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Service Configuration Item: Interaction-Based Framework for Service Description

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***Abstract*: Service description is required for product labeling. Product labels provides detailed information that potential customers can use to make purchase decisions, and other manufactures can use to determine whether products can be used as materials for their production processes. However, the service industry lacks such standardized product labeling operations. The complex customer situations, dynamic interactions, and ever increasing online transactions involved in a service process make service description challenging for service providers. This study develops a service description method focused on analyzing and implementing different types of interactions in a service process. The proposed method comprises two major constructs, a Service Configuration Item for interaction description and a service implementation framework for implementing different types of service interactions. Service Configuration Item is a modularized service process including descriptions of available human-to-human, human-to-machine, and machine-to-machine interactions that can be adapted to various customer situations. The framework is a roadmap using in service implementation including four explicit steps that can assist service designers in analyzing and implementing the interactions identified from the Service Configuration Items. A demonstrative implementation of the service description method was devised to demonstrate the application of the proposed method in a practical healthcare service process. The implementation reveals the benefits of this interaction-based service description method that can advance knowledge of service research and assist service designers with service innovations.**

***Keywords*:** Service Configuration Item, Web Service, Service management, Service description

I. Introduction

Service is defined as intangible goods [1] delivered by service providers via interactions with customers. Service providers [2], generally, design a set of generic delivery processes, including service alternatives to accommodate different customer situations [3]. Decisions regarding alternatives for specific customers are based on interactions during service delivery [4]. Service providers must be able to configure available resources, respond to dynamic interactions [5], and select suitable alternatives to fulfill customer expectations during service delivery [6], [7]. Numerous service firms have succeeded through a sequence of adaptive and evolutionary processes without developing deliberate service descriptions in advance. After having accumulated abundant service experiences, service providers are reaching out to academics for theoretical frameworks to support their service innovations [8]. Before turning intangible experiences into explicit frameworks, service researchers must abstract complex service situations and describe the dynamic interactions between service providers and customers to understand the adaptation and evolution processes of service firms [9].

Most services are complex and divergent, where complexity depends on the characteristics of the service the providers intend to offer [10]. However, divergence depends partly on customer expectations and partly on provider ability to accommodate the dynamic interactions involved in service delivery [6]. For example, hospital services provide different patients with high complex and divergent care service, and fast food services offer customers with high complexity but low divergence food service [4]. Identifying a crucial attribute that can adequately describe such variations in a service process is challenging for both service researchers and service designers [10]-[12] Numerous service description approaches have been developed in different domains, including service blue-print from marketing management [4], Business Process Modeling Notation (BPMN) from business process modeling [13], and Web Service from information system development [14], and each of these approaches use different descriptive methods. As information technologies and online transactions become an important aspect of service development, a service description framework that focuses on describing different types of interactions in a service process becomes necessary to deal with both managerial and technical concerns [15].

This study devises a service description method focused on analyzing and implementing different types of interactions in a service process. The proposed method comprises two major constructs, a Service Configuration Item (SCI) for interaction identification and description and a service implementation framework for implementing different types of interactions. SCI is a modularized service process including descriptions of available human-to-human, human-to-machine, and machine-to-machine interactions that can be adapted to various customer situations. The framework is a service implementation roadmap comprising four distinct steps that can help service designers to analyze and implement the interactions identified from the SCI. A demonstrative implementation was developed to represent the use of the proposed method in a practical healthcare service process. A brief literature review follows, including service characteristics, service description approaches, and techniques for service system description. Section 3 shows the development of the SCI and the service implementation framework. Section 4 then demonstrates the implementation of the proposed method to a service scenario from the healthcare domain. Finally, Section 5 discusses the findings and implications and presents concluding remarks.

II. Literature

Service is an intangible product created by service providers and customers via a co-production process [12]. Within this process, service providers dynamically interact with customers to achieve desired outcomes [16]. The interactions in a service process are part of provider deliverables, and comprise people, technologies, and information that continually adjust to adapt to the changing service environment [7], [17]. Although no consensus exists regarding the definition and description of the term "service" [8], researchers accept some common attributes, such as the people-centered perspective that sees people as part of service delivery [17]; the interaction-based service perspective that sees each participant, whether human or machine, involved in a service process as having various contextual characteristics and interacting to achieve a common goal [4], [18]; and the process oriented perspective that sees a service process as a set of modularized service items that service providers can flexibly adjust to fit different customer situations [2], [19]. The modularized service items enable designers to integrate and configure service items either from their companies or other service providers and design new service processes for their business purposes [7], [20]. An effective service description method is required to assist service designers in describing interactions between service items and coordinating those items to create new value.

Service description is needed as a necessary requirement for product labeling [10], [18]. Product labels provides a description of the good, including the product name, ingredients, expiry date, directions for use, technical specifications, manufacturer contact information, etc. This description contains useful information that potential customers can use in making purchase decisions [5], and that other manufacturers can use to determine whether the product can be used in their own production processes. Product labeling has become a standard operation in manufacturing, but the service industry lacks such standardized description. The complex and divergent nature of services makes description difficult due to the variation among customer situations [4], [21]. Moreover, modern services are rarely provided by a single service provider [6]. Unlike tightly-coupled supply chain operations in manufacturing, service operations are loosely-coupled and are only combined into an integrated whole on an ad hoc basis [22]. For example, a customer might visit a travel agent to book a holiday. The agent then starts a holiday booking service process through activating several service operations that involve interacting with different service providers, including hotel booking, transportation scheduling, and bank crediting. These service operations can be performed using human interactions, online transactions, or predefined automotive executions. Interaction among providers, customers, and other providers is crucial to the success of such service processes and needs to be described in detail [6]-[8], [16].

Numerous service description methods have been developed in various domains, and different methods can adopt different descriptive focuses and implementation. For example, service blue-print focuses on personal interactions between front line service providers and customers, and describes alternatives available to providers to meet divergent customer situations [4], [23]. Furthermore, BPMN models business process by describing roles, activities, and sequence flows in a service process [13], [24]-[25]. Moreover, Web Service stresses machine-to-machine communication using emerging Internet technologies, and describes protocols for message exchange between different service items [14], [26]-[28]. These service description methods have significantly contributed to service industry development. However, as information technologies and online transactions become important to the service industry, service interactions between providers and customers have gradually shifted from pure human-to-human interactions towards a mixed mode that includes human-to-human, and machine-to-machine interactions [7], [22], [29]. Current service description methods may incapable on fully articulating the mixed model of modern service processes. In competitive business environments, customer satisfaction and loyalty can be determined solely by the quality of single service interaction. A different service description method thus should be implemented to describe the increasingly complex and mixed mode of service interactions.

Complex service interactions can be understood using an abstraction technique that describes service as a system [9], [17]. Service systems comprise a clear objective, operational entities within the system boundary, and relationships that describe interactions between the entities and other systems. In the service industry, many service firms develop in a dynamic and evolutionary manner [7], [30], and even experienced practitioners have difficulty describing in detail how service operations have been conducted [18], [31]. This systemic description allows researchers to abstract certain attributes from the subject service system without becoming overwhelmed by the complexity of other system characteristics. Using the systemic concept in service description can benefit from other disciplines that use the same concept in their developments, such as the use of

requirement analysis from software engineering domain for identifying service interactions [32]-[33], the use of process modeling from business process management domain for describing service operation [20], [34], and the use of product lifecycle management from manufacturing domain for managing service configuration [35]-[36]. These developments from various disciplines can significantly benefit the innovations in service description.

Service description is vital to service system management [18]. The natures of service system make it difficult to describe in detail. An adequate abstraction method is required to provide service designers with a holistic view for describing and implementing human-to-human, human-to-machine, and machine-to-machine interactions in their service processes.

III. Method

The study designs a service description method to analyze complex interactions in modern service processes. The proposed method includes a descriptive item, SCI, and a service implementation framework. SCI is defined as a modularized service process that has an operational goal and interacts with other processes in three ways, namely human-to-human, human-to-machine, and machine-to-machine. Figure 1 shows a generic model of SCI describing identification of a service item, and needed and available interactions for the service item. The framework is a roadmap that integrates managerial and technical techniques from various domains such as system analysis, process modeling, and lifecycle management to support service designers in service analysis and interaction implementation. The framework comprises four steps, as follows:

- Use Case description: Use Case description is a systemic abstraction approach used to capture user requirements regarding information system development. This approach can describe the roles and relationships involved in a service process and provide information regarding the sequence of the process operations. Applying Use Case is an iterative operation that enables an initial description to be refined to clarify the interactions among different roles in the process.
- SCI identification: Use Case describes a sequence of service operational activities that required extended managerial and technical analyses for implementations. A modularization procedure can organize the lengthy process into a set of manageable SCI. Modularization is a crucial business strategy that can have substantial impact on the development of a service business. Modularizing service processes should have in-depth consideration on company current management and technical capabilities, interactions among potential partners and customers, and company long-term development. The modularized service processes should also maintain certain flexibility to cope with the changing business environment. Service designers can then determine the scale of an SCI and types of interactions between different SCI based on the capabilities of the service provider and available resources to implement the service process.
- Interaction description: This step focuses on identifying types of interactions among different SCI, which service designers use to define configurability in terms of interaction types for each SCI. An adapted BPMN diagram is used to identify type of interactions among human and machine agents described in SCI. Since customers are varied, service providers can interact in different ways to cope with the changing situations they face. Moreover, the diagram can sequence and classify interactions via a service process so that service designers and technical developers can focus on their own implementations without losing the business goals of service process in interest.
- Interaction implementation: Implementation of a service process can easily suffer problems associated with the gaps between managerial and technical concerns. Loosing either ones can jeopardize service process success. Service designers can use the type of interactions to organize the implementations of human-to-human interaction using marketing and managerial skills, of human-to-machine interaction using human-computer-interface techniques, and of machine-to-machine interaction using Web Service technologies. The implementations can also flexible to the changing business and technology environments.

The service implementation framework provides a guideline that service designers can use to modularize a service process into a set of SCI and implement the identified interactions using various techniques to realize a business objective. SCI describes types of available interactions that enable service designers to configure service to accommodate different customer situations. A demonstrative application is implemented to explain the use the proposed service description method to describe and implement a real work healthcare service process.

Service Configuration Item	Identification and Description	
Interaction	H_H	Needed and available human to human interactions
	H_M	Needed and available human to machine interactions
	M_M	Needed and available machine to machine interactions

Figure 1. SCI Generic model

IV. Demonstrative implementation

A care plan creation process from a local health service center is used to demonstrate how the proposed service description method can support service designers in describing and implementing service processes. The care plan creation process is adapted from Integrating the Healthcare Enterprise (IHE), an industrial initiative formed by the Radiological Society of North America (RSNA) and the Health Information and Management Society (HIMMS) in 1999 [37]. IHE aims to stimulate the integration of the information systems that support healthcare organizations. Based on an IHE medical summary sharing Use Case, this study develops a care plan creation scenario, as follows.

A senior citizen discharged from hospital reported to a local health service center and applied for a follow on care plan. The care manager in the center discussed his application and collected initial information to assess the required care. The care manager then coordinated with the hospital to request a medical summary. The hospital processed this request and sent the medical summary to the health service center. The manager then completed the information collection and prepared an initial care plan for the citizen. Finally, the care manager discussed the application with the citizen again to finalize the details of the care plan and coordinated with related care providers to deliver the required care.

In the scenario described above, a senior citizen can visit the health service center in an ad hoc basis that service manager in the center can only be prepared for care plan creation applications. Operational activities used in a care plan creation process should be programmed and tested in advance. However, the activities will only be coupled and activated when a senior citizen visit the service center and apply for follow-on care plan. Moreover, service managers may face various service situations in processing a care plan, for instance, some senior citizens may have adequate computer literacy and have checked the information needed before visiting the center and some citizens may only be requested by a hospital to report to a service center for applying a care plan. The situations require service designers to abstract essential attributes from complex service environments and design different alternatives to adapt to the changing service situations. Figure 2 illustrates an initial abstraction of the care plan creation business process to represent the main operational activities and interactions within the scenario.

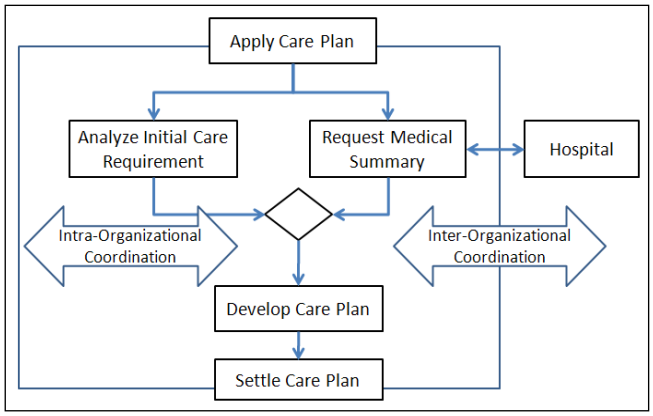

Figure 2. Abstraction of care plan creation business process

The service description method can be used to describe and implement the care plan creation process through the following steps:

- Use Case description
  Three roles and interaction\ns among them have been identified and described using the Use Case description in the care plan creation process, and the sequence of the care plan creation operations can also be identified. Table 1 lists the Use Case description of the care plan creation process.

Service	Care Plan Creation
Processe	1. Citizen visits local health service center 2. Care manager discusses with the citizen for care assessment 3. Care manager collects needed information from care plan creation 4. Care manager requests a medical summary from the citizen's discharged hospital 5. The hospital received the request and sent the citizen's medical summary to health service center 6. Care manager prepared an initial care plan for the citizen 7. Care manage discussed with the citizen about the initial care plan 8. Care manage explained the details of the care plan to the citizen 9. The citizen signed the care plan contract and service employee implemented the care service with various service providers

Table 1. Use Case description of care plan creation process

- SCI identification
  The nine operational activities involved in care plan creation process can be modularized into three SCI, namely care requirement analysis, care plan development, and care plan settlement. The modularization in this example was performed by the authors, who had practical experience as a result of healthcare and information system development domains. Additionally, a local health service center was consulted for confirming the operational activities described in the Use Case. Figure 3 illustrates the sequence and available interactions of the three SCI.
- Interaction description
  Detail tasks for each SCI can be described according to the intentions and capabilities of the health service center. This study assumed the senior citizen had sufficient computer literacy to communicate with the care manager using a computer if necessary. Care plan creation software was provided to support the care manager operations. The hospital was assumed to have an automated service for processing medical summary requests. An adaptive BPMN diagram was developed and used to describe the interactions between different tasks in the process, and each identified interaction was numbered and marked to indicate its interaction type, i.e. HH: human-to-human, HM: human-to-machine, and MM: machine-to-machine. Figure 4 illustrates the sequence and types of interactions involved in the care plan creation process.
- Interaction implementation
  This study implements a set of care plan creation software focusing on human-to-machine and machine-to-machine interactions. Web Service technologies are introduced to implement machine-to-machine interactions. The computer language C# from Microsoft Visual Studio 2005 is used to develop human-to-machine interactions. SQL service 2005 is the supportive database, and BizTalk 2006 is the process engine providing Web Service coordination between the health service center and hospital. Figure 5 shows a sequence diagram detailing Web Service implementations.

This demonstrative implementation illustrates the concept of the SCI and applies the steps in the service implementation framework to redesign a care plan creation process into a set of modularized service items, and identifies types of interactions involved in those service items. The interactions can be implemented with various managerial and technical techniques according to different business and environmental situations.

V. Discussion and conclusion

This study devises a service description method in response to the growth in the online service business environment. The developed method provides a generic structure that service designers can use to analyze interactions within a service process, modularize the process into a set of manageable items, and configure types of interactions to fit various customer situations. The proposed method integrates numerous service description approaches from service researches, such as the Use Case for identifying service requirements and operational sequence, service blue-print for describing types of interactions, an adapted BPMN process description for diagramming details of interactions, and Web Service technologies for depicting details related to technical implementation. The framework is flexible for service description and implementation and can include other service analysis methods such as service script [38], service integration patterns [33], and other process modeling techniques [39]-[40].

The SCI, unlike other service description methods, focuses solely on identifying and describing available service interactions, including human-to-human, human-to-machine, and machine-to-machine involved in a service process. Interaction is a crucial attribute in a service process that is complex and evolutionary in nature. The SCI abstracts interactions from mixed and dynamic service processes and classified them into three types that different domain experts can use to focus on their own type of service interaction implementations. Following the growing popularity of online transactions in service industry, the SCI have substantial descriptive capabilities to bridge the gaps between managerial and technical concerns and can reveal a holistic view of modern service processes.

The demonstrative implementation illustrates how the proposed service description method can be used to analyze a care plan creation process in the healthcare domain. Many industrial initiatives have attempted to describe standardized service processes in their respective fields, for example IHE developed Use Case descriptions with identifying roles and interactions among them in various healthcare domains. Such initiatives normally involve service providers from practical business environments who have the knowledge to adequately describe service processes of interest. Those descriptions can then be used by service designers in related fields as a basis for service innovations. The demonstrative implementation is a case to show that how a service designer can adopt a Use Case description from IHE to innovate a service process for a local health service center.

Web Service technologies were used to automate the interactions involving computer systems between the health service center and hospital. The Adapted BPMN description maintains the descriptive power from original BPMN and separates roles of human and machine in different lanes. This adjustment supports service designers to identify and describe interactions within and among different pools representing the roles of human and machine agents in the service process. The dot circled area in Figure 4 is a Web Service implementation to support machine-to-machine interactions for requesting medical summary. Service designers can also redesign the interactions shown in Figure 5 according to the situations of specific customers or other service providers.

This study is limited with its field evaluation. However, the SCI provides an integrated perspective on describing different types of interactions involved in a modern service process. The benefit of using the SCI description can be identified by analyzing a service process using the service implementation framework. The proposed service description method can provide service designer with the flexibility to adapt the implementations of types of interactions in a service process to match the changing business and technical environments.

Research on service as a scientific discipline remains underdeveloped. Numerous service firms that have succeed in the past are now reaching out to academics for theoretical analyses to extend their business successes. Service description can be an initial step by which researchers and practitioners can advance their understandings of complex service situations and explain how successes are achieved. This study abstracts a crucial attribute, interaction, with the SCI concept and combines this concept with the service implementation framework to advance knowledge of service description and illuminate service innovation.

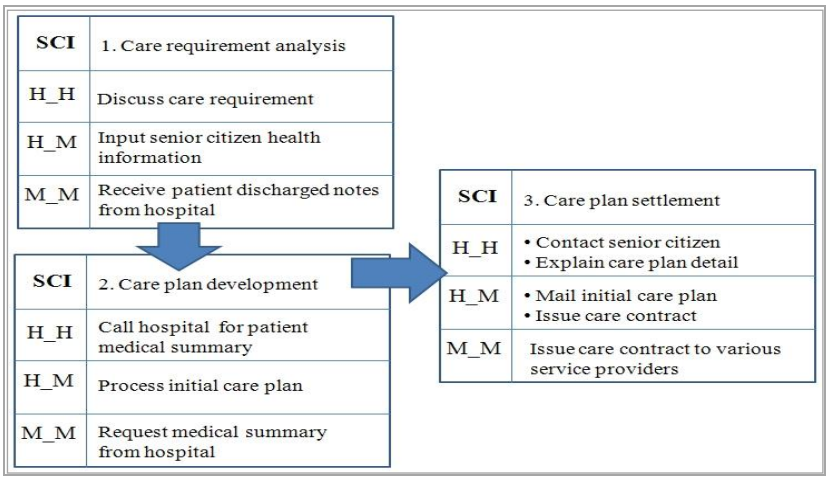

Figure 3. Sequence and available interactions of the three SCI

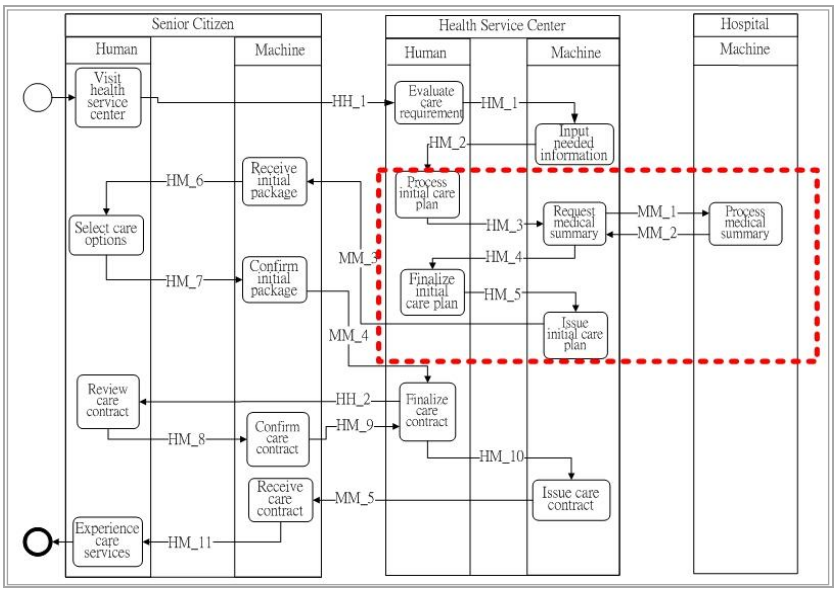

Figure 4. Sequence and types of interactions involved in care plan creation process

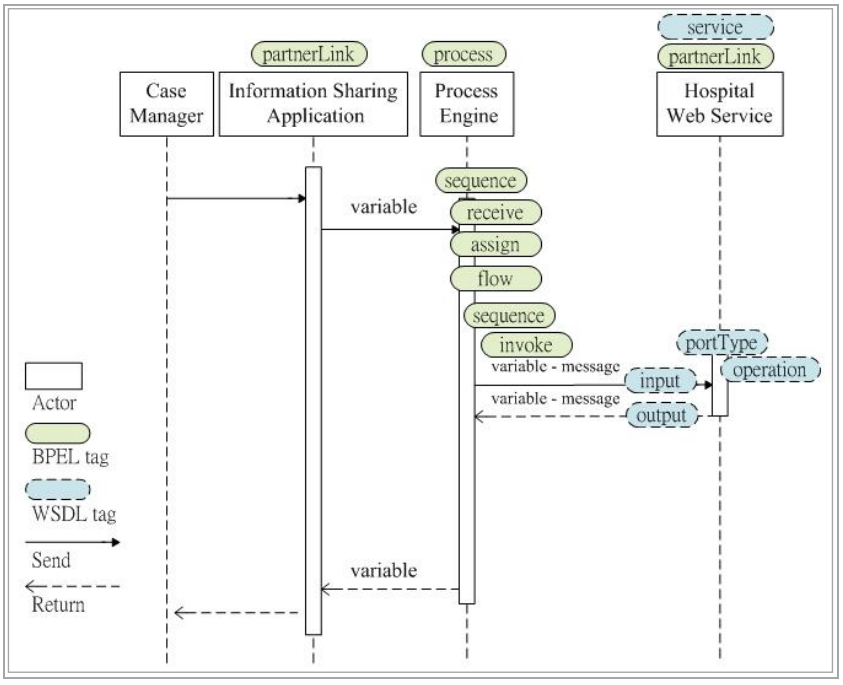

Figure 5. Sequence diagram of Web Service implementation

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