A framework for Service Innovation Capability Maturity Model

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Abstract: This paper proposes the Service Innovation Capability Maturity Model (SICMM), which was designed to assist organizations comprehensively implement service innovations in a variety of domains. The model is composed of an Innovation Process Model and a New Service Development Process Model, which are sustained by a Supportive Process Group and an Administrative Process Group. A case study is herein described to demonstrate the two process models. Two representations and corresponding process areas (PA) are also included for improving the service innovation capability of an organization. SICMM is intended to provide standard procedures for improving and benchmarking service innovation capabilities of organizations. Organizations also can adapt the process models in SICMM to accomplish their goals.

Keywords: Service innovation; Service Innovation Capability Maturity Model; service innovation appraisal; new service development.

I. Introduction

With the globalization of consumer markets and dramatic changes in customer behavior, organizations are facing an increasingly complex and dynamic business environment. In today's competitive Service Economy Age [6], service innovation is vital for organizations [7]. According to the concepts of service dominant logic (S-D Logic) and open innovation, customers play three significant roles in service systems: consumers, co-creators, and co-innovators [2][14]. Besides customers, other critical constituent groups, such as partners and employees, should also be included in service innovation [1][10]. Practically, organizations should interact more with customers and other constituent groups in service innovation.

Service innovation is a risky business [9]. In the complex open service innovation environment, a reference model to facilitate the implementation of service innovation is vital. Existing reference models can be categorized into two types: for service management [3][8][11] and for innovation management [12][13]. The former are to help organizations develop and maintain quality services via best practices. The latter focuses on assisting organizations implement innovations and improve their innovation capabilities.

Service innovation is to improve service systems to create customer value. Thus, in service innovation, service systems are innovated and innovation systems involve customers, partners, employees and other constituent groups. To date, there is no comprehensive service innovation model in academia or industry. Thus, this paper proposes a new Service Business Process Model (SBPM) for service organizations. As part of this SBPM, the Service Innovation Capability Maturity Model (SICMM) was developed to more comprehensively assist organizations implement service innovations and improve their service innovation capabilities.

The remainder of this paper is organized as follows: Section 2 reviews the related literature; Section 3 presents the two process models in SICMM; Section 4 shows two representations and corresponding process areas (PA) for the appraisal and improvement of the service innovation capabilities of an organization; Section 5 explains SICMM with a case study; Section 6 presents the conclusions.

II. Literature Review

According to [5] and [15], this paper defines that a service is a deed, a process, or work performed by a service provider for a customer. Services should be provided as a service package with the five components, which are: supporting facility, facilitating processes and/or products, information, explicit services, and implicit services. In order to meet the changing needs of customers, service innovation is vital to organizations.

Based on the concepts of S-D Logic and open innovation, this paper concludes the following: Service innovation is a change in service systems to create value; Service package offerings, service processes, and service business models can all be changed; Service innovation must be acceptable to the service recipient in order to be considered valuable; In order to innovate services, it is critical to use a service innovation model.

Since the 1980s, ITIL has compiled a series of books giving guidance on the provision of quality IT services. The 2007 version comprises five types of processes (Service Strategy, Service Design, Service Transition, Service Operation, and Continual Service Improvement) and four types of capabilities (Service Portfolio & Relationship Management,

Service Design & Optimization, Service Monitoring & Control, and Service Operation & Support). Based on ITIL's framework, ISO/IEC 20000 was developed as the first international ITSM standard that integrates five types of processes (Service Delivery, Control, Release, Resolution, and Relationship) to effectively deliver quality IT services. However, the most common route to achieve the requirements of ISO/IEC 20000 is still via the use of ITIL's concepts and practices, while the ISO/IEC 20000 certificate is often an effective way to show that an organization has adopted ITIL's concepts and practices [5].

Due to the success of the Capability Maturity Model Integration for Development (CMMI-DEV), CMU/SEI also proposed CMMI-SVC in 2009 to meet the needs of various service sectors. Unlike ITIL, CMMI-SVC is written to be more non-prescriptive and also offers a clearer improvement path. CMMI-SVC defines Continuous and Staged Representations to respectively measure PA capability levels or organizational maturity levels, and process areas are divided into four categories, which are Service Establishment and Delivery, Process Management, Project Management, and Support.

For innovation management, PRTM/Microsoft Innovation Maturity Model was proposed in 2007 and depicts four improvement levels and four types of processes (Vision & Strategy, Insights, Management, and Organization). In Think For A Change, LLC innovation maturity map, six improvement levels, five types of processes (Strategy, Tactic, Operation, Assessment, and People), and six types of systems & tools (Idea Management, Creative Problem Solving, Innovation Culture, Continuous Improvement, Innovation Centers of Excellence, and Creativity/Innovation Training & Education) are defined for innovation management.

For supporting an open service innovation environment, all participants should be closely integrated into service systems. Based on the models listed above, this paper proposes a more comprehensive SBPM to support such an environment. In this paper, SBPM is defined as a set of service-related processes which are in a sequential implementation order to create value for customers by offering service packages. As shown in Fig. 1, SBPM consists of three process models and two process groups. SICMM contains an Innovation Process Model and a New Service Development Process Model. The Service Capability Maturity Model (SCMM) contains the Service Mainstream Process Model. The three process models are all sustained by a Supportive Process Group and an Administrative Process Group, which contain 24 processes in total (see in Fig. 2), where * and # indicate the process is created or modified in this paper, respectively. This paper is focused on the introduction of SICMM only. The details of SICMM are described in the following sections of this paper.
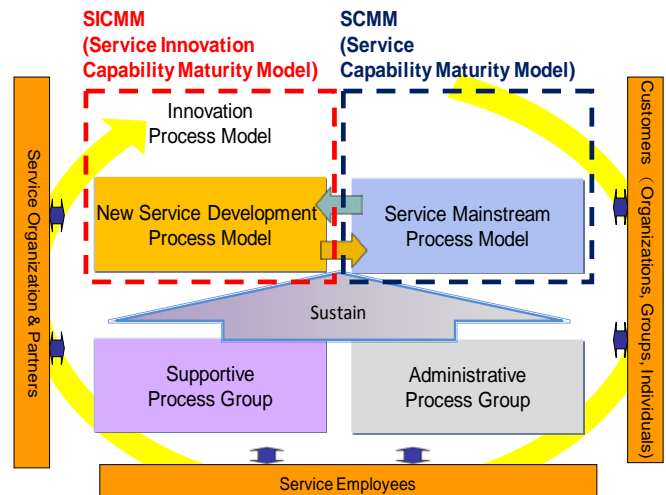

Figure 1 The framework of SBPM

Figure 2 Processes in the Supportive Process Group and Administrative Process Groups

III. Two Process Models in SICMM

The New Service Development process model is used to develop new services corresponding to organizational strategies or unexpected needs. It consists of six main processes, which are:

- Service Requirements Development involves identifying all requirements of a new service, and translating them into service requirements specifications.
- Service Concepts Development involves transforming the specifications into the concepts of service packages, and creating a value proposition.
- Service Design involves developing extensive external and internal service design specifications for service component development.
- Service Components Development involves developing service components required by service packages, and performing unit tests on them to ensure quality.
- Service Integration and Testing involves assembling all service components into a specific service package, and implementing integration tests and acceptance tests.
- Service Transition involves transferring service packages, which have been integrated and tested, into the existing service system for formal production.
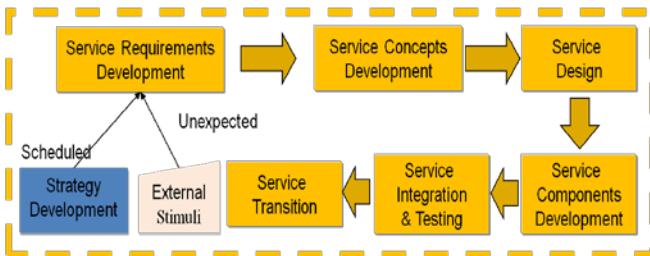

Figure 3 New Service Development process model

The Innovation process model, based on the concept of open service innovation, is designed to be a circular loop such that feedback about innovation improvement will stimulate the next innovation cycle. Its main processes are described below.

- Intelligence and Action Planning aims to collect and analyze important data, find the niches where innovation efforts should be focused, and to design a plan for further development.
- Idea Generation and Solutions Development aims to generate, evaluate and select ideas for innovation, and then develop several potential solutions.
- Design Experiments and Solution Selection aims to design and execute a series of pilot experiments to test those solutions, and select the most appropriate solution.
- Innovation Deployment and Review aims to train the participants, deploy the selected solution for formal operation, and monitor its performance.
- Knowledge Sharing and Lesson Learning aims to foster learning from experience and facilitate knowledge sharing in order to promote other innovation.
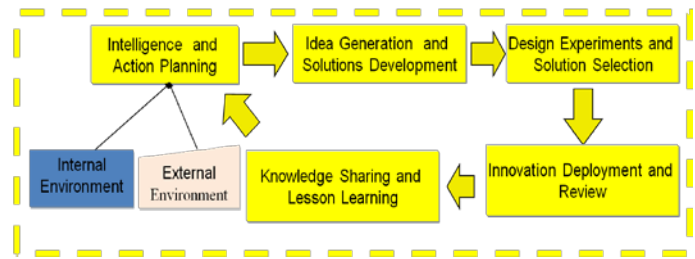

Figure 4 Innovation process model

IV. Two Representations and Process Areas

According to CMMI-SVC, a representation allows an organization to adopt model components differently with a specific set of improvement objectives, while a process area is a cluster of related practices in an area that, when implemented collectively, satisfy a set of goals considered important for making significant improvement in that area. In this paper, two representations are provided for organizations to assess the capabilities in each process area or the maturity of the overall organizational capabilities, namely Continuous and Staged Representations.

Continuous Representation with Capability Levels

Continuous Representation allows organizations to select one or a set of process areas, which are expected to be incrementally improved based on the priority of organizational goals. For each process area, there are six capability levels (CL). Levels 0 through 5 are defined in this paper. Every process area could reach a different capability level in an organization. The detailed definitions for CLs are addressed briefly below.

- Level 0, Incomplete, represents that the process area has not been performed or has been partially performed.
- Level 1, Performed, represents that the process area has been performed, but the performance, cost, delivery date, and quality are not able to be predicted and the normative processes have not been documented.
- Level 2, Disciplined, represents that, for the process area, a part of the project has fundamental normative guidelines to be followed as well as the task contents to be documented. Therefore, a successful case can be repeatable.
- Level 3, Defined, represents that institutionalized standard processes and normative guidelines for the process area are available, which project managers in the entire organization follow.
- Level 4, Managed, represents that the performance can be quantitatively measured, analyzed, and managed for the process area.
- Level 5, Optimized, represents that the variation generated in a process can be utilized for cause analysis,

prevention, incremental innovation, and to ensure optimal performance for the process area.

Staged Representation with Maturity Levels

Staged Representation provides an incremental procedure to improve overall service innovation capability of an organization by achieving five maturity levels (ML). Except for level 0, the definitions for MLs are similar with the ones of CLs. Table 1 shows the respective characteristics, key challenges and key process areas of MLs. Based on Table 1, an incremental improvement can be introduced via implementing predetermined process areas through the lower level to the higher level. * and # indicate the process is created or modified in this paper, respectively.

Table 1 Descriptions of MLs

ML	Characteristics	Key challenges	Key process areas
1. Initial	(Ad hoc) Project chaotic	● Project management ● Measurement & Analysis	● #Financial and Accounting Management ● Service Delivery
2. Coached	(Intuitive) Process dependent on individuals	● Organizational strategy ● Process management ● Technical support ● Training	● #Collaboration Management ● Measurement and Analysis ● #New Service Development ● #Project Management ● Quality Management ● Requirement Management ● Risk Management ● #Security Management ● Service Assets and Configuration Management
3. Institutionalized	(Qualitative) Process defined & institutionalized	● Quantitative management	● Decision Analysis and Resolution ● #Human Resource Management ● Incident Resolution and Prevention ● *Innovation Development ● *Laws and Regulations Management ● #Process Management ● Strategy Development ● *Technology and Infrastructure Management
4. Managed	(Quantitative) Process quantitatively managed	● Problem analysis & prevention ● Innovation technology	● Capacity and Availability Management ● #Information and Knowledge Management ● #Relationship Management ● #Reporting and Presentation ● Service Continuity
5. Synergized	(Innovative) Process continually innovated	● Maintain organization at optimizing level	● Causal Analysis & Prevention ● Change Management ● *Climate Management ● *Innovation Management ● *Intellectual Capital Management

V. SECOM - a case study for SICMM

In this paper, we use the case of SECOM, the largest security service company in Asia, as an example to demonstrate the two process models of SICMM. In 1962, SECOM was established to provide professional security-related services via well-trained personnel and high-technology security equipment. Today's SECOM has successfully expanded its business territory to 12 countries, such as Japan, United States, United Kingdom, Australia, South Korea, Taiwan, China, and so on. Two projects, one

home security service and one mobile security service, are used to demonstrate the two process models and how service innovation is implemented using SICMM.

New Service Development Process Model

External stimulus: At the very beginning, SECOM focused its business mainly on commercial security services. With burglaries and crimes continuously increasing each year, homeowners were urgently requesting policemen and firefighters to protect their families and properties. However, the police officers and firefighters are too busy with a variety of matters to handle such emergencies. As the result, SECOM decided to develop a home security service to fulfill these needs. Based on SICMM's New Service Development Process Model, its development is depicted as follows:

- Service Requirement Development
  Based on the external stimulus, key service requirements, such as accurate individual identification, all-day home monitoring, immediate emergency notification and danger exclusion, were developed and documented formally into service requirements specifications.
- Service Concept Development
  According to the established requirements specifications, potential stakeholders were invited to generate more feasible service ideas (e.g. home intrusion monitoring & notification by security glass with various intrusion sensors, and telephone circuit alert systems to notify the nearest police officers and SECOM response employees for danger exclusion). The selected service ideas were then depicted as various concepts of service packages (e.g. the service package of home instruction monitoring, notification and danger exclusion). Finally, the potential stakeholders also needed to assist SECOM in validating the concepts of the service packages and value proposition (e.g. good management mechanism, service quality, security protection equipment, and capability in loss reparation).
- Service Experience Design
  Based on the validated concepts of the service packages, the service experience design specifications were developed. Service experience design generally includes the three main designs: core service design (e.g. the design of danger exclusion process), employee service design (e.g. the design of the interaction between the customers and emergency response employees during the danger exclusion), and service-scape design (e.g. the design of physical surroundings to facilitate the danger exclusion process).
- Service Component Development
  In order to make these service packages workable, their components (e.g. the emergency response employees, telephone circuit alert system, and danger exclusion process) needed to be developed according to

established design specifications. Components may be provided by other SECOM partners. However, before the integration of these components, they all were tested by their respective developers.

- Service Integration & Testing
Integration of the service components into service packages should proceed according to a planned integration sequence and testing procedure. Subordinate components wee combined into a larger one for providing more complex service functions (e.g. installing various intrusion sensors on the safe glasses and testing their functionality). During service integration testing, if problems were identified, the problems were to be documented and corrective actions initiated.

- Service Transition
After Service Integration & Testing, the developed service packages were integrated into the existing service system to actually provide customers with the service packages. Generally, there are five main ways to implement Service Transition: parallel transition, batch transition, phase transition, immediate transition (or going cold turkey) and pilot transition. For example, the service package of home instruction monitoring, notification and danger exclusion could be introduced with pilot transition. A trial would be conducted of the service package to these homeowners in the area of rampant home crime. If it tested well, SECOM could regularly provide the service package to its customers.

Innovation Process Model

Once a home security service is regularly operated, an open innovation-based improvement process is applied to the service. Based on SICMM's Innovation Process Model, the implementation was as follows.

- Intelligence and Action Planning
The information gathering and analysis for the internal and external environments of the service was continual throughout the implementation. If an opportunity for creating value with the service was found, an action plan would be designed. For example, if it was found that SECOM's home security protection service could not effectively protect certain home members when they are not at home, there would be an opportunity for SECOM to develop a new service to also protect these not-at-home members.

- Idea Generation and Solutions Development
Based on the action plan, all potential stakeholders were included to assist SECOM in generating more feasible ideas (e.g. accurate positioning of not-at-home members and other valuables, and regular validation of not-at-home members' security) as well as designing corresponding solutions (e.g. accurate positioning of not-at-home members and other valuables by Assisted Global Positioning System (AGPS), and security

validation of not-at-home members via the regular vibration and confirmation signals of a small device on their persons) for the new service.

- Design Experiments & Solutions Selection
In order to validate the practicality of these solutions, SECOM designed and implemented a pilot test for them. Based on the results of the test, SECOM selected the optimal set of solutions for commercialization. For example, SECOM provided a prototypal positioning device to these potential customers to validate if AGPS could accurately position them.

- Innovation Deployment and Review
This stage involved deploying the commercial service into SECOM's existing service system. Then, the performance of the service was continually reviewed to ensure service quality. One example of this is the implementation of the promotion and training for SECOM mobile security services. After the service was regularly operated, providers continually measured and analyzed its performance.

- Knowledge Sharing and Lesson Learning
It is also important to document the proceedings of the innovation project and share the knowledge to all stakeholders. The problems encountered during development may be useful for other innovation.

The following are several processes in the Supportive and Administrative Process Groups to sustain the two process model for both projects:

- Climate Management
For example, establish and maintain a good open innovation environment to attract participants to actively join the implementation of SECOM's service innovation.

- Project Management
For example, adopt integrated and quantitative project management techniques to manage the implementation of SECOM's service innovation projects.

- Relationship Management
For example, identify feasible stakeholders to co-implement SECOM's service innovations.

- Technology & Infrastructure Management
For example, ensure the success of SECOM's service innovations by the effective management of new or existing technologies and infrastructures.

VII. Conclusions

This work has contributed a model, SICMM, to evaluate the capability of each process area and the maturity of the overall capabilities of an organization with respect to implementing service innovations. SICMM is designed to be a comprehensive model in a variety of domains. It is intended to provide standard procedures for improving and benchmarking service innovation capabilities of organizations. Service organizations may adapt the

processes in SICMM to accomplish their goals.

The future direction of this research is to collect general and specific practices for each process area and pilot SICMM in service organizations in order to assess its practical value. Following the procedure of the Standard CMMI Appraisal Method for Process Improvement (SCAMPI) [4], the gap analysis would be executed before implementing SICMM. The purpose of which is to understand the gap between the status quo and desired performance of an organization. Then the scope of the organizations to apply SICMM should be identified. By piloting, new opportunities to improve the model will emerge. A set of standard appraisal methods would be developed if required. With respect to compatibility with ITIL, ISO/IEC 20000, and CMMI-SVC, more comparisons would be conducted as well.

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