoption focuses on the decision to use the system (Tornatzky and Klein 1982). In contrast, Klein and Knight (2005) outlined innovation implementation as the use of innovation in a skilled, consistent and committed manner. The subtle yet apparent difference between innovation execution and implementation is that execution focuses on the enactment or continuous incorporation of the potential innovations whereas implementation focuses on the effective use of the already implemented innovation. Simply, innovation execution can be explained as a set of methods to germinate innovations from an innovation. For example, an implemented ES is an innovation where further innovations can be yielded through the right execution.

Our innovation execution mechanisms are developed with reference to Swanson (1994) IS innovation types. The selection of Swanson's innovation typology as the basis of our innovation execution mechanisms is justified through: (i) its wider pervasiveness with technology (Grover et al. 1997), (ii) its ability to describe the contemporary IS landscape in its entirety, outlining potential innovations through ES using ES architecture, governance and system capabilities, and (iii) its simplicity. Furthermore, despite its origins in Swanson's tri-core model, we argue that our innovation execution mechanisms can be generalized for most IS innovation classifications.

INFORMATION SYSTEMS INNOVATION AND ENTERPRISE SYSTEMS

Over the past two decades, Swanson (1994) tri-core approach has been employed by many to understand the innovation capabilities of IS (Lee et al. 1995; Subramanian and Nilakanta 1996). Herein, we argue that the IS innovation types proposed by Swanson can be employed to describe the innovation potential of an ES; from governance to process improvements. As Swanson argued, although these innovations are available to all adopters, such innovations must be applied differently according to the strategic priorities of the organization. The objective of our innovation execution mechanisms described henceforth is to identify how IS innovations can be enacted upon. The proposed innovation execution mechanisms allow organizations to select their innovation execution strategy based on the current capabilities of the system and organization's strategic priorities.

Swanson (1994) argued that the dual core model¹ proposed by Daft (1978, p.1072) is insufficient to describe IS innovation. He describes IS innovation as "innovation in the organizational *application* of information technology." According to Swanson, IS span across both the technical and administrative cores of an organization and links these two cores by creating a new informational layer. Thus, he proposed an additional functional IS core and extended the dual core model to a tri-core model for IS innovation. The tri-core model includes three fundamental types of IS innovation, categorized as Type I, Type II and Type III. Type I innovation is defined as the process innovation limited to the functional IS core. Type I is further classified into Type I(a) and Type I(b), where Type I(a) focuses on IS administration while Type I(b) focuses on IS technical tasks. In relation to ES, Type I(a) can be identified as the introduction of a Chief Information Officer (CIO) or the decision to outsource the IS department (Grover 1997). Type I(a) innovations are strategic initiatives, which involve high risks and the commitment of extra resources. Type I(b) innovation in ES can be introduced through technology platform innovations like Cloud ERP or Mobile ERP where "the nature of IS work is changed" (Grover 1997, p.233). Swanson's Type II innovation is about new IS products and services to the administrative core. A key distinction here is that Type II innovation does not have an effect on the core business processes of the organization. The introduction of administrative-focused ES modules on HR and Finance modules is an example of the Type II innovations available through ES. Type III innovation affects the core business processes of the organization. Type III innovation represents clear value propositions to the organization's core business activities. Thus, such innovations have a direct effect on the productivity and efficiency of the organization. Swanson divides Type III innovation into three sub-levels. Type III(a) denotes innovations in core business processes, Type III(b) refers to innovations in basic business products and services, while Type III(c) refers to innovations in integrating external business parties such as suppliers and customers. ES deliver Type III(a) innovation potentials through application modules that are focused on core business activities (e.g., Sales and Distribution, Material Management modules). Furthermore, ES could deliver Type III(b) innovation through add-on components such as the introduction of Point of Sales systems or dynamic catalogues. Here too, productivity improvements are eminent. ES examples of Type III(c) innovations include the introduction of

¹ Daft proposed a dual core model of innovation that focuses on the administrative as well as the technical core of an organization. The administrative innovation is associated with the organization's social system where it emphasizes the changes in organizational structure, procedures, roles and rules. In contrast, technical innovation focuses on the primary business processes.

Supply Chain Management (SCM), Customer Relationship Management (CRM) and Supplier Relationship Management (SRM) systems to the organization.

In addition, Swanson (1994) identified a weak order effect stemming from the IS functional core towards the business core (Type I to Type III) and a strong order effect stemming from the business core to the IS functional core (Type III to Type I). Further, he recognized the strategic importance of IS for Type III innovations. However, Grover (1997) argued that strategic imperatives as well as innovation dynamics determine the order effects in various organizations. He further explained that these Type I and Type III innovations are not mutually exclusive. However, the interesting fact is that in the modern business environment, all the three types can be wrapped in one core IS product. For example, in ES architecture, modules such as HR, Finance, CRM, and SCM can be integrated into one single application. Nevertheless, the execution of these innovation typologies is not widely discussed in the literature, resulting in a significant gap in knowledge.

RESEARCH METHOD

This research-in-progress paper reports the preliminary findings of four case studies conducted to instantiate the types of innovation execution mechanisms. The case studies included three client organizations using an ES and one ES consulting organization. When selecting the client organizations, we considered organizations that had already implemented an ES and were at the onwards/upwards phase of the ES lifecycle as identified by Markus and Tanis (2000). The lifecycle phase was an important consideration for selecting the case organizations, given Swanson and Dans (2000) argument about systems deteriorating over time, and the negative consequences of this deterioration for innovation. An ES consulting organization was included particularly to substantiate the views of the IS core. According to Swanson (2010), the consultant plays a substantial role in the innovation process. Table 1 presents the details of the case organizations².

Table 1. Details of the Case Organizations

Company (Interviewee)	Revenue (US\$)	Industry	Number of Employees	Interviewee's Position	No. of Hours
A (A1)	47 billion	A "big 3" ICT consulting company (global, private sector)	200,000	Consulting Services Lead	5
B (B1)	640.6 million	The largest trading goods equipment pooling company in the southern hemisphere (global, private sector)	7,000	Chief Information Officer	5
C (C1)	306.4 million	Dairy producer (global, private sector)	1,500	Supply Chain State Manager	3
D (D1)	677.7 million	Road and transport management (public sector)	3,000	Chief Information Officer	4

DATA COLLECTION AND ANALYSIS

We conducted eight (8) interviews with each representative, lasting between 90-120 minutes and a total of 17 hours of interview data (transcribed to about 150 pages). The interviewees were senior level managers, each with an average of 11 years of relevant industry experience and were widely considered to be opinion leaders with strong alignment with the research topic. Before starting each interview, we briefed the interviewees about the objectives of the research. We recorded, took additional notes, and transcribed the interviews. The first interview with each participant was exploratory in nature, largely discussing the history of their organization's ES lifecycle, key system-related events, changes to the ES landscape, and the expected benefits of each system. Subsequent interviews focused predominantly on the manner in which the organizations sought additional benefits from the system. All the interviews were conducted by a team of researchers. Data analysis was performed following the guidelines of Eisenhardt (1989). As Eisenhardt (1989) suggested, the emergent notions in one interview were verified in the following interviews until the state of theoretical saturation was reached, where we were able to comprehensively explain the results of the study. Swanson (1994) formed the initial set of

² Due to ethical obligations between the university and the case organizations, the names of the companies are disguised.

themes through which we analysed the interview data. The results of the data analysis are reported by reference to the identification of innovation execution mechanisms and the management of innovation execution.

Identification of Innovation Execution Mechanisms

Before seeking to identify the types of innovation execution mechanisms, we first sought to establish the pre-conditions of the phenomenon. First, we established that an ES in fact provides the foundation of innovation potential to the organization. This proposition received unanimous agreement from all the case organizations. A1 stated, “ES is an innovation that provides competitive advantage.” C1 mentioned, “Implemented system gives us opportunity to innovate.” Company B and D agreed, “[that] ES is an innovation that increased the productivity.” Second, we must identify that the organization is actively seeking innovation potential of the ES, throughout its lifecycle. A further qualification is that ES innovation potential wears-off towards the latter part of the lifecycle (Swanson and Dans 2000).

Once the pre-conditions were established, all the interview transcripts were analysed for common patterns in the past, present and planned technology-driven innovation. Such innovations of the four organizations (the consulting company commented on their projects attached to ES) included an effort to implement radio frequency identification (RFID) solutions by leasing equipment (and finally abandoning it) (Company B); the development of product catalogues (Company C); and the incorporation of traffic management systems with bush fire and natural disaster systems (Company D). Overall, each company undertook 7-8 salient activities after their ES implementation. These activities were analysed using descriptions provided by the respondents, and each item was then labelled using Swanson’s (1994) types of innovation. This process of identifying IS-related innovation activities and labelling them with Swanson’s three innovation types led to the discovery of the innovation execution mechanisms. Each organization demonstrated a set of characteristics that distinguished the way they executed innovation. This yielded three types of innovation execution mechanisms as summarized in Figure 1.

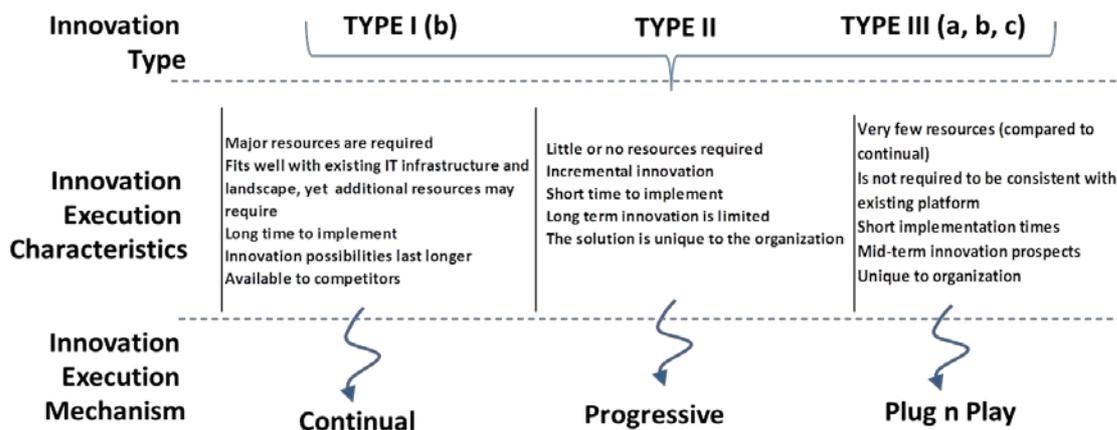


Figure 1: Innovation Execution Mechanisms

We argue that a better understanding of innovation execution mechanisms would facilitate increased productivity, efficiency and ultimately result in competitive advantage. Each of the three identified types of innovation execution mechanisms, namely, continual innovation execution, progressive innovation execution, and plug and play execution, is discussed as follows.

Continual Innovation Execution

Continual innovation execution defines the way that organizations carryout major innovations based on the existing IT (in our case, ES) infrastructure and architecture. Continual execution involves organization-wide changes and/or larger business processes and is generally considered as a long-term investment in resources allocation. Usually, the business processes fulfil multiple business objectives and this method is used for executing major, risky and pre-planned business tasks. For example B1 stated, “[The] addition of a module like HANA involves lot of money, time and makes changes to our existing platform. We are in the process of planning whether to go ahead with this new module or not.”

The configuration time can be similar to that of configuring an enterprise application and the frequency of executing this method is very low. From the ES context, Type II, Type III(a) and Type III(c) innovations can be executed through this mechanism.

We identified this execution mechanism (or lack thereof) in all three client organizations, supported by the consulting company. For example, C1 mentioned, *"We needed our suppliers/franchisers to be connected to our system. Then we have the full visibility. Therefore, we are in the process of integrating these systems."* Similarly, B1 mentioned, *"Integrating our customers to our system was crucial as our business model is different. Therefore, we implemented a whole new CRM module."* Company D had not had a major technology led innovation during the term of the current CIO. D1 stated, *"We are gearing to introduce a new ES in the coming years. It's a costly decision."* A1 summarized the industry sentiments of continual innovation stating, *"[That] the general tendency in the market place is smaller, incremental projects. They don't yield the same 'bang', but that's the nature of the current business."*

Progressive Innovation Execution

Progressive innovation execution focusses on innovating smaller, well-contained task/s. Another characteristic of progressive innovation execution is that it does not require any changes to technology platforms or major business process re-design. In general, business tasks may fulfil one or a few business objectives and they are considered as a mid-term investment. In addition, the progressive innovation mechanism does not require high levels of financial investment. An important consideration here is that a progressive innovation execution mechanism can only be employed with a stable IT platform. As we discussed earlier, our case organizations considered the ES to be a 'trampoline' for innovation. Through this execution type, no radical innovation can be adopted, and the focus is squarely on incremental innovations. Progressive innovation execution can be exemplified in the activation of a sub-module such as the Foreign Trade in Sales and Distribution module. Therefore, Type I(b) innovations are executed through the progressive innovation execution mechanism. For example, C1 stated, *"Since we have already implemented [an] SCM module in our system, we needed to optimize our supply chain using the SCM optimizer. This module doesn't cost as much as the SCM module and implementation doesn't impact much on our ongoing business processes."* B1 concurred with C1 and stated *"Since we had SAP BW implemented, we incorporated Business Objects on top of that."* The addition of incremental functionality was also common at Company D, where D1 state that, *"We are planning to implement business intelligence platform to increase the efficiency of our system."* A1 argued that the nature of consulting companies is changing because of these smaller innovation projects *"There are lots of smaller, yet specialized consulting companies now than it was 5 years ago...things are changing and the companies are striving for smaller projects with immediate innovations."*

Plug and Play Execution

The plug and play innovation execution is evident when firms employ unorthodox small or ad-hoc plug-in applications to their ES layer. The advent and proliferation of mobile technology has increased the prominence of this execution mechanism. In general, plug and play executions are comparatively low investments catering to specific business needs of an organization. This is the most effective method of execution when the urgency is high. The configuration time is very low compared to Progressive and Continual execution. This innovation execution mechanism cannot be observed unless the ES base is stable and optimized. B1 stated that, *"Our IT department developed this application within a very short period with a very little amount of money and resources. We could easily introduce this to our staff and execution of this had no impact on any other business processes."* Similarly, C1 mentioned that, *"We added dynamic catalogs to our system. The importance of each product changes in each period and marketing team manages this."* Similarly, A1 outlined that, *"Different visions, budgets, strategies and urgency leads to implementation of different solutions."*

From ES perspective, mainly Type III(b) innovations can be executed through this. Yet, any ad-hoc plug-in application in any other innovation type too can be executed through this mechanism. B1 stated, *"For those customers who don't have SAP implemented in their companies we added a VB script in our cloud, so that they too have access to our system."* B1 further stated that, *"We added RFID technology to our system."* These are examples of the plug and play execution method where the execution of these innovations brings monetary advantages and increases productivity, yet these are not complicated, complex executions like the continual and progressive.

In the contemporary business landscape, business models and IT are virtually inseparable (Peterson 2004). The advancements in IT have increased the integration and progression of IS such that the need for doing the right thing at the right time involving the right people has become essential. Thus, as Peterson (2004) argued, IT governance is the enterprise management system through which an organization's portfolio of IT systems is directed and controlled. We recognize Type I(a) innovations as strategic initiatives that bring value to the

business. The appropriate execution of Type I(a) innovation arguably could lead the organization to reap long-term benefits. Consequently, the execution of Type I(a) innovations is done through IT governance. However, in this paper we focus solely on the execution of potential innovations through ES.

CONCLUSION

The primary objective of this study was to understand what most innovation thought leaders (e.g., (Swanson and Wang 2005)) argued as the ‘innovation black box’ – the manner in which the innovation potential is enacted. First, we defined innovation execution process as, the ways in which organizations enact the innovation potential. Next, we determined three types of innovation execution mechanisms that corresponds with the three innovation types of Swanson (1994). The three innovation execution mechanisms: Continual, Progressive and Plug and Play provide unique, mutually exclusive innovation execution methods. Innovation execution is an important area of study since it ensures that the innovations achieve its full potential. As Govindarajan and Trimble (2010) explains, innovation execution is the challenging and the difficult part. To the best of our knowledge, neither the literature on innovation or IS/ES has discussed execution mechanisms. We derive and instantiate the innovation execution mechanisms using four cases. The case findings were derived through 8 interviews of 20 hours, totalling 150 pages of transcribed data.

Our execution mechanisms not only provide actionable mechanisms for an organization seeking IT innovation, it also recognizes the potential of the current IT infrastructure. Most organizations and academic studies (Kline and Rosenberg 1986; Swanson and Ramiller 2004) consider IT as a ‘sunk cost’, without recognizing the important foundation that it lays for innovation potential. Especially, with the advent of cloud and mobile technologies, companies have the opportunity to engage in low cost innovations that are tied to their back-end ES. Similarly, as touted by many (Davenport 2000; Markus et al. 2000; Seddon et al. 2010), ES must be progressively improved through business process optimizations, systems optimizations and also by introducing appropriate training schemes for end-users. The continual innovation execution mechanism takes into account unlocking the innovation potential as a result of major updates to the software. This too is at a verge of a major technology change, with the advent of in-memory technologies and big-data analytics. Finally, we introduced the importance of selecting the appropriate composition of innovation execution mechanisms– taking into account such aspects like organizational capabilities, motivations and awareness. Therein, we do not contribute to a single strategy or pattern of innovation execution mechanisms to all companies.

The study findings will be meaningful to IS academics and practitioners alike. Given the identification of innovation execution mechanisms, researchers and practitioners could observe ‘how’ organizations could innovate through IT. Though, the findings are heartening, future replication, multi-method work is required for broader generalizability. There is also the potential to observe what Swanson (1994) called the ‘order effects’ and ‘interrelationships’ of innovation execution mechanisms. We acknowledge the atheoretical nature of the construct derivation process, but argue that our conceptualization will facilitate a new theoretical view on IT innovation, its execution and its outcomes.

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