Inter Organizational System flexibility and standardization in innovative services: complementarity, opposition or independence?

Completed Research Paper

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Abstract

This paper examines the orientations of information systems (IOS) between characteristics of flexibility and standardization in the specific case of service innovations. More specifically it investigates the often taken for a fact tension between standardization and flexibility in this context. We explore this issue based on a case study drawn from the banking industry. Evidence is based on data collected over a significant period of time. Results show that in an innovative BPO, standardization and flexibility relationships depend on the level of analysis of the information system and involve a large number of elements that have been only partially considered in the literature.

Keywords: Flexibility, Standard(s)/ standardization, Inter-organizational systems, Service Innovation, Business process outsourcing.

Introduction

Service innovations are particular in nature and are most often associated with risks that carry a high degree of uncertainty (Greenhalgh et al. 2004; Maglio & Spohrer, 2008). Service innovations, which quickly materialize, can give way to a high surge in demand. Alternatively, the actual service demand could be much lower than the anticipated volumes, in which case, efficiencies are lost and resources could be wasted. Therefore service innovations require both volume flexibility and some standardization for automating the process where possible and thus benefit from scale economies. Moreover, service innovations also provide customized flexibility to account for different inputs in the process. If the process needs re-engineering or specific external capacities, companies may prefer to outsource it through Business Process Outsourcing (BPO). These BPOs are most often associated with Inter-Organizational Information Systems (IOS) that are part of the infrastructure. In such a BPO context when a service innovation is IT-based, flexibility and standardization are built in an Inter-Organizational Information System (IOS) whose components must be compatible and synchronized to some extent (de Corbière & Rowe, 2013). An IOS is « *a system in which two or more independently managed organizations communicate in a company, cooperative or commercial network in a memory-to-memory fashion, without the transfer of physical media* » (Suomi, 1992, P.96). An IOS has to respond to two potentially contradicting orientations. The first one is flexibility in order to accommodate for demand fluctuations, heterogeneity of inputs, environmental factors, and new arising technologies. The second one is standardization, so as to ensure that the service is productive, controllable and secure. While recognizing potential complementarity between them (Duncan, 1995), the IS literature often presents the flexibility and standardization orientations as difficult to conciliate with one another, if not as contradictory (Gebauer & Lee, 2005; Gebauer & Schober, 2006; Wimble et al., 2010). Thus, studying IOS flexibility and standardization relationships becomes more relevant in service innovation contexts where greater emphasis is put on flexibility needs to respond to "innovation" while responding in parallel to service "standardization" and performance tracking requirements. Building on the recent literature on flexibility types and synergies (Kumar, Stylianou, 2014), this paper seeks to answer the following question:

How are the needs for IOS flexibility and standardization managed in innovative services?

To study this question we chose the banking industry, which is precisely characterized by the need to provide a robust infrastructure that is compliant to professional standards, and yet be flexible enough to meet all kinds of changes in customer demands, provide new service offerings and handle changes in the external environment. The paper is structured as follows. In the first section, we present the literature on service innovations in BPOs, IS flexibility and standardization, how the relationship between both has been presented in previous scholarly work, and the theoretical framing of our research. Next we justify our use of the single case study method. The third section presents our data analysis and interpretation. We conclude with our findings and a discussion on how these findings contribute to the existing body of knowledge.

Literature Review & Theoretical Framing:

Service Innovation & Business Process Outsourcing (BPO)

Service innovative BPOs are the delegation to a supplier of an entire business process that delivers a service with innovative features (Raymond & Rowe, 2014). Fundamentally, service innovation is about creating beneficial improvements (Alter, 2008). Innovativeness of services is likely to differentiate the service provision of a company from others so that the company attracts new types of customers or allows it to penetrate into new markets and retain current customers, or to find innovative solutions to current problems, which will eventually contribute to the company's revenue growth. Firms may outsource the provision of certain services or processes when they do not have the in-house competences or capabilities (Mani et al., 2010; Raymond & Rowe, 2014). Under pressure for innovating in the provision of more accessible services with all kinds of new channels, banks may request vendors to serve them with information systems that support their own flexibility and standardization constraints. In turn these

constraints may constitute an advantage for the vendor who can diminish his own IT investment related risk when the relationship is not exclusive with one single bank. The vendor can then leverage on his IT investment.

IOS Flexibility and Standardization Relationships

IS flexibility definitions are numerous in the IS literature. This concept takes on many different meanings according to the context. In the context of IT infrastructure, Byrd and Turner's (2000, p.172) present the following definition: "*IT infrastructure flexibility is the ability to easily and readily diffuse or support a wide variety of hardware, software, communications technologies, and values within the technical physical base and the human component of the existing IT infrastructure* ». Such flexibility depends on the degree to which its resources are sharable and reusable (Duncan, 1995). In a more general context, IS flexibility enables organizations to respond to changes in their environments (Byrd et al., 2010). IS literature also distinguishes a number of components such as Technical IT infrastructure (IT Connectivity, Applications Functionality, IT Compatibility, Data Transparency), and Human IT Infrastructure (Technology Management, Business Knowledge, Management Knowledge, Technical Knowledge) (Byrd & Turner, 2000). Kumar & Stylaniou (2014) provide a typology of three broad types of IS flexibility needs and 10 sub-types at a lower level, which they incorporate in a process model of IS flexibility management: IS operations (volume, operating, input/output, integration), IS and services development and deployment (development, new technology deployment), IS management (financial, sourcing, and staffing). Interestingly they show that synergies and trade-offs between these types of IS flexibility have not been researched. Towards this aim they prescribe five IS flexibility management strategies: IS development, IS governance, IT architecture, sourcing and workforce. They show that most of these strategies are used to achieve multiple types of flexibility.

Let us now turn our attention to standardization. In the domain of technological innovations, David & Greenstein (1990, p.4) define a standard as "*a technical specification adhered to by a producer, either tacitly or as a result of a formal agreement*." Whether it is de facto or de jure, proprietary or open, it can be defined as a construct that results from reasoned, collective choices and enables agreement on solutions to recurrent problems" (Tassey, 2000, p.2). Tassey considers that IT standards are set to assist in the production process. Moreover, IT standards have specific roles to adhere to: ensuring quality and reliability, setting information standards, warranting compatibility and interoperability as well as reducing variability.

When it comes down to the relationship between flexibility and standardization, the IS literature only exceptionally deals with the specific case of IOS. Furthermore, it does not seem to have reached a consensus on the exact nature of the relationship between IS flexibility and standardization. Generally speaking, this relationship has been presented along two perspectives.

First, this relationship has been considered as being complementary. In a complementary interaction the function of one IT component differs from, but complements, that of the other. The key point here is that the interaction between two or more of the IS's components fulfils a new function that is different from the functions of each component taken on their own. The more standard components can be connected to each other, and the more functions can potentially be fulfilled as a result of these connexions. Therefore, some features of IS standardization lead to flexibility of the IS. Duncan (1995) lists her IT infrastructure flexibility issues "in terms of rules". She argues that IS flexibility is built on standards rules such as configuration rules for hardware and operating systems, compatibility rules and integration rules for applications and communication, access standards for IT resources and interface standardization. In such a context IS standardization is presented as a precondition to its flexibility (Byrd & Turner, 2000; Gosain et al, 2004). Reciprocally, application flexibility – e.g. the accommodation of heterogeneous data format - can be a condition for output standardization (Seethamraju, 2009). Furthermore, the concept of *flexible*

standards has been introduced as an enabling factor of service innovations (Hanseth et al. 2012), and in the context of inter-organizational networks (Van Den Ende et al., 2012).

Second, another part of the IS literature highlights the existence of "tensions" between flexibility and standardization configurations in the IS. For instance, a series of publications about IS flexibility co-authored by Judith Gebauer (Karhade & Gebauer, 2004; Gebauer & Schober, 2006; Gebauer & Lee, 2005) shows through mathematical and decision models that process performance could be enhanced through the introduction of additional IS flexibility characteristics. However costs associated with extra flexibility characteristics have to be constantly justified. These models imply that the quest for efficiency means giving a priority either to flexibility or to standardization. In the same vein, Wimble et al. (2010) predicts that when there are gains through BPO standardization, there will necessarily be a loss in flexibility. More explicitly, the study conducted by Hanseth et al. (1996) deals directly with the tension between standardization and flexibility in IS development projects. This relationship is shown as having an adversarial nature. A high level of standardization will make an IS inflexible due to a lack of reversibility of the standards (Hanseth et al, 1996. Allen & Boynton, 1991). Also, Mahinda & Whitworth (2004) suggest that "*IS flexibility and reliability impose contradictory design requirements on a system's internal structure*" (p. 96); where reliability means that the software is subject to standards and rules that ensure its robustness. Hence, the authors argue that some contradictions exist between the two. Finally, Bucki & Pesqueux (1992) noted that the overall flexibility of an IS is expressed as the ability to adapt behaviour to needs. It is supposed to be guaranteed by the different layers or subsystems of the IS. However they also note that "*the aggregation of elementary flexibilities do not mean overall flexibility, and can conversely, introduces rigidities not expected, which explains a number of disappointments observed during the implementation of flexible manufacturing systems* "(p.22). This suggests a contrast and sometimes a conflict between component-level flexibility and overall IS flexibility. More specifically in the case of IOS connecting two or more organizational information systems with different standards, de Corbière & Rowe (2013) show that while their linkages provide some service flexibility, their efficiency is lower than that of systems using the same standards. In this sense an opposition between flexibility and standardization prevails. In an opposition relationship, the behaviour of one IT component is contradicting with that of the other, impeding it or conflicting with its actions.

We thus conclude that, in the IS literature, there is no consensus as to the nature of the relationship between flexibility and standardization. The possibility that both the above perspectives could be true and could co-exist within the same context, and the configurations that would make this possible have not been explored. We use the rich context of an IOS underlying a service innovation case to uncover the multi-faceted nature of such relationships.

Methodology

Given the complexity of the research question a case study methodology has been chosen (Yin, 2003). The case selected for this paper is drawn from the Egyptian banking sector. It represents a service innovation BPO with high IT usage intensity that could give leads on answering our research question. Our case reveals granular, fine, interwoven elements on the nature of the relationship between IOS flexibility and standardization. Hence this single case can be considered as revelatory in terms of Yin's classification, which justifies our single case study methodology. The three researchers involved in this project present the following characteristics. The first has worked as a professional banker in Egypt before converting to the field of academia. The second has an extensive academic track record in the field of banking and IS. The first and third have a relevant knowledge of Egypt where they lived for many years. The first researcher acted as an observer at either the client bank's offices or at the service provider's site, at least a day a week over a period of two years lasting from late 2009 till end of 2011. Hence, we depended on a more ethnographic research approach (Myers, 1999) instead of collecting data in short field visits, to better understand how IOS flexibility and standardization relationships were formulated over a significant period of time. The context of the case study will be discussed in the next section.

Case Study: ATM payment reconciliation

Research site and context of the case

For the purpose of this paper our case study is labelled "ATM Payment reconciliation". In Egypt, where the retail banking has been expanding rapidly since the early 2000s, many individuals obtain loans without having a banking account because the population remains largely unbanked (Hafez, 2012). For this reason, many settlement transactions still depend on cash being deposited in the customer's loan account each month. Most of these loans are marketed in the two largest cities namely Cairo and Alexandria. Busy streets make it difficult for customers to reach their bank's branch and deposit the due amounts. Finally, the banks' rapid expansion in the retail industry has not come along with a similar expansion in the number of branches, especially for privately owned and foreign banks which developed retail banking. This leaves customers with a narrow choice of premises in which they can settle their dues. To deal with such contextual factors, the banks resorted to one of two alternatives, either establishing liaisons with public banks that had a relatively larger network of branches (but often with service levels that were far below those expected by the private banks' customers, long waiting queues, long processing time, low courtesy levels, frequent system failures, restrained service hours, etc.); or renting premises in neighbourhoods populated by their target customers mainly A and B+ categories, presenting as such a very expensive option. Moreover, the latter turned out to be an administratively complex task that spanned over many years of negotiations in order to obtain the required permits and approvals from government.

In the face of these challenges, a bank chose a different approach. It set up Express Deposit Machines (EDMs) in its own branches. The early versions of EDMs were simple drop boxes with the bank's logo on them. An opening allowed for envelopes to be deposited with the client's payment, out of opening hours. Then these EDMs were equipped with keyboards, allowing customers to enter their name, account number and the amount deposited. Finally, the bank introduced the same feature but through its network of ATMs either in the bank branches or in remote locations. An opening in the ATM enabled the collection of envelopes in a large bin. The envelope deposit was a suitable solution for the bank's clients since it allowed for more operating hours, existed in secure locations (inside the bank's 24 hour service area or in malls). The idea of enhancing ATMs with automatic cash acceptance features was considered but abandoned. It presented many difficulties for the banks in Egypt to implement, mainly due to the fact that most bills in circulation are either old or partially damaged, making it very difficult for ATM sensors to handle. Moreover, this feature required a huge investment that many banks were reluctant to incur.

The bank started handling cash deposits inside its own branches, with its own cash tellers and officers until it became clear that the solution needed more resources. It is then that the relationship with an external vendor was established. The vendor took in charge the establishment of secure premises in which similar measures as those enforced for bank branches were put in place. He installed see-through glass tables and designed a uniform with rear zips for his counting agents to ensure that the stealing of cash would not occur. He moreover adopted an advanced camera system that allowed the recording of every counting and sorting transaction that was taking place. Each glass table was equipped with two video cameras (Aventura box cam) accepting either PAL or NTSC signals, with automatic IRIS adjustment. The camera system was connected to a Digital Video Recording (DVR) system that included a server and a software application called the DVR client. The client handled the archival, retrieval and storing options to the multi-media files. The DVR s/w H.264 model from Aventura Company is compatible with the video recorder. It is a PC Based Commercial Hybrid DVR/NVR. This model allows recording and viewing of 64 monitors and 64 or 32 IP channels, with the possibility of synchronized playback of 16 channels. It offers backup and exporting feature for multi-media files and facilitates remote control through a web-based solution, based on pre-selected user criteria. The system deployed by the service provider is similar to the ones typically used in gambling casinos.

Being an ex-banking officer responsible for cash operations and fraud detection, the vendor opted for the development of an in-house system for payments, reconciliation and bundling of cash and transactions received. This application was so well designed that it was impossible at two occurrences, for the bank to reconcile the payment files without the help of the service provider and both attempts resulted in payment discrepancies that the vendor agents were able to resolve for the bank. In order to operate, the vendor connects himself to the ATM bank servers and copies the whole set of transactions that were recorded. He can then

reconcile the data based on the content of the envelopes, after checking two batch runs performed by the bank. This transfer mode fits with Suomi's (1992, p. 96) remarks on IOS components, involving batch-mode and on-line mode, as well as human-computer communication such as the application of external data banks (here access for copy to files of the bank). A detailed cross-functional process map is illustrated in figure 1 and clarifies the roles and interactions taking place between the different actors of this BPO.

The "ATM Payment reconciliation" was considered a service innovation for several reasons. First, the new service proposed by the bank allowed it to expand this particular payment channel as well as optimize its branches by dedicating less area to teller activities and more to "value adding" ones such as account opening and relationship management. This type of innovation resembles what happened in western economies (Rowe, 1994; Dos Santos & Peffers, 1995) and corresponds to an innovation strategy through differentiation with strong market orientation (Paswan et al., 2009) in the context of the Egyptian economy. Second, the organization of the service through an outsourcing relationship between the bank and the vendor represents an organizational innovation (Edquist, 1997). Third, the way the service is organized allowed for its expansion with more payment types. For instance the ATM now accepts payments for mobile phone, ISP, and utility bills. These newly introduced payment types increased the innovativeness of the ATM envelopes with a clear evolution of perspectives for services to bank customers. Fourth, the deployment of casino cash monitoring technologies along with banking payment reconciliation software is considered an innovative way of re-combining technological components giving it a new "artefact identity" and thus contributing to the innovativeness of the service for the bank (Faulkner & Runde, 2009, p.443).

Data collection, coding and analysis

During the data collection phase, the authors relied on several data sources summarized in table 1 below. In addition to rich ethnographic observation notes, the researchers were able to conduct 11 semi-structured interviews with 6 senior managers from both the client bank and the service provider. All interviews were recorded and fully transcribed. Moreover, several documents were used to analyse the IOS flexibility and standardization relationships.

Table 1: Case study data sources and coding

Data observation notes:				
Ethnographic approach	Presence at least once a week at either client bank or at service provider's			
Documents:				
Process manuals, policies and procedures (different versions), system specifications and documents, meeting notes, emails exchanges between the bank and the service provider regarding the project, service contract and SLA, ATM journals and batch run payment reports, payment files, reconciliation files, deposit files & cash slips.				
Semi structured interviews:				
Nº	**Professional Title**	**Code**	**Interview Date**	**Duration**
1	Payments head at client bank (BK)	BK1	18/06/2011	2hr
2	Card operations head at client bank (BK)	BK2	11/07/2011	2 hr
3	CEO of service providing company (SP)	SP1	27/02/2011	1hr
4	Counting room supervisor at service providing (SP) company	SP2	02/03/2011	1h30
5			05/05/2011	1h30
6			17/05/2011	1hr
7	Operations director at service providing (SP) company	SP3	28/03/2011	1hr
8			30/03/2011	30min
9			11/04/2011	3h30
10	IT division head at service providing (SP) company	SP4	31/03/2011	1h30
11			28/06/2011	1h20

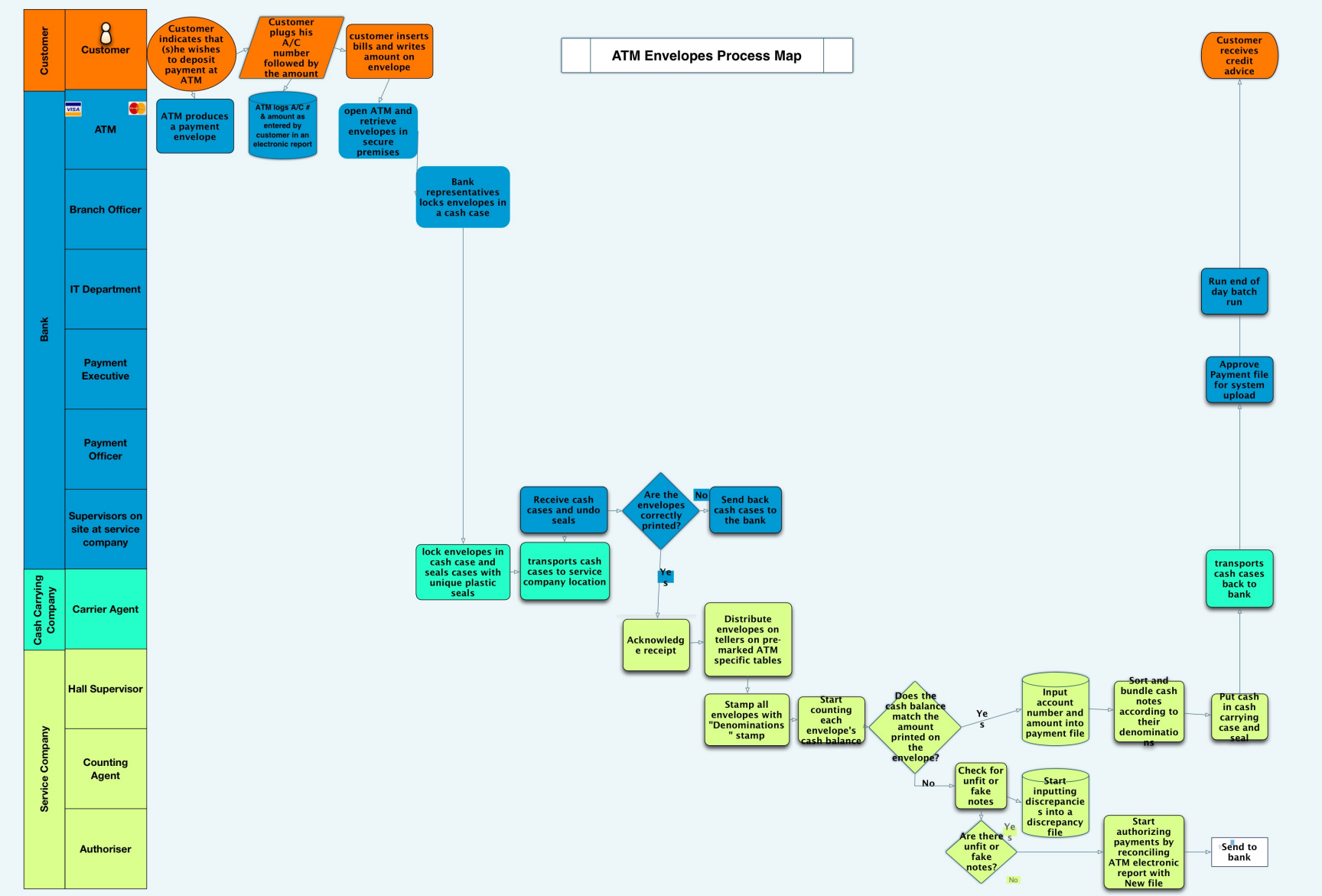

Figure 1: ATM Payment & Reconciliation Process Map

We also developed an IS flexibility and standardization tracking grid drawn from the literature. Against each flexibility and/or standardization measure in table 2 appears the reference from which it was drawn. Moreover, in order to track IS flexibility and standardization, we will differentiate between three levels of an IS, derived from similar approaches by Fimbel (2003), El Sawy et al., (1989) & Reix et al., (2011), namely:

- Level L1 refers to IT infrastructure, hardware, servers, and connections etc.
- Level L2 is concerned with applications, software and data; and
- Level L3 captures the IT competence, appropriations and utilizations made by the IS system users.

Each IS level comprises one or more IT or IT-related components. The different IOS components are listed in table 2.

Table 2: IOS levels and their related components

IOS Level	IOS components in the ATM Payment & Reconciliation
L1: IOS infrastructure, hardware, servers, and connections	Aventura box cam accepting either NTSC or PAL signal. Aventura DVR (Digital Video recorder) H.264 PC Based Commercial Hybrid DVR/NVR DVR media server ATM Payment & Reconciliation data server Dedicated cables between counting room cameras and DVR. Internet connections Computer stations both at vendor and at bank
L2: IOS applications, software and data	Aventura DVR client (software) v.7.0.3 In-House ATM Payment & Reconciliation application Window based tools (Excel, Word, Access) under several versions SQL ATM NCR application Payment files Banking batch run crystal reports
L3: IT competence, appropriations and utilizations made by the IS system users	Manual of Policies and Procedures Contract and SLA Counting agents uniforms Security measures installed in and around the counting hall Responses to environmental changes and customer requests. Users roles, rotation, parameters and manipulation of the system.

The data collected was analysed and coded according to the following criteria: (a) to which level of I.S. the features identified corresponds to (L1, L2, L3), (b) are these features oriented towards flexibility or standardization, or both? To go beyond simple flexibility or standardization orientations, we also rated the strength of the orientation of each feature for its degree of flexibility or standardization, according to the following scale (the idea was to express some degree of magnitude and to contrast features with one another, not to add up the ratings to obtain a total score):

- +++ (very strong), no extra effort with regards to this element could have been done.
- ++ (medium), some effort was done with respect to that element.
- + (weak), weak effort was done with regards to this element.
- -, --, --- , weakly, moderately or very strongly in contradiction with either flexibility or standardization. By this we mean that a feature cannot be made flexible (is inflexible) or cannot be reduced to a standard.

Based on the sub-dimensions identified, we highlighted where there were features of flexibility and/or standardization orientations, and at what level they occurred. We also tried to interpret in which way each dimension's orientation, interplayed with the orientations of other dimensions based on a deeper comprehension of the IS strategy.

Reliability of the coding was ensured in two different ways. First, one of the researchers coded the raw data twice, at six-month intervals. The two coding results were compared and discussed by one of the other authors so as to explain them. Second, the last of the authors, not involved in the first coding sequence, read a very detailed and non-coded account of the case study, complete with interviews, flow charts and process descriptions. Based on this material, he listed the features he could identify and coded the level they belonged to, their orientation, and their

rating. His results were compared to the ones of the first sequence. Differences were discussed until they could be explained and resolved.

Results

Our analysis led to us to findings on the relationships themselves, which we now present for each of the three, IS levels in table 3. These relationships are interpreted based on our observations and interviews in terms of flexibility and standardization.

At the L1 level of the IS concerning the technological infrastructure deployed for this BPO, there is a high degree of flexibility and there are many facets to this orientation, especially on the side of the service company. This applies to all its technological equipment with the exception of dedicated connections. A first dimension of flexibility is derived from the possibility to re-use/re-deploy the digital cameras, the digital video recorder, servers and work stations. A second dimension of flexibility is derived from technological excess capacity. In addition, the technological elements of this BPO may be varied and combined in alternative and different ways, showing a high degree of operational flexibility. Standardization at this level is also high; since the technologies are for secure transaction processing, and do use multiple configuration rules. ATMs are also highly standardized equipment because of their pre-configuration settings. In addition, all the components of this infrastructure rely on high compatibility and integration standards between them. The effect of such compatibility and integration standards is to further enhance IS infrastructure flexibility, since it allows for equipment add-ons and hence increases modularity. At this level, there is both a high level of flexibility and standardization. The BPO IS infrastructure orientation is therefore for a set of tools with which it can mitigate risks associated with innovative BPOs. Such risks are two-folded. First, an innovative BPO can witness a high increase of the demand on the service it provides, for which the IS infrastructure has to offer volume flexibility and modularity (compatibility and integration standards for more units to be added). Hardware flexibility requires more standardization. Second, the innovative BPO could also fail, in which case, the IS infrastructure has to be non-mission specific so as to be redeployed on other projects or simply resold on the market. *There is therefore a one-sided **complementarity** relationship between IS flexibility and standardization at this IS level.* This is meant in one direction and not reciprocal, more standardization leads to more flexibility, and not vice versa.

At the L2 level referring to the IS applications and software, a number of peripheral applications associated with this BPO follow clearly defined compatibility, integration and access standards; but the decisive element here is the core application (responsible for cash counting, validation and reconciliation) developed and used by the vendor. The core application is adequately designed to manage varying data formats and content conflicts of the assigned transactions without interruption, under the supervision of an operator. This scalable application contribute significantly to the flexibility of this level by allowing, among others: handling of files received from the bank (taken from multiple sources and in multiple formats), validating the audited payments, reconciling payments files received with those prepared in the counting room, linking each transaction with multi-media files especially for envelopes with errors, preparing bank deposit slips along with bundled and recycled cash notes that are deposited at day-end at the bank, preparing end of month invoices to submit to the client bank, monitoring the counting agents' performance, and, preparing an end of day payments upload file conforming to the bank's mandates (along with any discrepancy file if any). The key element is the ability of the core application to evolve as needed. This was ensured through widely adopted integration and compatibility rules. We need to distinguish at this stage between (a) standards that have an impact on the application's capacity to integrate and be compatible with more applications, enlarging the scope of this IS layer, and (b) standards that "control" the functionalities of the application by indicating in *drop down menus* the "allowed" tasks and options. Abiding by widely shared compatibility and integration standards in the core handling application was vital for the BPO's survival and its ability to continue performing and evolve with changing missions. This is one of the main reasons for the failure of the project to migrate towards a more "functionally" standard, robust; SQL based and fully automated application. Therefore, here we can envision two possible types of relationships between flexibility and standardization. The first where the core application adopts a wide variety of integration and compatibility rules, thus enhancing this IS layer's flexibility. In the "ATM Payment reconciliation" case, the core application presents a higher flexibility that enabled the bank to expand its marketing of this

Table 3: IS Flexibility and Standardization measures at the three IS levels with some extracts from case study.			
Measure / Feature	**Rational / Reason**	**Degree**	**Extracts from respondents' comments and case study observations**
IS level L1: Technological infrastructure, hardware, servers, connections, etc.			
FLEXIBILITY			
Operational flexibility of the IT infrastructure (*Kumar & Stylianou, 2000*)	The service provider wanted to ensure that the hardware could be easily redeployed in favour of other projects.	+++	*« Two types of cameras are used above each counting table. A Focus camera capturing the table and the counting agents as well as their close surroundings and a Zoom camera capturing the envelope's details. Both were bought with highest specs available for precision and detail. With such flexible functions, management can choose whichever camera in whichever function»* (SP2)
System connectivity (*Byrd and Turner, 2000; Duncan, 1995; (Seely-Brown & Hagel III, 2003*)	Dedicated connectivity (cables for cameras and connection to the bank server) is necessary for security reasons. Hence the limited flexibility. The throughput is limited.	-	*« (Connection is) not flexible since they are dedicated connections with very high security and firewalls.* » (BK2)
			Observation of the weekly backup procedure showed some slowdown problems in the connectivity.
Volume flexibility (*Kumar & Stylianou, 2000; 2014*) Excess technological capacity (*Reix, 1979; Duncan, 1995*)	- Excess capacity (ex. free ports for cameras, or digital recorder server space), which allows flexibility in volume - Emptying ATM envelopes bins resulted in greater volume flexibility.	++	*« The bank has always anticipated Heavy/High volumes and advanced technologies and thus has adopted the latest technologies. This platform has always allowed maximum flexibility within the allowed possibilities* » (BK2)
			« Server could handle more cameras because it has 5 slots, only 3 slots (each taking 8 cameras) are currently used.» (SP4)
			« Alternatively, when cash bins are filled, a "call tree" is implemented notifying the cash officer to go emptying the ATM bins as a response to external environmental » (BK2)
Location flexibility (*Kumar & Stylianou, 2000; 2014*)	The vendor has a contingency site for this BPO but the business continuity plan was never tested.	+	*« If, however, <the service company> closes down both location facilities, there won't be any location flexibility. The volumes are too high for the bank to process »*(BK1). There is no location flexibility at the bank premises to handle the BPO.
IT infrastructure support for continuous business processes redesign (*Duncan, 1995*)	The vendor's choice of hardware was based on the eventual future developments in this BPO or other BPOs.	+++	*« It is hypothetically - if needed – feasible to replace and or remove any hardware component of the ATM BPO like a Plug & Play device* » (SP4) According to observations, the ATM Payment Reconciliation BPO re-engineering took place without ever being blocked by the IT infrastructure.
STANDARDIZATION			
Configuration rules for h/w (*Duncan, 1995*)	The devices are configured according to the rules imposed by the bank.	+++	*« The digital video recorder software is set to record ALL time. Automatically once server is on all cameras and DVR are on.»* (SP4)
Integration standards for the multitechnology (*Duncan, 1995*)	The DVR s/w H.264 model from Aventura Company is compatible with the video recorders is a PC Based Commercial Hybrid DVR/NVR.	++	*«There is an integration between the two servers. All the recording system, the DVR, and the cameras can be integrated together.»* (SP3)
Compatibility standards for multitechnology (*Duncan, 1995*)	Compatibility between the components of the technological infrastructure.	++	*<Yes>, we bought the Aventura Server, application and cameras together and they come all compatible and integrated. Envelopes scanner is also compatible with system.»* (SP4)
Integration standards of communications and networks (*Duncan, 1995*)	Communication parameters are strictly followed in order to control integration with other networks.	+++	The bank follows communication integration standards when allowing the connection of the service provider's authorized personnel to retrieve ATM journals and payment transaction reports in order to work on the reconciliation.
IS level L2: Applications, data and software			
FLEXIBILITY			

System development flexibility (*Kumar & Stylianou, 2000; 2014*)	The core application is highly flexible.	+++	The core application is an in-house application that allows for system development by the team of developers that work at the vendor within the ATM Payment Reconciliation unit.
Efficient system maintenance and update (*Duncan, 1995*)	The core system is maintained and updated in house efficiently. Other peripherals are maintained efficiently.	++	«For *the validation/reconciliation application, it is easy since a company employee who knows it inside out develops it. As for the DVR software, it all depends on the releases done by the company and these are not communicated easily or documented efficiently.*» (SP4)
Possibility to incrementally update the s/w (*Duncan, 1995*)	The need to ensure that each system update can be controlled.	++	The core in-house application's update is done incrementally. Each single change at a time.
Support by federating information systems (*Mehdi et al., 2004*)	A number of backbone federators to access different banking databases and restore contents of information.	++	*«Card number logic verification only is applicable at each <ATM> machine for online deposits. No databases are used except for PIN verification database and balance inquiry database»* (BK2)
Correct integration of systems (*Seely-Brown et Hagel III, 2003*)	The banking system is not directly integrated with the ATM Payment Reconciliation system. Only front and end integration with BPO's IOS.	++	*«The integration level is average. For the validation/reconciliation application, there is very good integration between the various modules. It is not a fully functional system like a CRM for example the validation/reconciliation application is not fully integrated with the DVR system».* (SP4)
Operational flexibility for system applications *(Kumar & Stylianou, 2000; 2014)*	The operation flexibility is deduced from the fact that the company is able to meet its service commitment by varying software resources.	+++	Several meetings that took place between the service provider and system developers showed clearly that the service provider managed to maintain the highest operational system flexibility to meet varying bank report changes and format structures.
STANDARDIZATION			
Configuration rules for operating systems *(Duncan, 1995)*	The Windows XP operating system is configured with many organizational configuration parameters.	+++	*«Since the servers support various Operations Systems (although<service company> is operating globally on Windows), we configure all equipment with same Windows version and parameters.» (SP4)*
Compatibility rules for applications *(Duncan, 1995)*	Many applications and various versions to be able to deal with various types of incoming files.	+++	*«We maintain multiple applications with multiple versions to ensure that the incoming file is assimilated and that it is possible to process the validation/reconciliation application.» (SP4)*
Integration rules for applications (Duncan, 1995)	The core-application can integrate with other applications easily since it is a Microsoft based one. Standards here are widely adopted standards. Complex integration rules for the applications developed for ATMs because of many security standards. Hence integrating new modules is difficult because of such complex integration rules.	+++ --	It was essential for the service provider to keep a high number of standards available in case the core application needed to be integrated with other banking applications. *«Nasty blocking for <ATM> integration, development, etc. because of heavy/advanced firewalls. »(BK1)* We have noticed that the adoption of complex integration rules for ATM add-on applications did not hinder the BPO since the complete integration was not needed.
Compatibility rules for EDI and / or other types of data exchange *(Duncan, 1995)*	No EDI. Data exchange requires following certain exchange standards.	++	We observed that to exchange data, the service provider needed to log onto banking system with authentication conventions and standards in order to retrieve needed processing files and reports.
Data compatibility standards *(Duncan, 1995)*	The output payments file must comply with the standards of the bank.	++	*«Upload payment file (outgoing) has to be compatible with banks payment files data formats»* (SP3)
Data integration standards	This type of standards is only applicable on payment upload file sent from service	+	*«Validation file compares the INPUT FILE (untreated, received from the bank) and the TRANSACTIONS FILE comprising (a) number of envelopes (b) cash denominations (c)*

(Byrd et al., 2010)	company to the bank at the end of the day.		*DISCREPANCY FILE. Result should be zero.»* (SP3)
Access standards for data resources and applications (centralized / transparent location) (*Duncan, 1995*)	The digital video recording data are located on a different server than the one on which runs the core validation / reconciliation application. So the data are not centralized. Also, applications do not run on the same server.	++	*«When a staff logs in with his username & password, he can access his/her allowed applications and data (auto-pre-authentication on files & applications).»* (SP4) Location is not neutral /transparent for users. However, there are clearly strict access standards for the various resources (data at the bank, the service provider as well as applications)
Interface standards (*Tassey, 2000*)	No common interface standards shared across the BPOs sub systems	No standards	*«Each application's module has a different interface.»* (SP4)
Standards for user acceptance tests (*Tassey, 2000*)	No formal way for testing of the in-house core modules at the service company, but very well defined and rigorous UAT at the bank for each ATM development.	++	*« No UAT (User Acceptance Test) was performed before DVR version / service pack upgrade which resulted in a smaller number of video files being stored on the server due to a default being set on high resolution videos. So instead of storing 3 months video, only a month and half video files were stored. This led to EGP 9,000+ penalty imposed on <service company> as stipulated in the SLA ». (SP2)*
IS level L3: System usage and appropriation			
		FLEXIBILITY	
Business management leadership in long term IT resources planning (for future adaptations) (*Duncan, 1995*)	Leadership of the service firm is tangible for long-term equipment and related applications. The long-term vision of bank leaders is tangible. An IT resource planning is done on a decision and revision points mode.	++	« *The management had always wanted and discussed with vendors and IT software companies the data re-use and a major consolidated data warehouse system that would allow for value creation.* » (SP3)
			« *When it was time to change the ATMs, <the bank> underwent many negotiation cycles with NCR and other vendors, they did not see only what were the current business needs or what would be sufficient for today's operations, but what value adding applications could be installed meanwhile. For example, cash acceptance. Although when they first installed the new ATM machines, the module was not still operational, they planned for the possibility to have it* ». (BK1)
Simple system and easy to use (*Duncan, 1995*)	The core application is relatively difficult to learn and use.	+	« *It is hard to use and to learn, because it is not used elsewhere, it is neither a standard system nor a standard usage. It evolved over time* ». (BK1)
Input / Output customization flexibility (*Kumar & Stylianou, 2000; 2014*)	The BPO manages to incorporate various types of payments (internet, mobile phones, and utility bills). Customization of the report was also possible, but not necessary.	+++	«*A system was specially developed capable of handling multiple payment modes (offline and online), channels (credit cards, loans, banking, operators, etc.) and types (banking, ISP, telephony).»* (SP1) The success and continuity of this BPO depended mainly on being able to handle a very heterogeneous data inputs.
Staffing flexibility (*Kumar & Stylianou, 2000; 2014*)	Different staffing flexibility at the service provider and the bank.	+	During observation, it was noticed that the service provider maintained a certain level of staffing flexibility by allowing rotations, and replacement of on-leave staff. The bank was not able to maintain similar staff flexibility because of more rigid hiring, transfer and licensing processes at the bank.
Agility towards clients (*Sambamurthy et al., 2003*)	High responsiveness towards banking customers. The service provider's agility towards its banking client is strong because it represents its only client bank for this BPO.	+++	*«The Bank accommodates for customers detaining their a/c, card or not, special process for Alex branch customers, investigation process for customers complaints, avoiding discrepancies for time differences by aligning the report time with cash bin pulling time ». (BK1)*
			«*Any request, any input, or any change in schedule by the bank, we accommodated for* it». (SP2)
Agility towards partners	For the bank, there is very little flexibility	---	« (Laughing laughing laughing). *Treatment of a slave*!!!» (BK1)

(*Sambamurthy et al., 2003*)	towards this BPO partner.		Response of a senior banker when asked how they would evaluate their agility towards the service provider.
Agility towards the external environment (*Rowe, 1994*)	Low responsiveness external environment changes (ex. power outages, events of the Egyptian revolution, introduction of ATM cash recognition and acceptance technology).	--	It was noted that during the recent Egyptian revolution events, there was no agility possible. Streets were too insecure to transport cash towards the service provider. Also, there was no agility when the service provider could not envisage how to re-engineer the BPO once the bank would start introducing the cash recognition and acceptance technology at the ATMs. « *A UPS was bought to avoid electricity cuts problems.*» (SP2)
Operational flexibility at this IS level (*Kumar & Stylianou, 2000; 2014*)	Varying the IOS utilization could still benefit the BPO in meeting with its business objectives and expansion of missions.	++	Because of the previous experience of the service provider's CEO at the bank, he knew how to adapt utilization of the core application. When some banking reports were not available after batch run, he knew which other substituting reports to pull data from.
STANDARDIZATION			
Access standards for a variety of service providers (*Duncan, 1995*)	The bank follows a very formal and strict vendor selection checklist, followed by IT security auditing and resources inspections.	+++	«*For critical processes, CSIS has to go and check against a standard framework the vendor's location, facility, technology, etc. This checklist is called Third Party Inspection Self Assessment*.» (BK1)
Process standards (*Tassey, 2000*)	Significant number of standards concerning the BPO, translated in a lengthy SLA and manual of policies and procedures.	+++	«*This process has A LOT of process control standards, however these are very high and respected for counting room processes. Any sub-process/task has to have a standard. This is in order to avoid errors/risks.* » (SP3)
Transaction handling standards (*Tassey, 2000*)	Very strict and highly formalized transactions' standards to ensure the highest integrity levels.	+++	«*There are password management sequences to send and receive files from the bank. Also, the batch numbers respect certain numerology.* » (SP4) We observed that when an error is detected in envelope's counting, a red button is pushed to mark the video file, plus some handoffs rules.
Quality standards for reliability by: (*Tassey, 2000*) -Functional levels	This case relies on well-stipulated Escalation Matrix that appears in the Service Level Agreement. Transactions follow a path depending on their severity and timeframe.	++	« *Although there are specific functional standards such as escalation matrix with clear cut responsibilities and deadlines; the unofficial dealings between (the head of project) in <the service company> and (the agent) in (the bank) most often avoid to use the escalation matrix (part of the culture wants to avoid escalation). Therefore, these standards are seldom used* ». (SP3)
Quality standards for reliability by (*Ibid*): -Controlling performance variations	Measures worker productivity, track delays, gaps, etc. to ensure an optimized counting performance at the counting room.	+	*« YES, the system tracks on a high level the counting agents productivity and error ratios with clear KPIs since 2010 ». (SP4)*
Quality standards for reliability by (*Ibid*): -Control service deadlines	The bank applies penalties on the vendor if the payment file exceeds the deadline (needs to be validated before batch run).	+++	*« Presenting a timed electronic report along with the cash consignment to <the service company> allowed to process the payments in a more timely manner.» (BK1)*
Quality standards for reliability by (*Ibid*): -Controlling of efficiency	Many efficiency standards are adopted by the service company to ensure that transactions are well accounted for.	++	*« The opening of the envelopes is done in a specific manner under the camera to capture the exact frames on the video file. »* (SP3) *«When electricity cuts, cameras should be re-verified» (SP2)*
Quality standards for reliability by (*Ibid*): -Security control measures	A number of quality standards is stipulated in the Risk and Control Self-Assessment	+++	«*Once configured with the right permissions, the project manager could log onto the server remotely to run the validation/reconciliation application online real time. As for the counting room supervisor, he too, has permissions to connect and edit certain parts (as specified in the workflow) of the validation /reconciliation application* ». (SP4)

repayment channel, assign more work to the service company, since this latter managed to cope properly with continuous changes in the bank's terms, needs, handoff file types and volumes. The second relationship would be of opposition if the service provider had adopted a more standardized and controlled application that would result in a less flexible IS if he had set standards for a pre-selected list of "allowed" tasks, options and possibilities. For this IS level, we retain that the flexibility is mainly derived from the core application developed by the service company. To handle the variety of formats and files sentby the bank, the internal development of this application is the answer brought by the service company. *Flexibility and standardization IS characteristics are either* ***complementary*** *or* ***opposed*** in *nature at this IS level. Decisions concerning the innovative BPO's IOS have to constantly make trade-offs between software flexibility and standardization features*. In this case, the trade offs have constantly been in favour of flexibility.

Finally, at the L3 level, IOS flexibility features that could be identified in this case study, concern agility towards the client which is strongly reflected in this BPO and is most obvious when the vendor still accepts cash shipments even when the ATM printer ribbon is illegible on the envelopes, or when there are important shipment delays that affect the delivery time of the cash shipment at the vendor site. The SLA signed between the bank and the vendor allows the vendor to refuse accepting the ATM payment shipments in such cases. High flexibility at this level is also materialized by the establishment of several new payment service add-ons considered as innovative value propositions served by the same BPO (e.g. utility bill payments). The standards adopted at this layer are clearly those of processes (policies, procedures and transaction handling). This is best understood with regards to the sensitive nature of the BPO transactions. Process and transaction quality standards mostly characterize this layer of IS. Otherwise, the outsourcing relationship could be threatened, resulting in penalties, damaging of the bank's reputation/image and even could lead to the termination of the service contract. For this BPO, flexibility could not be deduced and generalized throughout this IOS level, except for the agility towards the client that is strongly reflected in this case. We note at this level of the IS, that there is no dependency between factors leading to IS flexibility, and those leading to IS standardization. They are different in nature and do not lead to the same results. *We find that an* ***independent and non-mutual*** *relationship exists between flexibility and standardization at this IS level.*

It is worth noting that apparent inter-IOS level relations have also been detected in this case study. More specifically compensating mechanisms or counterbalancing relationships have been documented. In a counterbalancing relationship, the behaviour of one IT component is enacted to compensate that of another. For instance, when the DVR servers became quasi-saturated, the vendor was unable to store more media files on the dedicated servers (server capacity being from the L1 IOS level, he resorted to adjusting the parameters of the DVR client (from the L2 level) to reduce the quality of the video files from high quality media to medium quality media (with consequently lower megabytes per file), thus occupying less server space. This shows how inter-IOS levels could be enacted to compensate some IOS performance shortcomings.

Reflecting on the nature of core applications, the inter-level IOS counterbalancing relationship becomes a logic outcome: having a flexible core application (L2 IOS level) where many manipulations are possible, forces a compensation by instituting stricter controls while handling the cash counting transactions (L3 IOS level). Alternatively, had the vendor opted for a more standardized core application, he could have tolerated a more "flexible" transaction handling work environment.

Discussion and Conclusion

We analysed through the "ATM payment reconciliation" case study the inherent relationships between IOS flexibility and standardization at different IS levels in the specific case of service innovations. The relationships were found to be substantially different at each IS level, which justifies our resorting to this three IS level classification. We refute therefore the idea of a particular relationship between flexibility and standardization that could describe and be applied to the overall IS, since IS levels are different in nature. Flexibility and standardization should not be systematically treated as opposing dimensions in the IS. Hardware is different in nature to software and to IS appropriations and utilization. The overarching management strategy will dictate which IOS orientation each layer will follow. It would be a severe mistake

to confuse across all IS levels while trying to formulate an "IS strategy". We summarize our case study findings on the relationships between IS flexibility and standardization in table 4, around the three IS levels.

Table 4: **Relationships between IOS standardization and flexibility at different IS levels.**

IOS level		FLEXIBILITY	Relationship	STANDARDIZATION
Counterbalancing	L1: IT infrastructure, hardware, servers, and connections etc.	Mission, volume and modularity flexibility	Complementarity	Compatibility and integration standards
	L2: Applications, data and software	System development flexibility	Complementarity	Data standards
			Complementarity	Applications Compatibility and integration standards
			Opposition	
		Flexible core applications	OR	Standardized core applications
			Counterbalancing	
	L3: IT competence, appropriations and IOS utilizations	Flexible transaction handling	Counterbalancing	Standardized transaction and exception handling
		Staffing flexibility, agility towards clients, partners and environment.	Non // Related	Standards for quality, process, transaction handling, etc.

For hardware and technical infrastructure at the level L1, the risks associated with technology investments, will translate into taking measures that ensure flexibility of the equipment to be re-used, and eventually incremented. This type of equipment flexibility is best ensured through compatibility, modularity, and integration standards. More widely adopted standards will enable more hardware flexibility. This is in line with Duncan's (1995, p. 42.) definition of technical infrastructure flexibility as *the degree to which these resources are shareable and reusable*. The meaning intended by the terms versatile or reusable used by Bucki and Pesqueux (1992) applies to what they have named *hardware mission flexibility*. However, we extend this definition to include the possibilities of hardware reselling. How flexible a given hardware is also depends on mobility, adaptability and / or liquidity of the equipment (Reix, 1979), and on the reversibility of its uses (Fimbel and Pesqueux, 2004). All hardware standardization measures at this level contribute to greater hardware flexibility. This is why we concluded that there is complementarity between standardization and flexibility. The adoption of compatibility (also referred to as interoperability) standards allows for the flexibility and modularity of the equipment.

The service provider chooses non-specific and multi-mission resources to mitigate his BPO risks. The selection of commercial – off the shelf products, promoting standards of compatibility, integration and connectivity is his adopted strategy for the hardware flexibility and standardization orientations. The hardware should mostly secure volume flexibility in case the BPO service demand increases, and this is ensured by modularity and excess technological capacity. It also has to allow for process re-engineering in case the BPO has to adjust for changes in the service provider's mandate. This standardization at level L1 is a precondition for the flexibility of the infrastructure (Duncan, 1995; Byrd and Turner, 2000, Gosain et al, 2004). It also gives support to Braa et al.'s (2007) flexible standard strategy in which standardization is frequently interrupted and interwoven with events that require standards to become flexible and easy to change (Hanseth et al. 1996, p.414). The flexibility / standardization relationship is therefore conforming to

the way that it has been presented in the first stream of the IS literature, except for the fact that, in our case, we have located it at the hardware level. This is summarized in table 3 for the L1 level.

To process the varied and complicated incoming data files that are part of level L2, the service company proceeds towards their standardization. Seethamraju's (2009) study shows that the direction of IS standardization must be adapted to the nature of the process. The author distinguishes degrees of standardization that will be required depending on the data transformation process (repetitive, special, or exception handling). The BPO we studied transforms very heterogeneous, large volumes of data inputs, in homogeneous data outputs and combines repetition and special handling. Flexible software allows for standardized outputs with heterogeneous inputs. We interpret it as a one-way complementarity relationship as shown by the arrow direction at level L2 in table 4. Another complementarity arises from the adoption of widely adopted compatibility and integration standards of applications to accommodate for the different versions, file formats resulting in accrued system development flexibility. We can therefore conclude that complementarity between flexibility and standardization at this level also occurs in both directions (table 4).

Our research contradicts what Sprague and McNulin (1993) cite as seven key factors of successful IOS. These seven factors include high integration with internal information systems, sharing of industry standards and the possibility of inter-organizational processes reengineering. The integration of the internal bank's systems with the BPO's core application was even considered undesirable by the bank and cannot be considered as a factor of IOS success in the case we studied. Instead both special equipment and treatment were needed for special cases and human to computer communication was required to lower the risks incurred by the bank and for reconciliation needs. This is an opposition shown in table 4 between system development flexibility and standardized core application.

What we have described above implies a very flexible L2 level, but requires that the L3 level is made up of highly standardized protocols including exchanges, reports issued and conventions so as to avoid too much subjectivity. Therefore, at the application and software level, the core application has to be flexible enough to handle data conflicts; diversity of formats, new data types, varying service offerings; while at the same time, it has to be able to standardize output data to be fed back into the banking system's process. The highly standardized features at L3 are here to support and ***counterbalance*** a very flexible core application at level L2. With such a context, a long-term standard core application could become a nuisance, but also a strategic choice, which should be then counterbalanced with more flexible handling at the L3, level. Resorting to a more flexible application is often the best answer to deal with the service innovation uncertainties. In this respect, there is an overall counterbalancing effect between flexibility and standardization that takes place across the two levels L2 and L3 as shown in table 4.

As for the IS appropriations and usage level L3, we notice that a variety of both flexibility and standardization measures are adopted within the framework of the innovative BPO. The innovative BPO adopts a large array of standardization policies and procedures as well as a variety of agility tools. These factors co-exist without affecting each other. The highly standardized features at L3 are here to support and ***counterbalance*** a very flexible core application at level L2, as shown in table 4. As reasoned above (cf. results), had the core application been standardized, features at L3 would have counterbalanced them. The other flexible features of L3 serve other purposes in an independent manner. For example, on one hand, flexibility features at this level can contribute to agility towards the client, the partners and the environment, while the other flexible features of L3 serve other purposes in an independent manner. On the other hand, and in parallel to flexibility features, standardized dimensions make sure a given process - such as transaction handling, is not subject to undesirable variations. This absence of inter-relation between flexibility and standardization features within L3 level is shown in the last line of table 3.

It was equally confirmed through exchanges with the managers we interviewed at the service provider that other counterbalancing possibilities could be realized across different IS levels. A lack of flexibility (or standardization) in a given N_i-level of the IS can be offset by greater flexibility (or standardization) in another IS level N_j. For instance, a lack of flexibility in the available storage memory capacity needed for the multi-media files in the ATM payment reconciliation BPO (hardware limitation under the L1 level) can be offset with a flexibility to reduce file size (programming parameter in the digital video recorder software under the L2 level, expressing video file quality as: high, medium or low), or by reducing the selected archival time for video files on the servers (choice expressed by users under the L3 level).

These counterbalancing relationships tend to nuance the second stream of IS literature which views IS flexibility and IS standardisation in tension. For instance, our research supports the strategy of *flexible standards* proposed by Braa et al. (2007), and the *flexible generification* standardization strategy proposed by Hanseth et al. (2012). In addition, our research opens a path for a better understanding of the strategy and the concept of flexible standards. While standards are primarily designed to ensure "stability" and to set elements in accordance to well defined marks / points (time-performance-productivity-format), they must still ensure some flexibility to allow proper handling and manoeuvring. When they achieve both they can be qualified as flexible standards. For example, what happens if the cash transportation company is supposed to make the delivery of payment envelopes collected from ATMs to the service company before 9:00 am so that the latter has enough time for counting, processing, validation and reconciliation operations before 17:00; and on a particular day, the cash transportation company delivers the cash boxes at 10:00 am because of unexpected delays. The standard in this case must then be staggered to allow sufficient time to perform the necessary operations and allow, for example, delaying the delivery of the final payment file till 18:00. However, such standards cannot be left too flexible either, because they must be consistent with other standards such as integration with other payment files for batch processing at the end of the day. This standards shifting and flexibility may be called "smart standards." This is why the rules should allow a certain level of discretion. These are standards that allow the service to be more responsive to external changes and thus catalyse service innovation.

The case study results presented above go beyond the two discrete IS "efficient" flexibility approaches proposed by Allen and Boynton (1991) the "low road" and the of "high road". They further extend Kumar and Stylianou's (2014) analysis of combinations of flexibility types within a managerial approach by enlarging the combinations to standardization issues, and that at different levels of the IS components. For example, our analysis shows that there is a continuum of possibilities and permutations between the components of an IS to complete this state of efficient flexibility, including adjustments between levels of IS under the imperative of an innovative service BPO. Those degrees of IS flexibility and standardization reflecting management orientation at each IS level do not necessarily represent an "optimal" point of compromise between both dimensions.

This research claims to have both managerial and academic implications. First, managers in banks would know how and where to standardize the IOS and what features should be left flexible to deliver innovation. On their side, service vendors, would know how to leverage on their IT investment and manage the IOS in risky situations. Second, some academic implications are also worth noting. Our findings that flexibility and standardization are not as opposed as the literature speculates or reports, may be explained by the service innovation character of the studied IOS. In order to respect strict standards imposed to the vendor by the client, innovation materializes as new flexibility features that are not, and cannot be, in contradiction with client driven standardization. However, a limitation of our results is that we drew interpretations based on a single case study and abstracted those to the more general IOS levels rather than scrutinizing the single IT component-to-component relationships. Moreover, the service innovation character of the studied case study, exemplified for instance in the vendor's motives to diversify his IT investment's risk, might have influenced the nature of relationships existing between flexibility and standardization in the IOS. This is why it would be interesting to compare these relationships with those drawn from non-innovative service contexts. A lead for future research would be to compare the results with those drawn from other case studies in the banking industry and from other service sectors such as health care or e-commerce. This would enable us to further test our initial interpretations and refine the methodology through cross-case comparisons.

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