Embedding the New Discipline of Service Science: A Service Science Research Agenda

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Abstract—This paper presents a discourse for embedding the new discipline of service science. It argues for service science to be free of the paradigmatic research influences of existing disciplines and propose service science as an integrative discipline of engineering, technological and, social sciences (including business and law) for the purpose of value co-creation with customers, much like medicine is an integrative discipline of physical and biological sciences for the purpose of healing. The paper proposes a research agenda for service science and considers five salient issues for knowledge production. It locates the argument for service science knowledge production alongside disciplinary knowledge of service and in so doing, suggests that service science is not a logical development within any discipline and proposes that the time is right for it to emerge into a discipline of its own.

I. INTRODUCTION

Today’s world economy is going through the largest labor force migration ever known to mankind. With globalization spurred on by rapid technological innovation, business growth has been phenomenal in providing employment particularly in the service sector. Indeed, this sector now accounts for more than 50 percent of the labor force in Brazil, Russia, Japan and Germany, as well as 75 percent in the United States and the United Kingdom.

The growth of the service sector is changing the nature of the organization, and it is becoming apparent that there is a lack of research and knowledge in services. Historically, research has supported the manufacturing sector (e.g. in engineering, management, technology etc.), but with economies shifting to service economies, research needs to focus on the technology and techniques that will enable organizations in the service economy to function effectively and productively. Even traditional manufacturing companies (e.g. Kone, Rolls Royce) now attribute more than 50% of their revenues to service. Yet, the technology, knowledge and expertise required for an organization to deliver a service which may include intangible activities that are perishable by nature and heterogeneous in characteristic, are clearly deficient. It is widely recognized that service research has not kept up with the demands of the economy.

One of the principal reasons for this is that service research is often interdisciplinary, thus suffering from a lack of ownership by any one discipline. Inter-disciplinarity does not sit well with traditional academic performance indicators such as publications, since very few interdisciplinary journals make it to the top tier, particularly for business research. Two outcomes have resulted from this. First, service researchers have found the need to ‘belong’ to a particular discipline – hence the rise of service marketing, service-oriented architecture, service management, service and support engineering. Second, even within the disciplines, the field is often relegated to a ‘second class’ status by purists of each discipline. Yet, if the objective is to research into how a service is designed, architectured, planned, forecasted, specified, sold, priced, integrated, delivered, managed, used, certified, evaluated, etc. [2], it should not be constrained by such political and territorial boundaries. Unfortunately, the traditional silos of discipline (in academia) and function (in organizations) have been too entrenched to meet this objective. To be truly interdisciplinary, i.e. to be transdisciplinary, service needs to be free of its disciplinary boundaries, and the paradigmatic research influences of each discipline. In short, service needs to evolve into a discipline of its own right.

The lack of adequate service research at an abstract level has also resulted in knowledge in the service industry becoming increasingly sector-driven with practitioners and researchers socialized within their own industries (e.g. health, finance, tourism, transportation, telecommunications), thus perpetuating more contextual, jargonized language that is becoming less inclusive and resulting in more embedded and tacit knowledge. This has inhibited the transfer of knowledge between service industries and academics, who would traditionally be seen to provide a higher abstraction of learning for knowledge transfer. Instead, new sector-based journals are starting to emerge (i.e. academic journals in transportation, telecommunication, health service etc.) as a manifestation of academia’s struggle to stay relevant to the needs of the different sectors in the service industry.

In May 2004, alarmed by the skills and knowledge gap, a summit held at IBM US attended by universities and thought leaders in the business world mooted the idea of a new academic discipline in services science. IBM is not new to proposing a new discipline; they were the first to have proposed the discipline of computer science in the 1950s [4]. Since the summit, there has been worldwide support for the new discipline, with the Harvard Business Review naming

the new science in services as one of the top ideas in 2005 [5]. Unfortunately, progress has been slow. Universities have to manage practical issues such as ‘which school or department should house the new discipline?’ and the political nature of such a question has led to the discipline being trapped by institutions’ unwillingness to change. This paper attempts to provide some scope to embed the discipline of service science. It presents the distinctiveness of the discipline, and proposes a research agenda incorporating five issues for knowledge production. We also argue why service science is an emerging discipline rather than a logical development of existing disciplines and we present our thoughts on its future.

II. SERVICE SCIENCE AND ITS DISTINCTIVENESS

Service science is the creative application of appropriate theoretical structures towards the study of service for customer value co-creation. It focuses on fundamental service characteristics and properties, as well as their application and interactions in the co-creation of value between an organization and its customers. It will build upon the founding disciplines of business, engineering, social sciences and law but will not be constrained by any single discipline’s epistemology. However, service science is not simply the point of overlap or even a bridge between these subjects but due to its intrinsic properties, may necessarily extend and change them to develop the new knowledge necessary to operate and innovate in the service economy. In short, service science is an integrative discipline of engineering, technological and, social sciences (including business and law) for the purpose of value co-creation with customers, much like medicine is an integrative discipline of physical and biological sciences for the purpose of healing.

Service, as it was traditionally understood, comprised of activities, deeds and performances [6], [7]. However, the new understanding of service is now broader, one where service “is the application of competences (skills and knowledge) for the benefit of another party” and such competencies could be manifested in a complex combination of goods, money, activities and institutions [8]. This service-dominant logic embraces the concept of value co-creation, where the value is no longer value-in-exchange (i.e. a tangible product solely created within the firm and exchanged with the customer), but value-in-use, i.e. jointly co-created between the customer and the firm for benefits [9], [10], [11]. The understanding of “customer” here is taken in the broadest sense of the word e.g. the end customers who actually pay and receive the service or organizations/customers in public services and even customers who use services and do not directly ‘pay’ for them (e.g. Broadcasting and Google). The notion of value co-creation implies customers’ abilities to co-create value (e.g. in knowing how to use an ATM, informing the hairdresser how s/he would like his hair cut, understanding how to get around an airport, or a leasing company’s ability to operate aircraft) is now part of the organization’s service capability [9]. Seen in this light, value co-creation thus demands a major rethink of traditional disciplines from management and technology to the engineering and manufacturing of tangible products. Traditional disciplines are strongly goods-based, more often involving linear supply chain models and linear models from design to manufacture. This may impede organizations’ potential to construct optimal systems for value co-creation since, in contrast to linear models, services often involve “value constellations” which suggest a multi-faceted and iterative approach. Thus, organizations are challenged to move towards a service orientation, a process commonly known as service transformation [12]. Moving towards a service orientation also leads to the ability to define new “spaces” for doing business that were previously non-existent. With newer technologies such as computing and web-based technologies in which such IT-related capabilities could be provided “as a service”, the time has come to allow service to emerge as its own discipline of service science, which will enable it to focus on producing knowledge on how best value could be co-created, and how a service system of people, technologies and products could be configured in order to integrate the best from all disciplines. The service science research agenda, however, should address five issues.

III. SERVICE SCIENCE RESEARCH AGENDA: FIVE ISSUES FOR KNOWLEDGE PRODUCTION

1. The need for more STEM (Science, Technology, Engineering and Mathematics) in service. There is a pressing need for service to be understood across sectors. Abstraction is necessary to discern the tacit knowledge in services for the purpose of transferability of knowledge across industry sectors and academic disciplines as well. Abstraction is also needed for replicability so that future service design could be systemic, structured and deliberate to ensure sustainable service excellence. Finally, abstraction is needed for the scalability of service for growth. STEM could provide tools and mechanisms for discovery and abstraction. Even at the very least, service needs better measurement, analytics and identification of what is performance success. The concern for the lack of science in service is apparent from the Royal Society’s call for evidence on the role of STEM in Service Innovation. For most of the past three decades, social scientists have tried to find ways to classify and disassemble service in a meaningful manner that would aid practice. This has been without any noticeable success in part due to the analysis being not sufficiently fundamental (the periodic table would be a good analogy of achieving a framework for fundamental understanding so as to classify, systematise and compare all the many different forms of chemical behaviour). In addition, we argue that existing research of this nature has been conducted through narrow disciplinary lenses. Hence, much of service research to abstract service typologies use words such as “complex”, “system” and “relationships” (see [13] for a historical account of service typologies), an indication of a knowledge gap. Just as science provided ways forward for Physics and Chemistry from ‘Alchemy and Occult’, service science research is
challenged to find its unit and properties that would subsume all sectors. Service, like color in the early days, is currently alchemistic{2}.

2. The need to understand the whole as well as the parts.

We have already argued that the current mindset is dominated by linear, cause-effect thinking and that services are not defined in that way. We contend that the study of service science can best be considered from a combination of perspectives which includes a systems approach. Systems thinking has a long academic tradition dating back to the open systems concepts of [14] and the control systems work of [15]. In management systems it developed as an alternative to the analytical and reductionist view which has dominated much of management research [16]. Reductionism proceeds by breaking a problem down into its component parts and seeking to optimize each part. At the core of a reductionist approach are three fundamental assumptions:

1. The connections between the parts must be very weak;
2. The relationship between the parts must be linear so that the parts can be summed together to make the whole;
3. Optimizing each part will optimize the whole.

We propose that for the study of service systems these assumptions do not hold. Strategic organizational problems involve tightly coupled parts; changing one component affects many others, leading to unintended consequences. These relationships are often highly complex and non-linear. Forrester [17] points to the importance of time delays, amplification and structure on the dynamic behavior of the system. Akkermans and Vos [18] provide an excellent example of a Telco implementing a new customer service process that includes four separate activities – selling, installing, provisioning and billing – each of which is carried out by a different department. The interactions between the departments led to enormous amplification, where a 10% increase in sales order volumes leads to a 250% increase in provisioning, 140% in installing and 175% in billing. Finally, Lipsey and Lancaster [19] in their theory of the second best showed that if one optimality condition is not satisfied, it is possible that the next-best solution will involve changing other variables away from their positions of optimality. Buckley [20] in his masterly essay on the problems of causality in organizations summarizes it thus; “Of particular importance are those kinds of mutual relations that make up circular causal chains; the effect of an event or a variable returns indirectly to influence the original event itself by way of one or more intermediate events or variables.”

In short, we reject the linear perspective on causality for the richer insights that can be gained from the systems view. The rejection of simple linear models does not imply wholesale rejection of the analytical approach. It is necessary to have both analytical and synthetic research perspectives in scientific method [17]. Systems thinking can provide service science with a language that will act as an integrative mechanism to prevent the re-emergence of a discipline and silo mentality. The boundary of the service system should extend to include the customer and the service supplier organizations in the value co-creation network. Service science should therefore explore the notion of service as an emergent property not present in any of the component parts but in the dynamic relationship of the parts, consistent with the view of Service-Dominant (S-D) logic as a superordinate position [8].

![Figure 1: S-D Logic as interacting systems](image)

Other aspects of research into service science that can be informed by a systems approach include the notion of variety [21], open and closed systems [15], transformational processes [22], and systems architectures [23].

3. The need to look forward.

The Janus face of science suggests that science has two faces where one looks back at the current state and evidence (ready-made science) while the other looks for the way forward [24]. For the sake of publications, service research in the past has had to be conducted through the lenses of one or another existing discipline. The current state of service research could then be a reflection of the way it has been influenced by whichever disciplinary regime in which it currently sits, and may not be the best way to look forward. There is a need to take the lessons from the other disciplines, but without the hegemony. When disciplines come together to understand value co-creation with the customer, there would be new impetus for service innovation and service excellence. Yet, while service science is tasked to be able to both look back for the best technologies and look forward to progress knowledge, it must acknowledge the strength and weaknesses of current disciplinary-based knowledge and methodologies. In researching service systems, the technology to capture the range of data (particularly behavioral data) may be beyond the current conventional collection methods and possible observations are far more expansive than what current methodologies can capture. The interactions and the interplay between processes and outcomes within a service system which are non-linear and multi-directional in nature, suggests that the instrument of analysis that could normally be achieved by human observation and judgment may not yet be scientifically reproducible in any meaningful manner by conventional methods. Hence, current knowledge and methodologies may be inadequate for service systems. Rather than apply legacy knowledge towards service systems, researchers must also

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2 As Newton wrote, “A Naturalist would scarce [sic] expect to see ye science of [colours] become mathematicall, and yet I dare affirm that there is a much certainty in it as in any part of Opticks” (The correspondence of Isaac Newton ed. HW Turnbull, JP Scott, A Rupert Hall, Laura Tilling, 7 volumes, Cambridge: Cambridge University Press, 1959-177 1.96)
open their minds to opportunities to produce new knowledge and new methodologies, brought upon by intrinsic characteristics of the service system. The act of focusing on what exists now should not draw attention away from ‘what can be’ [25 p. 134].

4. The role of technology changes the service system and vice versa. Real/virtual interaction is playing an increasingly prominent role in the service economy and there is a need to better understand virtual worlds as a medium, virtual companies, brick-and-click delivery, multiple-channels, and web 2.0 in service value co-creation. In the field of management, technology is beginning to gain traction in changing business models, for example, in the field of management 2.0 [26]. Leaps in computing power have resulted in newer technologies with greater capability, from the ability to sense facial expressions and stress levels to a fully liberated cyberspace where autonomous and intelligent entities or virtual objects can act in full interoperability and auto-organize themselves to deliver services, based on the concept of the Internet of Things attributed to the original Auto-ID Center, based at MIT (with continuing research with Cambridge, UK). The service system and the notion of value co-creation is starting to change research in technology as well. More studies are being conducted in the technological sphere that includes customer behaviors and processes, informing research in service-oriented architectures [27]. User Centred Design (UCD) and Human-Computer Interaction (HCI) which views design for and from the user. A systems view of service could challenge the assumptions surrounding user types in software modularity and mechanistic designs, compelling research in this area to bring the customer into design issues for greater innovation in value co-creation.

5. The need to integrate social sciences (and business), engineering and technology for customer value co-creation. As an analogy, one does not leave sodium and chlorine in a beaker and expect them to naturally react and deliver salt. More often in the real world context, the sodium would have retired to their rooms while the chlorines would have gone down to the pub. Integration of disciplines requires a common purpose and the development of a common language, platforms, units of analysis and research philosophies towards that purpose. Thus, our emphasis on value co-creation with the customer explicitly identifies the purpose towards inter-disciplinary collaborations. The focus on value co-creation, much like the focus on healing for medicine as a discipline, is the central theme of service science and is also the unifying focus towards which knowledge from various disciplines can contribute. By explicitly bringing in the customer, we believe service science can achieve a constructive collaboration for the betterment of knowledge to deliver and innovate on services in the modern economy. In addition, the focus on value co-creation conceptually differentiates service science from service research within other disciplines which would still thrive, particularly in light of the dominance of the service economy. The theme of customer value co-creation is echoed in several papers and presentations on service science (e.g. [29], and in Jim Spohrer’s editorial for the first Service Science Journal [30]: Service science is emerging as the study of value co-creation phenomena in a globally integrated and connected world, which has the potential to become significantly smarter and more sustainable. In a service world, diverse entities create, abandon, utilize, ignore, configure, reconfigure, specialize, integrate, protect, and share resources and relationships to co-create benefits with and for each other, both as individuals and collectives, both for the short-term and the long-term.

With value less ‘contained’ within the vessel of a tangible product, value co-creation could happen everywhere within a service system, often between employees, customers, tangible products and technology [31]. Traditional manufacturing and engineering technologies that proposes the optimization of a system that does not include the customer system is now challenged. Similarly, the notion that costs could be minimized and efficiency gains could be attained within a service system without controlling for the loss of value co-created with the customer suggests that many tangible product-based technologies need to be seriously re-evaluated [32]. The need for new knowledge is now more pressing than ever.

IV. SERVICE SCIENCE AS AN EMERGING DISCIPLINE

The industrial era has accumulated more than a hundred years of knowledge in the managing, manufacturing, and engineering of tangible products, often within silo-ed disciplinary domains. Thus, the advancement towards a technologically fast-paced globalized world where the service system is a constellation of amorphous value co-creation with the customer integrating several disciplinary approaches is bound to create severe discomfort, not least amongst the knowledge producers of the old. As the world moves towards a service era, serious questions need to be posed about the legacy knowledge and while the best technologies to advance knowledge in the service era will eventually be adopted, adapted and improved upon, the initial task of embedding the discipline of service science will encounter political difficulties.

Those with the most to gain from a trans-disciplinary approach would be expected to embrace it most fervently. These include researchers who recognize knowledge transfer through a plurality of mechanisms rather than merely through publications; those who are marginalized by their own disciplines or who labored under the patronizing attitudes of the ‘purer’ or more ‘basic’ disciplines, as well as policy makers who are motivated to create better links between science and innovation. Those who are most threatened by a trans-disciplinary approach would predictably be most skeptical; they would argue that the quality of research would be eroded through trans-disciplinarity or feel that their autonomy might be jeopardized. Most alarming to such researchers is the possibility that those who subscribe to product-based technologies may find themselves obsolete in a service
system-dominated world. For these researchers, a natural reaction is to reject and refuse to participate. This would be a shame as the reality is usually far less threatening. What is required of researchers is the willingness to share and adapt existing knowledge, particularly in light of increasing complexity of research problems, and recognizing interdependencies in the production of new knowledge, a fact that has been widely acknowledged [33], [34], [35]. Ziman [36] describes the transformation of knowledge production processes in what is commonly known as ‘post academic’ as:

“...marked by an increasing degree of collectivization as a response to the growing complexity of research problems, [and] the increasing costs of scientific equipment, but also the growing potential for research collaboration that is offered by information technology.”

What is needed for service science is for knowledge from all relevant disciplines to be presented to inform customer value co-creation. In doing so, we believe that the gains from the interactions would inform and contribute in return to the production of their own disciplinary knowledge, which is still much desired.

As a consequence of interdependency, we therefore argue that service science is not a logical development within any existing discipline. As long as it sits within a discipline, it shall remain a subset of that discipline and more drastically, oppressed by the discipline’s agenda, whether intentionally or otherwise. High level mainstream journals are disciplinary-focused, and these gatekeepers will often not allow their power bases to be diluted by a trans-disciplinary approach. The current climate of service research therefore behaves as though most of the answers are there to be applied, albeit it depends on whether it is a technology, marketing, operations, organization behavior, strategy or engineering perspective of service. As such, we argue that service research is currently studying service very much in context. A research article in a service sector often does not address how relevant it is towards other service sectors and as long as service is relegated to ‘sectors’ and does not sit as a ‘discipline’, it would be impossible to progress the learning. Hence, we contend that service needs to emerge into a discipline of its own; an integrative discipline of the business, engineering and social sciences for value co-creation with the customer, much like medicine is an integrative discipline of physical and biological sciences for healing.

Our thesis is incomplete unless we conceptually locate where disciplinary knowledge of service, what we define as serviceX (e.g. service marketing, service engineering, service operations, etc.), sits vis-à-vis service science. Disciplinary knowledge in service is still very much desired due to the depth of analysis within that domain. To achieve that depth, many disciplines such as engineering, operations and ICT, while striving to be customer focused, have had to assume customer characteristics to be exogenous to study problems in service design, architecture, engineering and delivery. This is necessary for research questions to be defined and solutions to be tractable. The knowledge produced within such disciplinary domains would still be valuable to service science. Marketing, which brings the customer endogenously into its discipline (in terms of understanding customer choices and needs) is conversely less inclined to evaluate design and delivery issues in service for the obvious reason that design and delivery requires exogenous customer characteristics to design and deliver around. Yet, marketing research in service would also contribute to service science, for example in the understanding of value-in-use and customer needs. Consequently, to use again the analogy of medicine, research in genomics should still continue even while the discipline of medicine continues to seek the best technologies for healing.

Those who currently conduct service research would recount two major movements to push the service agenda – once in the seventies and another in the late eighties/early nineties and both led by Americans [37]. Concurrently in Europe, there was also a movement in support of service research. The most notable were by the Nordic Schools and among its proponents include works by Gronroos and Gummesson [38]. Unfortunately, these movements lacked traction and a tenure-track system of rewarding academics only if they publish in top-tier (disciplinary-focused) journals led to the quiet withdrawal of many service researchers back to their parent disciplines. The creation of the new Journal of Service Research in the early 2000 by Roland Rust, who subsequently became the editor of Journal of Marketing, was the start of a new initiative in customer-focused service research in this millennium which has finally begun to gain momentum.

Our proposal for service science as an emerging discipline is facilitated by two further major events in 2004. First, the publication of Vargo and Lusch’s Service-Dominant Logic in the Journal of Marketing [39] and its follow-up article in [8] served to propel service into the forefront and has had a big influence on at least one other discipline, operations management; and second, the growing service science movement initiated by IBM. Led by these two events, service researchers have become more empowered to challenge the status quo and to push journal editors for more interdisciplinary special issues in service. While the current state of empowerment is laudable, it falls short of true liberation. Hence, service science, as a catalyst for change [40] and as an emerging discipline, would complete the task necessary to push the frontiers of service research.

Large manufacturing, telecommunication and engineering organizations such as Kone, Rolls Royce, BAE Systems, BT and HP have started to take a greater interest in service, bringing along researchers from engineering and manufacturing and increasing the credibility of conducting service research. However, it also poses new research challenges for service researchers who have been based in business schools often researching in traditional service industries such as hospitality, healthcare, transportation, leisure and banking. The arrival of engineering and technology researchers threatens to create a schism in service research, polarizing it into the IPS (Industrial
Product-Service-System) and service support engineering research that caters to the engineering-types; the IT-based research on service oriented architecture, HCI, cloud computing or ‘Everything as a Service’ (EaaS) that cater to the technology-types; and the traditional service research of the social science and business variety. We argue that the timing is therefore right for service science to emerge as its own integrative discipline.

Finally, we propose an answer to the question ‘is service an art or a science’. Healing is both an art and a science. Yet medicine, to aid healing, is arguably an integrative discipline of the sciences. Similarly, customer value co-creation can be presented as both an art and a science. Service science would tap existing scientific (and social scientific) disciplinary knowledge to aid value co-creation as the substance of service science lies less in the activities and components that bring service into play than in the theoretical reasoning through which it discovers, evaluates and coordinates these activities and components. The debate on whether service is an art or science detracts from the real purpose of service science, which is to seek greater creative inputs and new knowledge for society to progress in the fast growing service economy.

REFERENCES


[3] IPS² comprises the integrated and mutually determined planning, development, provision and use including the option of partial substitution of products and services over the lifecycle. IPS³ working group was founded by the International Academy for Production Engineering and is a community of 550 members from 41 countries with a strict limitation of membership. See http://www.ips-rub.de/schwerpunkt/cirp.

[4] Cloud computing is the development and usage of Internet-based (hence, “cloud”) computer technology (hence “computing”). Cloud computing signifies IT-related capabilities that are provided as “a service”, allowing users to access technology-enabled services from the Internet with little knowledge of, expertise with, or control over the technology infrastructure that supports them.


