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Americas Conference on Information Systems (AMCIS)

8-2010

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ABSTRACT

To succeed in the current business environment, organizations need to be innovative, flexible and faster in the face of uncertainty, complexity and change. As the perspective has moved from products to services, enterprises have componentized their structures to operate in the newly emerging collaborative ecosystems. Service-oriented information technology approaches have proven to be well suited to this business transformation. Increasingly, IT capabilities also drive business strategy. To create a 'big picture' that brings together different viewpoints and their relations and helps positioning and comparing various approaches to service systems, we put forth a new artifact, the Map to Service-Oriented Business and IT. The map uses a layered approach and is divided to four viewpoints along two dimensions: business-IT continuum and distinction between internal and external aspects. The layering is grounded in the Stratified Systems Theory, a cognitively motivated theory on organizations.

Keywords

Service system, service science, service-oriented architecture (SOA), requisite organization, stratified systems theory (SST)

INTRODUCTION

Gone are the days of business-as-usual tranquility. To succeed in the current business environment, organizations need to be innovative, flexible and faster in the face of uncertainty, complexity and change. The wants and needs of customers are increasingly varied; in many industries, customers see products increasingly as commodities and demand customized, end-to-end solutions to their myriad problems. The perspective has moved from products to services, which has led to rethinking the very structures of these industries. An increasingly accepted response has been the deconstruction of the corporation and respective emergence of collaborative ecosystems (Cherbakov, Galambos, Harishankar, Kalyana and Rackham, 2005).

Service research has significantly increased in the last few years. Two ideas have been of particular influence: service-dominant logic (S-D logic) formulated by Vargo and Lusch (2004) and the service science initiative launched by IBM (Chesbrough and Spohrer, 2006). *S-D logic* defines service as the application of competences for the benefit of another (Vargo and Lusch, 2004). *Service science* is an interdisciplinary study of service systems and how the resources of one or more service systems are applied for the benefit of another service system in economic exchange (Spohrer, Vargo, Caswell and Maglio, 2008). Spohrer et al. (2008) propose that service co-creation can be described as interaction of service systems. A *service system* is an open system consisting of resources that can be dynamically configured and connected to other service system's resources. Resources can be competencies, knowledge, shared information, technology, people, and organizations. Study of service systems, i.e. service science, therefore needs to integrate organizational and technological considerations.

Both S-D logic and service science imply that service is about networked value co-creation, where both provider and customer resources actively partake and where interaction is as important as the resulting outcomes. Depending on the complexity of the service, successful interaction may require intra- and inter-organizational coordination of activities, people, information and technology. Organizations striving to succeed in such business cannot rely on managerial and operational

practices based on the so called *goods-dominant logic* (G-D logic) which focuses on production processes' units of outputs (Vargo and Lusch, 2004). The dynamic configuration of resources during service system value co-creation seems to require a management logic that allows for open systems and adaptability.

Information technology has traditionally been seen as mere 'cost of doing business' that is 'aligned' with business at best. As IT infrastructure has commoditized at operational levels (Carr, 2003), the focus has shifted to more strategic use of IT. Business-IT alignment has been discussed for almost two decades (Luftman, Lewis and Oldach, 1993; Henderson and Venkatraman, 1993), but the issue is still considered to be of high importance (Luftman, Kempaiah and Rigoni, 2009). In particular, the need for better alignment between business and IT strategies is still topical.

Information technology is responding to the changing business requirements through approaches that help organizations to be more flexible. In service-oriented business, IT capabilities increasingly drive business strategy or even comprise the foundation of the business model (Cherbakov et al., 2005). Web services, service computing, and service-oriented architecture (SOA) are some examples of this phenomenon (e.g., Papazoglou and van den Heuvel, 2007). These approaches have proven to be well suited to business transformation. Cherbakov et al. (2005) argue that the principle of 'separation of concerns', well-known in software engineering, should also apply in service-oriented business in the form of logical separation between business function (service) and its fulfillment (implementation).

The service composition, enabled by IT, is a powerful concept: the process fulfilling a service can combine several other services, potentially provided by others, without the consumer being aware thereof. Zhao, Hsu, Jain, Spohrer, Tanniru and Wang (2008) discuss how bridging service computing and general service management is an important research topic that will require attention from various fields like information science, system engineering, and organizational science, among others. However, organizations are likely to fail to leverage the adaptability promised by such technologies, unless their structure is changed accordingly (Bieberstein, Bose, Walker and Lynch, 2005; Cherbakov et al., 2005).

We note—and welcome—this general move towards service-orientation amongst a myriad of research fields. This denotes a shift in perspective from a closed, controllable system to an open, transformational system, and from efficiency to effectiveness. In the IT realm, the paradigm shift is from development of information systems to composition of software services, from single device to network computing, and from traditional buying of software to a more utility-oriented model (Fitzgerald and Olsson 2006). We also note that a 'big picture', bringing together different viewpoints and their relations, would be beneficial for researchers and practitioners alike. Several other researchers have also provided frameworks with differing viewpoints towards this end (e.g., Cherbakov et al., 2005; Bieberstein, Bose, Walker and Lynch, 2005; Chen, Chi and Li, 2009; Alter, 2009).

In this paper, we chart a map of the territory of service-orientation in business and IT. Our approach is similar to Alter (2009), who analyzes relations and synergies between four lenses for studying service systems: IT-reliant work systems, co-creation of value, outputs of IT-based tools, and services computing. The framework is presented as four concentric layers with each layer successively less specific and broader in scope and divided among the four lenses. Likewise, our map uses a layered approach and is divided to four viewpoints along two dimensions: business/IT continuum and distinction between internal and external aspects. The business/IT dimension is motivated by the ever-important notion of business-IT alignment (Luftman et al., 2009), whereas the internal–external distinction reflects the logical separation of the business function from its implementation (Cherbakov et al., 2005).

In terms of layering, we build on the rigorous foundation of the Stratified Systems Theory (SST) (Jaques, 1998), according to which work in a 'Requisite Organization' is stratified into distinct natural layers, or 'strata'. In information technology context, the Stratified Systems Theory has been applied to determining information system requirements (Cashman and Stroll, 1987), designing the design of enterprise information systems (Gould, 1986), and more recently to architecture governance pertaining to Business Process Management (Korhonen, 2007), Enterprise Architecture (Korhonen, Hiekkanen and Lähteenmäki, 2009) and Information Security Management (Korhonen, Yildiz and Mykkänen, 2009).

We view that our artifact, the Map to Service-Oriented Business and IT, provides a novel and rigorously grounded model for positioning and comparing various approaches to service systems. Specifically, the map has potential to provide insights into aligning service-oriented business and IT artifacts and their management internally and externally.

In this paper, we first introduce Stratified Systems Theory, then proceed with mapping service-oriented business and IT domains in line with STT, and finally conclude with discussion and conclusions.

STRATIFIED SYSTEMS THEORY

Jaques (1998) recognized that both the complexity of work and the capability of people occur at distinct organizational levels. In his Stratified Systems Theory, he defends hierarchy as a natural form of social organization that reflects the discontinuous steps in the nature of human capability. Just as adult psychological development transpires through distinct stages of increasingly higher orders of abstraction (Kegan, 1982); the organizations exhibit a hierarchical ordering of complexity that evolves through dialectical motion between differentiation and integration.

In a 'Requisite Organization', levels of work complexity are measured by the required time span of discretion in a role and are aligned with respective human capability levels to support effective managerial accountability. The role complexity increases discontinuously in specific steps, stratifying varying kinds of work into natural layers, or 'strata'.

In the realm of human organizations, Jaques (1998) distinguishes two orders of complexity:

Symbolic-Verbal (SV) order of complexity that covers Strata I through IV. This order of information complexity allows us to carry out all the activities necessary to manage day-to-day work from shop floor to middle management levels.

Conceptual-Abstract (CA) order of complexity that covers Stratum V and beyond. This is the form of thought and language required for successful work at senior corporate levels.

Figure 1 depicts exemplary roles at the requisite strata as identified by Jaques (1998).

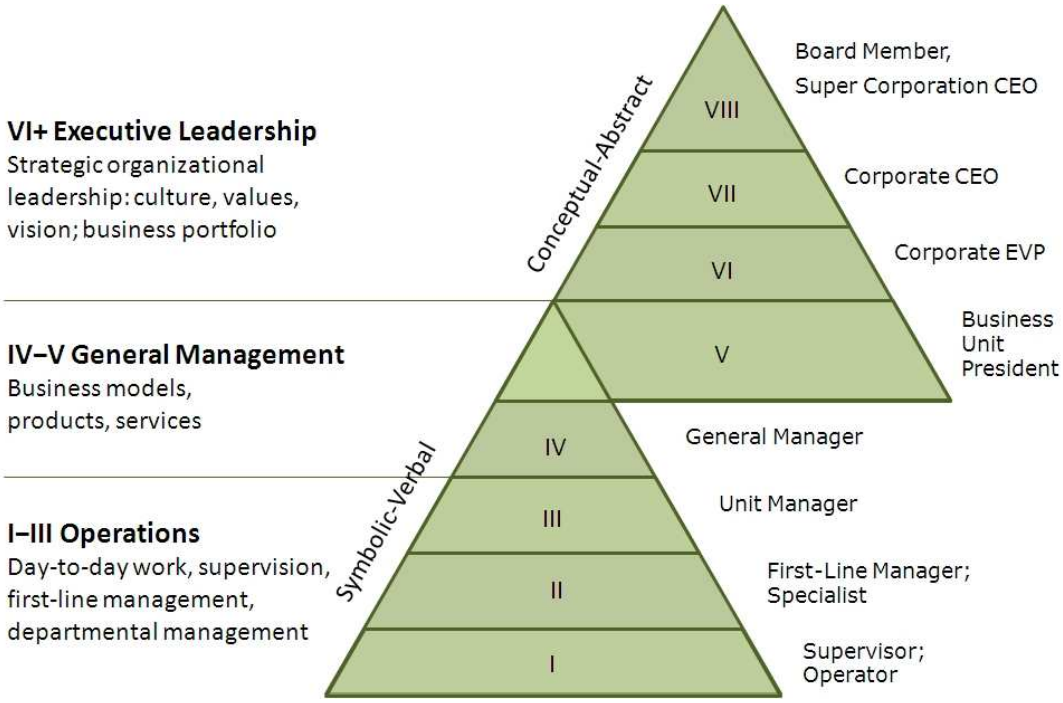

Figure 1. Work in a 'Requisite Organization' is stratified into distinct strata; adapted from Jaques (1998).

Operations at Strata I–III

Strata I–III are the levels of direct operations within a mutual recognition unit, such as a department of the organization (Gould, 1986). These lowest three levels include operational day-to-day work, work supervision, first-line management and management at the departmental level.

The work at Stratum I is concrete work towards completely specified goals. It is usually done by first-line manual workers and clerical staff; managerial activity at this level is supervision at best. Direct actions at this level do not call for much discretion or planning ahead, but the tasks are carried out following scripted instructions. When things go wrong and the obstacles cannot be overcome based on previously learned methods, outside help is needed from the next higher stratum. (Jaques, 1998). This is the level of elementary business activities, client interaction, rules and regulations, quality standards,

and time and other constraints (Gould, 1986), where service excellence, accuracy and proficiency in organizational routines are valued (Van Clieaf and Kelly, 2007; Fallow, 2007).

The work at Stratum II includes first-line managerial work and specialist work of engineers, scientists, therapists, etc. It requires interpretation and reflection on what is occurring to diagnose potential problems and obstacles (Jaques, 1998). Examples of tasks at Stratum II include delivery of service to internal/external clients, design of a product component or implementation of a software system.

Stratum II is about continuous improvement and quality improvement (Van Clieaf and Kelly, 2007). People value consistency (Fallow, 2007) and deviations from expected standards are managed (Calitz, 2007). The change is incremental and takes place within the established structure. Underlying theories, reasoning or assumptions are not questioned, but requisite change is incorporated into existing structure.

The work at Stratum III is not only direct judgment and diagnostic accumulation, but also about constructing alternative pathways to a goal, proceeding serially along one of the pathways and switching to an alternative route of action, if necessary (Jaques, 1998). The sequence of tasks must be managed as a whole, not as a series of unconnected events (Dive, 2008). This is the first level at which managers are expected to lead other managers. Roles at Stratum III also include 'senior' or 'chief' engineers, scientists, many lawyers and doctors. (Jaques, 1998).

Stratum III is about process reengineering within the existing asset base; there is no expectation for investing new capital for innovation in new products, new services, and new businesses, but the decision-making authority is limited to short-term core business process efficiencies to maximize return on investment (Van Clieaf and Kelly, 2007). Extrapolating from single instances, systems are planned to cope with known or predictable situations on a linear or serial basis (Gould, 1986). Managers at this level are also expected to make a significant contribution to the formulation of policy and strategy (Dive, 2008). They provide information on resources and capabilities up to business unit and corporate strategies and translate higher-level strategic plans to actionable departmental plans.

General Management at Strata IV–V

At Stratum IV, direct control over the domain of a mutual recognition unit is no longer possible. Management is less direct and more about coordination of multiple functions. Stratum IV is about breakthrough innovation of new products and services and discovery of new markets (Van Clieaf and Kelly, 2007). Work at this level requires intuitive judgment to detect gaps in services and to compare known systems with one another, but not to develop yet unknown systems (Gould, 1986).

The general managers at Stratum IV translate the strategic intent and demand signals in their larger context into more tangible objectives and concrete plans for operating units to realize new products and services. The level of response is strategic in nature and aims at finding the best fit between the systemic organization and the wider ecosystem beyond organizational boundaries.

Stratum V denotes a shift from symbolic-verbal to conceptual-abstract order of complexity. This is the first level where full-scale business units or businesses— unified whole systems—are elementary entities. It is about creating new business models (Van Clieaf and Kelly, 2007) and requires the capacity to redefine the rules, to change the boundaries of the organization, and to engage in strategy development (Gould, 1986). The organization's current and potential future role within the business environment as well as the influence of social, political, economic and technological factors must be understood. Strategy at this level must recognize that profitability is not only a function of competence within the business but also a function of the relative competitive position to other businesses in the industry (Hedley, 1977).

The BU presidents at Stratum V have a dual role as members of the corporate executive collegium and entrepreneurs in their organization (Gould, 1986). They create strategies for Strata I–IV managers to carry out and need to exhibit transformational leadership (Fallow, 2007): provide vision, communicate high expectations and important purpose, and focus efforts through symbols (Bass, 1990).

Executive Leadership at Strata VI+

At Strata VI and VII, complexity is not so readily contained: the 'great organizational divide' is crossed to a 'whole world' view. Stratum VI is concerned with change and development of corporate strategy, whereas Stratum VII is about managing the development, formation and construction of Stratum V organizations.

At Stratum VI, work no longer takes place within the boundaries of a unified system, but institutions are overseen and changed from the outside. Worldwide networking is called for to accumulate diagnostic information that are of significance to the corporation (Jaques, 1998). In an extended enterprise (Konsynski, 1993), each business focuses on its core

competencies (Prahalad and Hamel, 1990; Hamel and Prahalad, 1994), partnering with other organizations that also focus on what they excel.

In co-evolutionary collaboration at Stratum VI networks, agility, synergy and ecosystem dynamics are emphasized over efficiency and economies of scale. In a complex and unpredictable environment like that, traditional strategic planning that focuses on defensible strategic positions (Porter, 1980) is inadequate, as the strategic position can quickly be eroded. Emphasis on competitive forces (*ibid.*) often results in imitative and reactive, rather than innovative and proactive behavior. In the extended enterprise setting, the focus of strategy is on value innovation that aims at making competition irrelevant by offering fundamentally new value and by creating new markets. (IT Governance Institute, 2005).

Stratum VII is about constructing institutions and theories, placing them into society, influencing the environmental context, and setting and maintaining the organization's value system (Gould, 1986) The work is concerned with worldwide strategic plans: judging the needs of society, nationally and internationally, and deciding what types of business units to provide to satisfy them. This is the 'full corporate arena' where business units are developed by creating ones, transforming existing ones, divesting others, or acquiring still others by mergers, joint ventures or purchase. (Jaques, 1998).

Stratum VIII manifests itself only in the largest and most complex Fortune 100 companies. We deliberately omit this level and the higher planes from our analysis.

MAPPING THE TERRITORY

Traditionally, information technology has emphasized structured decision-making (Gorry and Scott Morton, 1971) at low-complexity strata (I–III) of incremental improvement. In order to support effective planning and restructuring at moderate complexity strata (IV–V) as well as to embrace the emerging service-dominant logic pertaining to innovation and transformation at high-complexity strata (VI+), a more strategic approach to IT is required to support semi-structured and unstructured decisions (*ibid.*) in organizations. In the following, we construct a holistic map to service-oriented business and IT that addresses structured as well as unstructured decision-making at all levels of the organization.

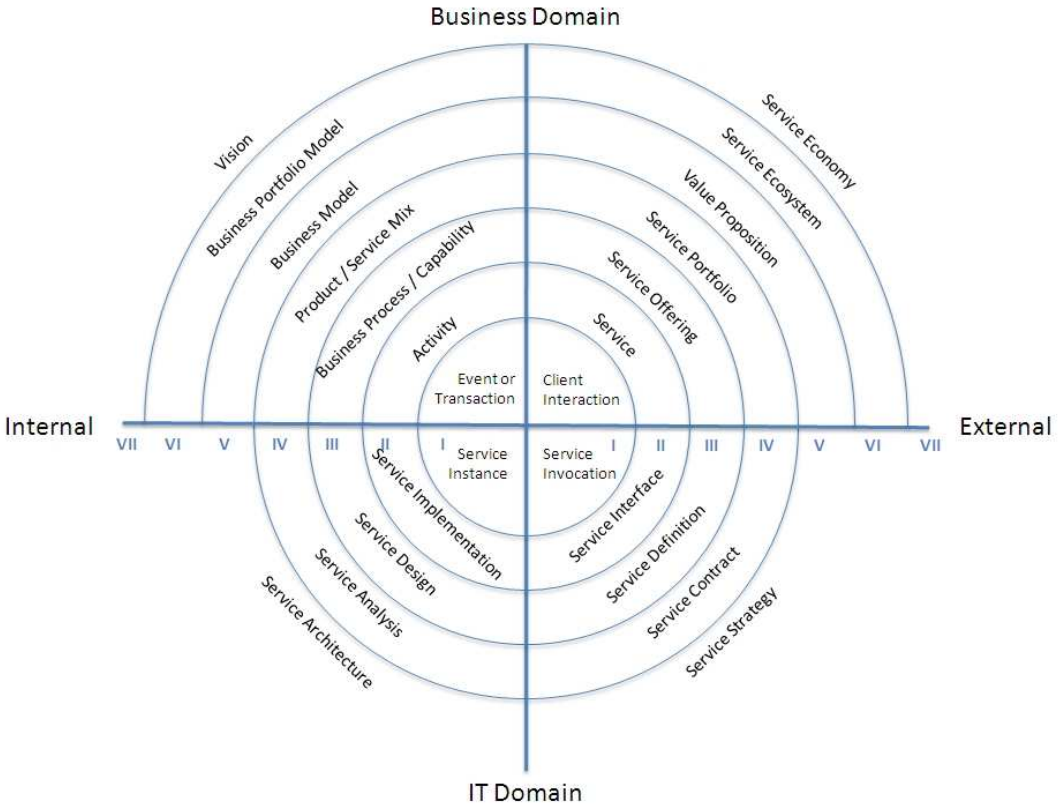

Figure 2. Map to Service-Oriented Business and IT.

The map, depicted in Figure 2, embraces internal and external dimensions of both traditional 'service thinking' and service-oriented information technology. The layers in the map match the idealized organizational levels of Requisite Organization (Jaques, 1998). In the mapping, artifacts related to 'real-time' client interaction are described at Stratum I, artifacts that are related to implementation, execution and optimization of services are described at Strata II–III and artifacts that are related to the development and management of service portfolio are described at Strata IV–V. Abstract concepts related to the development of service-based business and related IT based services are described at Strata VI and beyond.

Strata I–III (Operations)

As Stratum I is characterized by concrete work towards specified goals, the artifacts on this level are related to 'real-time' interaction with the service consumer (client). *Client interactions* and corresponding internal *transactions and events* are at the core of service provisioning. On IT dimension, this is characterized by a *service instance*, a client specific computational entity with context that is triggered by the client's *service invocation* and executed in the service provider's environment, conducting the required action and providing the client with specific functionality.

At Stratum II, the defined external business artifact is the *service* that is internally manifested as an *activity* (e.g., a workflow of transactions). In S-D logic (Vargo and Lusch, 2004), service forms the basis of economical exchange and is defined as the application of operant resources for the benefit of another party. On IT dimension, a service in SOA is defined as a bound pair of a *service interface* and a *service implementation*, which then are the respective artifacts in external and internal IT viewpoints (Papazoglou, 2007). The service interface defines the identity of a service and its invocation logistics to external clients (*ibid.*) and the actual implementation resides inside the service provider's environment. At this level, a service interface is typically described using some formal interface language (e.g., WSDL). The focus at this stratum is on the quality of services provided (Van Clieaf and Kelly, 2007).

At Stratum III, the defined external business artifact is the *service offering*, a collection of lower level services that provide the service client access to *business processes and capabilities*. These services are realized by the *service design* process, which includes, for example, service-related software development activities such as design, construction and deployment of a service implementation or service realization upon existing systems. An example of a service definition at this level would be a RosettaNet PIP, a process level interface describing an interactive, multi-step business transaction between parties, such as order processing. The focus at this stratum is on the process improvement and incremental innovation (Van Clieaf and Kelly, 2007).

When combined, Strata I–III define the artifacts related to service fulfillment. As pointed out before, managerial focus at these strata is on efficiency of service operation—both economic benefits and customer satisfaction. The focus at this stratum is on improving operational efficiency of existing service offerings, not on the development of new service concepts (Van Clieaf and Kelly, 2007).

Strata IV–V (General Management)

From external business viewpoint, Strata IV–V denote a transition beyond the boundaries of one service provider (organization) to a network of interconnected or competing service providers. In an external business viewpoint, Strata IV is defined as the *service portfolio*, a collection of service offerings provided by one entity. At Stratum V, this portfolio is viewed as the *value proposition* by a customer. This value proposition competes with value propositions offered by competing service providers.

External value proposition is internally codified as the organization's *business model* at Stratum V. This model is implemented through a *mix of products and services* at Stratum IV. According to service-dominant logic (Vargo and Lusch, 2004), products provide a mechanism for service provisioning.

From external IT viewpoint, the relevant artifact at Stratum IV is the *service contract*, a business-level agreement between service consumer and provider that consists of functional, non-functional (e.g., service level, quality, economic terms) and policy facets of the service. At Stratum V, these contracts are externally perceived as the service strategy which describes what services are provided and with what terms.

From internal IT viewpoint, *service analysis* is a process of identifying and describing the processes and services in a business problem domain. Business goals and objectives of an enterprise are analyzed in order to determine a set of economically feasible and realizable business level services based on extant competencies, products, services and systems (Papazoglou, 2007).

By service architecture at Stratum V, we refer to a holistic view of all the elements: systems, processes, principles and management and governance structures related to the service provisioning from internal IT viewpoint.

Strata VI+ (Executive Leadership)

Stratum VI widens the perspective from an individual system, such as organization, to the larger ecosystem. The view to the organization is from the outside. From external business viewpoint, our map identifies the *service ecosystem*, by which we mean a collection of comparable service providers with competing and complementary service portfolios. From internal business viewpoint, the *business portfolio* is managed accordingly to determine which business models the (extended) enterprise pursues. At Stratum VII, the overarching *vision* guides the construction and acquisition of strategic businesses in this business portfolio in alignment with the overall shape of the *service economy*.

These higher strata pertain to the conceptual-abstract order of complexity and encompass strategic information that cannot be readily expressed in explicit symbolic-verbal terms, utilized in information technology. Thereby, we restrict the scope of mappings in IT domain to the lowest five strata.

DISCUSSION AND CONCLUSIONS

In this paper, we constructed the Map to Service-Oriented Business and IT that is intended to help in navigating the relationships between business and IT artifacts at and between different organizational strata. The construct is rooted in theoretical underpinnings of Stratified Systems Theory (Jaques, 1998), a cognitively motivated theory on managerial leadership and organization. The map is charted along two dimensions: business/IT dichotomy (Henderson and Venkatraman, 1993; Luftman et al., 1993; Luftman et al., 2009) and distinction between internal and external aspects (cf. Cherbakov et al., 2005).

We view that extant literature pertaining to service-dominant logic focuses on the external side of service-orientation, whereas literature on service-oriented architecture is typically characterized by technical, internal perspective. Service science aims at integrating these approaches. Our map denotes a small step on this road towards providing a holistic, integrated view on service. We view that it provides a structured, integrated and theoretically sound approach to identify and build requisite business and IT capabilities that meet the inherent complexity requirements of service business.

The validity and applicability of our theoretical construct is yet to be evaluated. We plan to address this research limitation in future work by applying the map to empirical analysis of service-oriented organizations and business models.

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