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TOWARDS AN INTEGRATED EFFORT FOR MANAGING IT PROCESS STANDARDS IMPLEMENTATION

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Abstract

Adopting IT process standards seems to be a trend for IT organizations to meet ad-hoc informational needs and to provide better business value. Due to the changing environments of IT organizations themselves, one key to IT success lies in not only the establishment, but also the sustainability of ad-hoc professional IT functions. As IT organizations face many kinds of process standards to implement for various IT functions and although the implementations may be different due to various IT domains, from the management point of view, these implementations may not exist individually. This article attempts to highlight a possibility of an integrated effort to effectively manage the implementations of IT standards in an IT organization. Such a shared management refers to the integrated institutionalization design, which provides a road map for all IT functions to systematically improve and sustain the implementation results. A case example is provided for demonstrating the proposed attempt.

Keywords: IT standards synergy, IT implementation strategy, Object technologies

1. IT Organizations in Contemporary Enterprise

Information technology (IT) organizations have played an increasingly important role in contemporary enterprise due to growing IT use in almost every business function and area. IT organizations, either serving internal or external customers, face many challenges in order to accommodate the vicissitudes of business. IT organizations must be capable of providing many functions, including software development, IT services, and IT security protection in response to the various informational needs from the enterprise. On the one hand, IT organizations need to align their IT strategies to demonstrate the business value of the enterprise. On the other hand, they need to work towards establishing and improving their professional functions in order to provide better value.

1.1 IT Organizations – Overwhelmed by Ad-hoc Best Practices and Standards

In order to yield better professional performance, IT organizations are often advised to focus on processes and to standardize the practices of their functions. Hence, IT organizations must consolidate related best practices and standards, such as the IT Infrastructure Library (ITIL), the Capability Maturity Model Integration (CMMI), the International Organization for Standardization (ISO) 9000 series, the ISO 20000 series, and the British Standard (BS) 7799 for each of the IT function. For example, an IT organization may implement CMMI for its software development function; and adopt ITIL practices to improve and standardize its IT service function. For each implementation strategy, tremendous efforts are involved to implement the requirements from each applicable standard and to change the work habits of the IT staff. As a result, IT organizations may be overwhelmed by the adoption of ad-hoc IT standards or fragmented pattern of process standards adoption can be easily seen in IT organizations.

1.2 Sustaining IT Standard Implementations

To IT organizations, a common motivation behind implementing standards is to earn certificates, which serve as outward symbols and verification of professional competency in various IT functional areas. Such certifications indeed help establish the best practices for related IT functions. They also act as proof that the organization has successfully implemented the best practices. Yet just like a blossoming flower which ultimately fades, the successful results of IT process implementation needs to be sustained owing to the dynamic IT environments. Besides, because IT organizations face many kinds of process standards to implement for various IT functions, these implementations often operate individually. In these regards, how to sustain the implementation results of the best practices becomes critical for IT organizations to systematically and stably perform professional IT functions.

2. An Integrated Effort

It appears that one common issue for the adoption of ad-hoc IT process standards is how to sustain the implementation or improvement results (Latif et al., 2010; Chen et al., 2010). This article aims to

address this issue. Furthermore, a concept is presented, which focuses on the possibility that the implementation of these standards can be integrated for an IT organization to effectively manage and sustain continual improvement of the implemented processes.

2.1   The Integrated Institutionalization Design for IT Process Standards

Figure 1 below illustrates the idea of such an integrated effort. In this concept, an integrated model is advocated to manage and sustain an implemented standard's requirement for continual improvement. Such an integrated model features an *institutionalization design* that enables the sustainability and drives the continual improvement of IT standards implementation. As the diagram shows, the three circles represent the major IT functional areas such as software development, IT services, and information security. The intersection of these cycles represents the integrated institutionalization design as shared managerial content among the functional areas. In the following sections, the integrated concept is introduced, including the institutionalization design and some of its academic context.
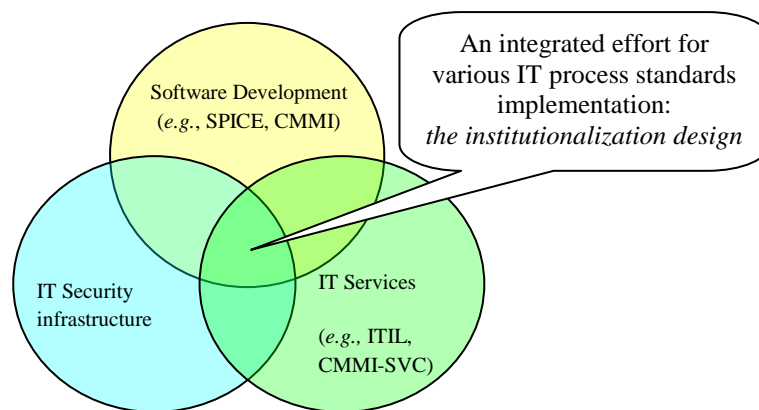

Figure 1: Concept of an Integrated Effort in Managing IT Standard Implementations for Various IT Functions (e.g., software development, IT services, and information security)

The term "institutionalization" was initially seen in earlier organizational and sociological studies. It was regarded, for example, as an effort to effect the "routinization of charisma" (Weber, 1964). Institutionalization is a process whereby new norms, values, and structures become incorporated within the framework of existing patterns of norms, values, and structures. This process lends stability and predictability to social relationships and enables them to persist (Barley and Tolbert, 1997; Kimberly, 1979). Furthermore, institutionalization concerns the process of sustaining effort through organizational changes (Goodman et al, 1980). Therefore, organizations attain reproducibility of structure and organizational performance during times of changes through institutionalization and by creating highly standardized routines (Hannan and Freeman, 1984).

Institutionalization can be applied to IT organizations through the act of adopting IT process standards. A good example of institutionalization is the generic goals and practices provided in the

(CMM/CMMI) series (SEI, 2010). Specifically, the CMM/CMMI framework comprises a number of core process areas (PA), which cover a full range of software development building blocks. Each PA features sets of specific goals (SGs) and related specific practices, which an IT organization can implement to standardize software development. To sustain these implementation results, CMM/CMMI further defines generic goals (GGs) and corresponding generic practices (GPs) (See Table 1). According to Mark Paulk and his colleagues (Paulk, et al., 1993), the application of institutionalization in software development entails building an infrastructure and a corporate culture that supports the methods, practices, and procedures of the business, so that such implementation strategies endure through human and organizational changes, including the turnover of IT staff and the loss of those who originally established the infrastructure and culture.

2.2 Degrees of Institutionalization

In his book *Quality is Free*, Crosby (1972) introduced the concept of "staging" in the implementation of quality. CMM/CMMI successfully combined the institutionalization concept with the quality staging concept to yield a continual improvement road map for software organizations. CMM/CMMI addresses an IT organization's performance in stabilizing the sub-functional areas (*i.e.*, process areas) of software development in terms of capability levels. To be specific, the institutionalization design indicates how an organization has performed regarding software process sustainability and CMM/CMMI further classifies the aforementioned GGs and GPs into different degrees of institutionalization, that is, capability levels, of process areas. In other words, the institutionalization design in CMMI guides software organizations in not only achieving current improvement goals, but also in strategically initiating the next improvements for higher goals. Table 1 shows the GGs representing different capability and institutionalization levels. Refer to (SEI, 2010) for the institutionalization meanings of each capability level.

Capability Level	Generic Goal	Generic Practices	
0	N/A	No requirements for software development institutionalization	
CL-1 (Incomplete)	GG-1: Achieve specific goals	GP1.1	Perform specific practices
CL-2 (Managed)	GG-2: Institutionalize a managed process	GP2.1	Establish organizational policies
		GP2.2	Plan the process
		GP2.3	Provide resources
		GP2.4	Assign responsibilities
		GP2.5	Train people
		GP2.6	Manage configurations
		GP2.7	Identify & involve relevant stakeholders
		GP2.8	Monitor and control the process
		GP2.9	Objectively verify adherence
		GP2.10	Review status with higher level management
CL-3 (Defined)	GG-3: Institutionalize a defined process	GP3.1	Establish a defined process
		GP3.2	Collect improvement information
CL-4 (Quantitatively Managed)	GG-4: Institutionalize a quantitatively managed process	GP4.1	Establish quality objectives for the process
		GP4.2	Stabilize sub-process performance
CL-5 (Optimizing)	GG-5: Institutionalized an optimizing process	GP5.1	Ensure continuous process improvement
		GP5.2	Correct root causes of problems

Table 1: Institutionalization Design from CMMI

3. Ensuring Continual and Contextual Improvement

The capability-level design described above provides a gradual path and a contextual understanding regarding a software organization's improvements. Besides its use in CMMI implementation, the capability-level design may also be used in implementing other process-oriented standards to motivate and drive the continual improvement effort.

Many IT process standards also advocate the importance or require the act of continual improvement during implementation. Some of the IT standards attach a continual improvement program to serve this need. However, these programs are no more than a "rolling stone" process framework regarding continual improvement (similar to a car that is continually driven by starting the engine, driving, filling with gas, driving, then filling with gas, and so on) without showing a road map regarding improvements. Besides, improvements are most likely triggered only when auditors visit the organization and identify deficiencies, or are often found in the pursuit of technically achieving a better result of ad-hoc KPIs (Vandenberg, 2002; Iversen, et al., 2004; Kautz and Nielsen, 2004). The implementation of IT standards often lacks a contextual understanding between improvements. The institutionalization design serves as the road map as well as the contextual path to guide IT organizations in gradually planning, carrying out, and sustaining an IT standard's implementation.

In the following sections, the proposed concept is demonstrated. First, an example of a famous IT standard is shown to explain the idea of how the institutionalization design can be applied to help manage the implementation. Then, a case is depicted that implements the design to contextually achieve where an organization is and to realize where they want to be.

4. An Example: Institutionalization in ITIL Implementation

In today's computerized business environments, IT service has become a substantial function of IT organizations for any enterprise. IT organizations often wish to standardize their IT service function in an effort to provide better service quality. Among the relevant process reference models and standards, the Information Technology Infrastructure Library (ITIL) has been widely adopted by IT organizations (Galup et al., 2009) to implement quality IT services. In addition to the establishment of best service practices, ITIL is also concerned with maintaining value for customers through continually evaluating and improving service quality (Cartlidge and Lillycrop, 2007). Hence, as the left part of Figure 2 shows, ITIL has a continual improvement program called the Continual Service Improvement Program (CSIP). CSIP provides a way for an IT organization to manage appropriate improvements by identifying and resolving the gap between their current and expected performance. This is done on a continual basis to address changes in business requirements, technology, and to ensure a higher service quality.

Although ITIL provides a way for improving service quality, such a way refers to a process framework and needs a road map for organizational improvements. Moreover, many improvements typically focus on the technical content of IT services, *e.g.*, improving the process design or techniques; there is a need for a means to further help sustain the implementation or the improvement results (Rudd and Hodgkiss, 2004). In this article, the proposed concept, as well as the institutionalization design, serves this need. The right part of Figure 2 is an overview of the ITIL implementation design by incorporating degrees of institutionalization to the tune of "How do we keep the momentum going?" in CSIP. As the figure shows, by taking advantage of CMMI's institutionalization content, IT organizations also have six degrees of institutionalization (i.e., six capability levels) to assist in continually improving their IT service function.
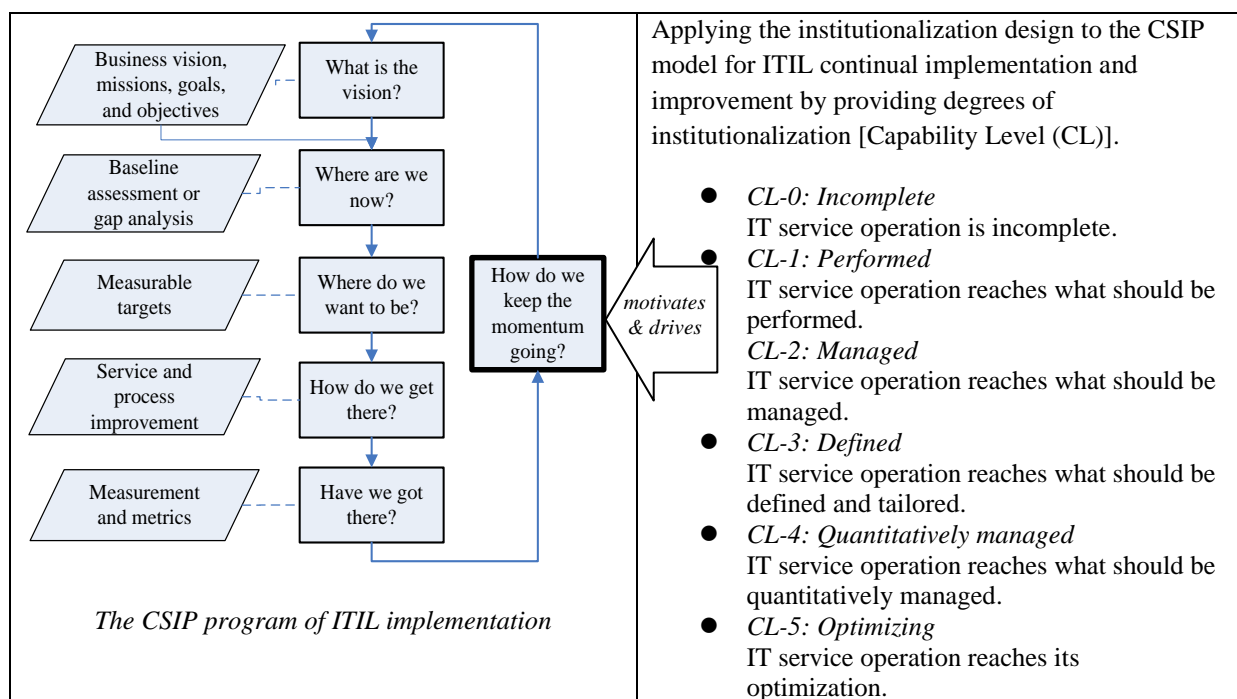

Figure 2: Applying the Institutionalization Design to ITIL Implementation

The integrated institutionalization design establishes a shared and a leveled vision for an IT organization in improving and sustaining IT functions. In this ITIL example, corresponding GPs for different levels of organizational vision in managing the service function and the ITIL implementation are further elaborated in Table 2. For example, in order to reach level two (CL-2) (in addition for IT organizations to establish a set of computing maintenance and service processes according to ITIL), organizational vision needs to achieve the GG of institutionalizing a managed process (GG 2; see Table 2). In this regard, they implement the ten GPs (GP 2.1 through GP 2.10) and apply these GP implementations for the ITIL processes. The fulfillment of both the GGs and GPs thus achieve the "Managed" capability level (CL-2), which means that similar services should yield similar performance and results.

Capability Level	Generic Goal	Elaborated generic Practices	
0	N/A	N/A	
CL-1 (Incomplete)	GG-1: Achieve specific goals	GP1.1	Implement the ITIL processes
CL-2 (Managed)	GG-2: Institutionalize a managed process	GP2.1	Establish organizational policies for the IT service function
		GP2.2	Plan the IT service processes
		GP2.3	Provide resources to execute the IT service operation
		GP2.4	Assign responsibilities
		GP2.5	Train people to perform the IT service function
		GP2.6	Manage the configurations in executing the IT services
		GP2.7	Identify & involve relevant stakeholders for IT service operation
		GP2.8	Monitor and control the IT service process quality
		GP2.9	Objectively verify the adherence to ITIL
		GP2.10	Review the status with the service stakeholders
L-3 (Defined)	GG-3: Institutionalize a defined process	GP3.1	Establish a defined ITIL process
		GP3.2	Collect ITIL improvement information
CL-4 (Quantitatively Managed)	GG-4: Institutionalize a quantitatively managed process	GP4.1	Establish quality objectives for ITIL processes
		GP4.2	Stabilize IT service quality by managing sub-process performance
CL-5 Optimizing)	GG-5: Institutionalized an optimizing process	GP5.1	Ensure continuous IT service process improvement
		GP5.2	Correct root causes of problems

Table 2: Generic Goals and Practice Elaborated in ITIL Implementation

The capability levels and the associated GGs and GPs are further explained as follows. GP 1.1 refers to the requirement of implementing the IT service content based on ITIL. When the specific practices are performed, it means that the ITIL implementation has reached capability level one (CL-1). For capability level two (CL-2), in addition to realization of CL-1, organizations need to reach the goal of institutionalizing a managed process (GG-2). That means that for ITIL processes, IT organizations need to establish policies (GP 2.1) and provide training (GP 2.5) for the entire IT service function. Besides, the organizations need to assign functional responsibilities for work roles (GP 2.4) and then identify and involve relevant stakeholders who will fulfill the roles through the lifecycle of a service request event (GP 2.7). Moreover, organizations need to provide tools and methods or resources to facilitate the execution of the services (GP 2.3), and manage configurations of process artifacts (GP 2.6) resulting from the execution of the services. Additionally, a CL-2 organization needs to plan the IT service process (GP 2.2), monitor and control the service quality (GP 2.8), objectively verify the adherence to ITIL (GP 2.9), and provide communication channels for reviewing the status with both the IT staff and the management (GP 2.10).

As for CL-3, in addition to the realization of the GPs in both CL-1 and CL-2, organizations need to further reach the goal of institutionalizing a defined process (GG-3) by characterizing ITIL processes (GP 3.1) and continuously collecting process improvement information (GP 3.2). More specifically, process characterization refers to specifying the goals, inputs/outputs, and entry/exit criteria (SEI, 2010) of ITIL procedures. To achieve CL-4, in addition to implementing the requirements through CL-1 to CL-3, organizations need to further reach the goal of institutionalizing a quantitatively-managed process (GG-4) by establishing quality objectives for ITIL processes (GP 4.1) and stabilizing the overall process quality by managing sub-process performance (GP 4.2). In order to achieve the highest level, CL-5, an organization must successfully meet the requirements presented in

CL-1 to CL-4. Once these are attained, CL-5 focuses on IT service innovation (GP 5.1) and corrects the root causes of problems (GP 5.2) in organizationally optimizing service performance.

Recently, the CMMI has developed a similar module (CMMI SVC) for service. Besides the fact that CMMI SVC applies to entire service industries including non-IT service functions, this article does not stick to a particular standard vendor due to the freedom of choice principle adhered to by industries. This is just like the following case in which an organization is depicted that uses ITIL to improve their IT service performance, and applies the institutionalization design to sustain the ITIL improvement results.

5. Discussion

In this section, the aforementioned example is further discussed by using one of our implementation cases (Chen et al., 2010). The Management Information Center (abbreviated as MIC) at Chang Gang University, Taiwan applies the proposed work to the implementation of ITIL and CMMI in the organization. The perceived satisfaction of the case organization regarding the applied institutionalization design of the ITIL implementation was investigated and discussed.

According to MIC, the greatest concern pertained to the sustainability of ITIL implementation, which included: (1) ITIL processes enduring and repeatability of work-value; (2) seamless work transition/handover of student staffs; and (3) sharing and reuse of IT service resources. Hence, how the institutionalization design helped to satisfy these needs was investigated and discussed, and the focus group method (Morgan et al., 1998) was used for this validation due to the humanistic nature of this case.

Conducting focus group interviews

The discussion was carried out based on the results of the focus group interviews in the MIC case. The focus group interview session was held for two groups of participants: the customers and the employees of the computer maintenance services. Customer data were pulled out first by looking up the service records that were after the ITIL and institutionalization implementation. Those who have requested similar services two times or more were then further identified as the customer representative to join the discussion. The employee group included the service manager, the technical supervisors and the student technicians. Among these employees, only two of them participated in the establishment of the ITIL processes, and the rest were new comers after the implementation.

In the first group with the customers, the goal was to learn about the consistency of the perceived satisfaction through different times of services provided by various technicians. In the second run of group with employees, the goal was to hear detailed accounts of how the institutionalization design would affect the MIC staffs. The analysis included the semi-structured summary of views from both

groups, and the follow-up discussion with the employee group regarding the feedbacks from the clients' group. The final report contained a concluding summary for both groups, and is itemized and discussed as follows.

ITIL process enduring and repeatable work-value: During the discussion regarding the durability of the implemented ITIL processes, employees of MIC felt that now the organization's managerial infrastructure (i.e., the established GPs applied to all ITIL processes) enabled the enduring of the ITIL processes. "We do not need to worry about the infrastructure that supports the six maintenance operations under the high turnover of student technicians in our organization," said the service manager. In the responses to the manager's comment, employees especially pointed out that the incentive policies (*i.e.*, GP 2.1) and the online system (*i.e.*, GP 2.3) greatly contributed to the maintenance of the processes and repeated work-value.

In MIC, the SRs or questions by customers are often similar in nature. "Because of the preservation of the service content into the database, we were able to quickly know how to deal with the problems and requests based on the prior experiences recorded in the system (the online SR system) by previous technicians", said one of the student technicians. The recording of SRs online is a good source of documentation so new technicians were told to look up solutions first if they saw problems happening. The reference documentation is found to be useful for employees in carrying out similar services efficiently and producing similar outcomes. Such a repeatable work-value allowed the technician to shorten their service time per case.

During the interview, it was found that the customers benefited from the repeatable work-value as well. They mentioned that the Frequently Asked Questions (FAQs) in the online Question and Answer (Q&A) subsystem helped diagnose and fix the commonly seen problems, thus helping MIC to reduce some SRs and effort.

Seamless work transition: As mentioned earlier, high staff turnover is common to many IT organizations. "Prior to this implementation, we spent tremendous effort on training new technicians" as the supervisor noted. "To meet the *training people* (GP 2.5) institutionalization requirement, we established the instructional materials regarding the ITIL procedures and the tools and then videotaped the training activities. So anyone was able to watch the training content during the job orientation or at any time they felt like it." "We also have a job transition policy -- before a senior technician leaves, she/he should train the newcomer to be ready for the qualification test. Moreover, we reward the senior technician when the newcomer passes the test."

Though currently not being perfectly seamless, the service manager and technical supervisor felt that the effort of job transition was reduced. Because of the implementation of GP 2.5 and the aforementioned policies, the supervisor's job has changed from providing the training from scratch

for each newcomer, to monitoring the job transition that is automatically done by technicians themselves. "But we need to come up with a method for continually and effectively updating the training content due to the fast-changing nature of information technologies," noted the service manager. This is considered to be an improvement opportunity regarding GP 2.5. The GPs from the next level (CL-3) may be helpful in addressing this improvement issue.

Reuse and sharing of IT service resources: In MIC, IT service resources included the software and hardware tool kits, *e.g*., the testing equipment, for performing the services, and standard form and report templates that guided the execution of the ITIL processes. Prior to ITIL and institutionalization implementation, these resources were provided, but not efficiently shared and reused. "Usually the technicians took the tool kits away without returning them to the office, thus we had to ask everyone where to find the tools.", as noted by the supervisor. "The institutionalization implementation required providing these resources (*i.e.*, GP 2.3), and we further managed these resources by using the check-in and check-out rules from configuration management" (*i.e.*, applying GP 2.6 onto the GP 2.3 implementation). MIC also applied GP 2.3 to material management. For example, when a computer is disposed of, the reusable parts are collected to be utilized as replacement parts for other computers being fixed.

In addition to the physical resources, MIC valued the sharing and reuse of work knowledge as well. Currently, student technicians are able to consult each other for resolving ad-hoc service questions. MIC further argued a need to make the implicit knowledge explicit to the organization. In this regard, the organization has the Q&A subsystem in the SR system for collecting repeated questions and solutions. However, technicians mentioned some errors in the system that might mislead them during the service. "This is because currently the system (i.e., the Q&A subsystem) allows anyone to enter anything without approval or review," some students noted. This was considered to be a future process improvement opportunity. For the next institutionalization implementation (CL-3), they plan to develop an improvement function by using the idea of Wiki and Web 2.0 for publicly revising and evolving the explicit work knowledge. In this case, it was suggested that the organization should provide incentives for encouraging employees to spend time participating and giving of their valuable experience.

6. Conclusion: What's next?

Adopting IT process standards seems to be a trend for IT organizations to meet ad-hoc information needs and to provide better business value. Due to the changing environments of IT organizations themselves, one key to IT success lies in not only the establishment, but also the sustainability of ad-hoc professional service content. This paper pointed out an emerging phenomenon (IT process standards adoption) on IT management. We proposed and further discussed a possible solution to solve the issue. Our contribution to the study is that it concerns a practice-oriented problem and uses

"Institutionalization" as a theoretical support. It represents a good combination of relevance and theorization.

Based upon this work, the research would continue to develop the proposed idea. Hence the second stage of the research includes the development of the integrated model, and a more comprehensive study of the empirical support. Since this paper only presents a portion of the integrative scenario, i.e. the adoption of the proposed idea in the ITIL implementation, further studies may be developed base upon more process standard implementations to present the comprehensiveness of the proposed work. Specifically it needs to address issues such as increased complexity and possible conflicts (e.g. conflict of the adopted IT process standards, resources conflict, etc.) when integrating the effort of institutionalizing ad-hoc IT standards' implementation. Perhaps the integration of sustaining various IT standards' implementation would require a standard as well to fully consider the aforementioned issues. As for the case presented in this paper, it served to derive the rationale of the proposed idea. To investigate the proposed work and model, further studies are expected to gather and analyze empirical data in a quantitative fashion.

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