

Asset Reuse and Service Science: The Delicate Balance

Tyrone Grandison, Jakita O. Thomas
IBM Almaden Research, San Jose, CA - USA

Abstract--The need to increase efficiency and productivity is driving an increase in the creation of service assets, which embody the essence of service functionality and can be used across engagements. This move towards reusable service assets reduces some of the cost of service solution design, is less labor-intensive, and reduces the need for particular service professionals. However, service and the study of service innovation called *Service Science*, is inherently people-based. People, interactions, and relationships are at the core of the discipline and technology plays a pivotal role in supporting these entities. The tension between the emphasis on people, which implies customization and differentiation, and service asset reuse, which implies standardization and commoditization, may pose a problem for the service industry in the long term. Replacing the people component in the production equation with service assets may significantly reduce the drivers for the field of *Service Science* to continue in the future. This paper presents a cautionary tale of reusable service assets, where the balance between the knowledge and skills embodied in the asset and the utility of having expertise embodied in people is examined. Suggestions for bridging this divide and easing the tension are discussed.

I. INTRODUCTION

Service Science is an emerging discipline that paradoxically has been hidden and visible in the sub-culture of the business environment for at least two centuries. Recent recognition of its value and pervasiveness has created a lucrative industry and driven demand for more ways and methods to further the field. Organic growth in the approaches taken to expand and scale *Service Science* has heralded a multitude of sociological, scientific, marketing and information technology based tools and techniques that can be leveraged by service science practitioners. A commonality shared by all these techniques is the decomposition of the service delivery process into discrete, atomic functions and the encapsulation of each function into a service asset. For each asset created the value of the service professional decreases. In this paper, we will first define a service more formally (section 2), then describe the models of service (section 3), provide a history of *Service Science* (section 4), discuss services productivity and innovation in this century (section 5), discuss service assets and asset reuse (section 6), present a scenario that highlights the tension between knowledge embodied in an asset and knowledge embodied in people (section 7) and conclude in sections 8 and 9.

II. WHAT IS A SERVICE?

A service is defined as the application of skills and knowledge for the benefit of another [17]. A service may be

a process, standardized description, protocol or a negotiation of these base artifacts. A typical service requires participation and input from both the client and the provider, resulting in the co-creation of some valued asset. The client owns or controls some state that the provider transforms according to some agreement established between both parties that describe the negotiated terms of the interaction [15]. This process of transformation results in a modification of the client's possessions, processes, or tangible assets. Operationally, we take the view that a service is a task that one organization does (with and) for the benefit of another (and themselves). There exists a service contract that describes what is to be done, defines what services will be carried out, how they will be used, under what conditions, the monies to be paid, associated incentives, deliverables and results.

Providers and clients may be individuals, firms, government agencies, or a myriad of different organizations of people and technologies, which may result in a complex network of value. For example, a financial services information provider, FinServ, which provides aggregate financial analysis data to the market, may require local statistics from Timco Mutual and Bank of Toledo in order to co-create value for their clients. FoxFund, one of FinServ's clients, also provides a service to their investing clients Thomas Brown and Nickolas Owens. Everyone in the network works in a myriad of ways to create value.

III. SERVICE SYSTEMS AND A MODEL OF SERVICES

A service system is "any number of elements, interconnections, attributes, and stakeholders interacting in a co-productive relationship that creates value" [5][10], where services are "intangible activities customized to the individual request of known clients" [5][10]. Service systems can be described as socio-technological systems that are similar to manufacturing and economic systems in that all three systems include elements, interconnections, attributes, and stakeholders, represented at a basic systems level in terms of an input, throughput, and an output process model [5]. However, service systems also include a feedback loop into the input that defines the service engagement, in which the client and provider interact in such a way that they co-create value for all parties. This notion of co-creation of value is what differentiates a service system from other types of socio-technological systems.

Sampson's [12] Model of Unified Services Theory describes the distinction between traditional systems, like manufacturing and economic systems, and service systems (Fig. 1). In the former, while the consumer may drive or

inform the requirements, they are not actually engaged in the design, implementation, or manufacturing of the output. Instead, the consumer's only role is to select and consume the output [11]. In service systems, however, the consumer provides inputs into the process itself that impact the production process and affect the final output with the provider [5]. Examples include banking, in which customers provide savings and checks to the financial system. The final output of a service system may be tangible or intangible. Examples of tangible outputs are customized cars or code that is customized for a particular customer, while examples of intangible outputs are business processes.

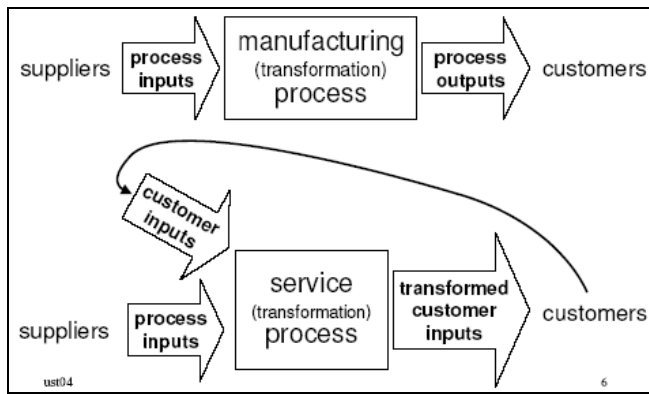


Figure 1: Sampson's Model of Unified Services Theory

Fitzsimmons and Fitzsimmons [2] extend Sampson's Model of Unified Theory by suggesting that the service consumer not only provides input to the service system, but actually is an input to the service system that is "transformed by the service process into an output with some degree of satisfaction". Examples include airlines, in which customers, as well as their baggage, are inputs, and education, in which consumers provide their minds.

Whether the service consumer is considered a provider of input or as input itself, the enactment of a service is a process of transformation that results in a modification of the client's possessions, processes, or tangible assets. A service engagement generally has three distinct phases in which various pieces of the transformation process are carried out: service establishment, service transition, and service delivery.

During the service establishment phase, the initial terms of service are generally negotiated between the service provider and service consumer and formalized in the form of contract terms and conditions. These terms include what service(s) are to be performed, what the expected outcomes of service enactment should be, and any incentives or penalties associated with meeting or failing to meet expected outcomes. It is at this point that the service system is "conceived".

The service transition phase is where the rubber meets the road. In this phase, the terms of the service agreement are implemented. This involves 1) determining what the consumer's state actually looks like, which may be different

from what is described in the service agreement, 2) understanding what will be required to transform the consumer's state in order to meet the terms outlined in the agreement (e.g., time, resources, money), and 3) determining whether the terms outlined in the service agreement can be achieved given an understanding of the requirements needed for service transformation. Note that this phase is also where the transformation of the service consumer's state begins, and often occurs. It is during this phase that the service system is "birthed" [8].

The service delivery phase is normally a continuation of the implementation of the service that began during the service transition phase or is when the service solution is maintained according to the terms outlined in the service agreement. This phase is typically the longest phase as it may range from a few months to a number of years, unlike the other phases which usually begin and end within a few months.

It is important to re-iterate that service providers and service consumers may be individuals, firms, government agencies, or a myriad of different organizations of people and technologies. This means that a complex network of value may result and an even more complex web of interactions should be expected.

IV. SERVICES THROUGH THE YEARS

As previously mentioned, the services concept has existed for at least two hundred years and has slowly been recognized as a powerful force in its own right over time. There have been three distinct eras in services evolution – *Agricultural*, *Industrial* and *Service Science*. These eras can be directed mapped to the evolutionary categories identified in [19] and [2].

A. The Agricultural Era

As early as the late 1880s, services have been discussed in the field of economics, as the world transitioned from an agrarian economy to one fueled by machinery and engineering [13]. These services were primarily physical services, such as those performed by a shopkeeper, housekeeper, teacher, lawyer, etc. These services were extremely labor intensive and very customized to a particular customer or client.

The era of the late 1800's is referred to as the dominant period of classical and neoclassical views by Vargo and Lusch [19]. It is characterized by a good-centric perspective, where value is embedded in matter, i.e. in the good itself. It was perceived that wealth creation was enabled by the acquisition of tangibles, and marketing involved the movement of those goods - creating matter in motion.

In the analysis by Fitzsimmons and Fitzsimmons [2], this era is referred to as the *Pre-Industrial society*. *Pre-Industrial societies* focus on surviving natural forces, e.g. weather, animals, etc., with technology playing a very limited role, having very little impact and or being absent. These societies

are mostly agrarian and are often structured by local traditions, which were fashioned from customs, occupations, etc.

B. The Industrial Era

After the late 1800's, the world embraced the lessons and fruits of the *Industrial Revolution* and replaced emphasis on crops and labor-intensive production with focus on consumer goods and automation. This era is marked by an ongoing debate between goods and services [4].

Early formative marketing [19] was prominent in the early to mid 1900's and signaled the emergence of the characterization of goods. A marketing institution's role was seen as that of embedding value in goods, as opposed to the previous era where goods intrinsically contained the value. This period focused on the transaction of selling goods to the consumer with an emphasis on producing the most output possible.

The *decision marketing schools* period of the 1950's [19] viewed marketing as a decision making activity with a focus on the four P's: product, place (in terms of where goods were distributed), promotion, and price. This era was primarily concerned with the optimization of decision making to maximize the outcomes of the four P's.

The *marketing management and experts* period of the 1970's [19] was characterized by the determination of the variables that most impact a company's marketing decisions and with helping companies maximize their objectives in the face of uncontrollable demand variables. Marketing relationships prevailed and quality and resource management were seen as critical. Ideas and concepts around supply chain and value chain management emerged during this period.

The 1980's marked the *customer fulfillment and satisfaction* period [19], which conveyed the view that the primary motivation of services was to achieve high customer satisfaction. This emphasis on high customer satisfaction led to a focus on service quality assurance based on quality attributes that were important to specific customer segments.

In Fitzsimmons and Fitzsimmons's [2] world, this era maps to the *Industrial society*, where the production of goods encompasses the majority of economic activities. This society is typified by the production of a good and by the mass production of that good to meet demand.

C. The Service Science Era

The most recent era is that of the *Service Science*, which has been a dominant frame of mind in the 2000's. This period focuses on soft-skills, domain expertise and application of knowledge to targeted industry problems.

By the model proposed by Vargo and Lusch [19], this era is characterized by the fact that all marketing, economic interactions and exchanges are viewed through the lens of services, with products being the materialization of the knowledge and skills sold to consumers in order to satisfy a particular service need. In this view, value lies in the particular way knowledge and skills are coupled, enacted, and

delivered in a particular context to meet address a particular need.

For *post-Industrial societies* [2], quality of life is the thing that becomes most important. Information is a key resource in this society and services are key supports to the improvement of quality of life, i.e. health-care, education, etc. People, who have knowledge and skill in business and technology and that utilize and apply information represent a majority of available jobs and workers, i.e. "knowledge workers".

V. SERVICE PRODUCTIVITY AND INNOVATION

"In the networked economy in a world of ubiquitous connections where everything is connected to everything else scarce will be the person not connected at all, or the company not pushing ideas and intangibles. If they can interface with the economy without losing distinctiveness or value, they will be sought out and their price for their service will remain high. They'll use technology to eliminate as much of the repetitive work as possible, leaving time to do what humans are good at – working with the irregular and unexpected." [7]

Productivity is a measure of economic efficiency which shows how effectively economic inputs are being converted into output. Productivity is measured by comparing the amount of goods and services produced with the inputs given [6]. For example, labor productivity is the ratio of the output of goods and services to the labor hours devoted to the production of that output. Output per hour of all persons is the most commonly used productivity measure. However, perception of quality of service industries is sometimes tied to how much labor is involved, especially when delivery of a customized service experience is paramount.

Baumol's disease [3], i.e. the argument that most services are, by their nature, labor-intensive, and that the perceived quality in service industries often depends on how much labor is involved, is evidenced in service industries such as entertainment, hotels, health and education [3], as well as in Baumol's striking example. Even after 300 years, it still takes four musicians to play a string quartet. Baumol also recognized the potentially negative impact of this phenomenon in terms of economic growth. For as economies mature, consumption shifts more and more away from goods and toward services. Sluggish or slow growth in services productivity means slow economic growth as well.

However, Triplett & Bosworth [18] found evidence that information technology has aided productivity growth in services since the late 1990's, suggesting that information technology may be "the cure for Baumol's disease". Service industries are now the predominant engine of US growth, having grown 2.6% per year between 1995 and 2001, and are the primary consumers of IT capital. Service industries are the most dynamic and innovative sectors today [18]. This shift toward service economies also signals the emergence of

what has been termed “knowledge-based economies” [9], in which the ‘value’ of a modern economy depends on the number and quality of people and activities. A modern economy in Petit’s view [9] is open to new technologies, external competition and massive education. This new perspective suggests that although productivity measurement is an important focus of service, it is not (nor should it be) the main focus of service. This is primarily because productivity has limitations [18]. Productivity is a better measure for manufacturing than it is for services, which tend to involve more intangible characteristics that impact the value delivered by service providers, but that are difficult to measure using a productivity paradigm. As a result, not only is productivity not a good measure of the overall effectiveness of a service, but it is also not a good leading or predictive measure because of its failure to account for the more intangible aspects of service.

Instead, a more holistic measurement that takes into account the many factors at play in service engagements, which are generally built and associated with social interactions and relationships (e.g. loyalty, trust, maintenance of relationship, value, etc.) as opposed to technologies, should have more focus. With a more holistic approach, how one goes about measuring nebulous variables that are subjective and more often “felt” than counted becomes extremely important. However, this is outside the scope of this paper.

From a service design perspective, a more interpretive model is needed, in which workers develop skills in understanding customer wants and needs, translate those into services they provide, and if the worker finds this is not producing the desired or intended effect then he or she modifies the service or method of delivery or even their interpretation of what the customer wants or needs. This continues until the worker perceives that the services or delivery match the customer’s wants and needs [6]. An example of this is medical diagnosis and treatment. However, this kind of interaction requires the establishment and cultivation of a relationship between service provider and consumer, where each develops a better understanding of the other. Knowledge and skills are applied to co-create value for everyone. This is not simply the implementation of a technical solution. Instead, it requires innovation, which after going through a distillation process and for reasons of efficiency and consistency is encapsulated in assets.

VI. SERVICE ASSETS AND ASSET REUSE

An asset is defined as anything of material value or usefulness [16]. Types of assets include best practices, designs, tools, and components. Best practices are techniques or methodologies that have been proven through experience and research to produce reliable outcomes. Designs are written documents that describe a general solution to a recurrent problem across many projects. Tools are a set of artifacts that support the development or re-creation of a

project, application or task. Components are identifiable parts of a larger program or construction.

Asset reuse has been largely viewed as valuable, though implemented with questionable success. The value in reusing assets include reducing costs by shortening development cycles (i.e., developers do not have to re-create functionality from scratch), reliability (as the asset has already been used in the marketplace and shown to be successful) and saving time (in terms of testing and maintaining the asset), which eventually reduces the number of service professionals, e.g. developers, delivery and maintenance workers, etc., on a team.

However, asset reuse has its challenges. Oft times, an organization’s assets are so scattered (in multiple forms across multiple, heterogeneous systems) that it becomes difficult to find available assets or to identify which assets are available for reuse. This suggests that asset management is extremely critical to the success of asset reuse. Additionally, reusing an asset is not as simple as going to an asset management system and lifting the artifact as is. In order to create reusable assets, extra time must be added to the development cycle to document the asset and generalize it so that it may more easily be connected to other assets in the future, which may be created in a different context from that in which the original asset was created. Normally, asset management systems do not always keep the connection between an asset and its context of use. It is common practice to decouple the asset from the environment and situations in which its use made sense. This can make it difficult to know which asset to use when and how, especially if the service consumer’s environment is sufficiently different enough to require more adaptation of the asset than intended. In addition, identifying the parts of a solution that should become assets is another challenge. Some small tasks, e.g. printing an output, might have relatively little impact in a given situation, whereas other tasks, like changing a variable state, may have drastically different outcomes from context to context.

VII. SCENARIO OF ASSET REUSE AND IMPLICATIONS

Service Science as an established discipline is still a relatively new academic field. As such, lessons about the impact of asset reuse have to be extracted from examples in the past. Let’s discuss the automotive industry.

The *Industrial Revolution* had its biggest impact on the transportation sector. At the peak of the industrial era, there were a significant number of people involved in the production of a single automobile. Each person had a specific job and physically leveraged a (set of) tool(s) to accomplish his job. The obvious benefit of this environment was an increase in the labor demand, which translated into a thriving economy based on people executing a physical service with their associated tool to produce the output of one particular stage in the car manufacture process. This scenario was

perfect until the market demands started to push the bounds of production and new car manufacturers entered the marketplace. Both these factors drove the need for these companies to grow, i.e. scale, to meet this increased demand for their goods and to reduce cost in order to be competitive in this new environment. Company executives sought to leverage even more innovations in order to streamline their business and reduce their most significant cost centers – their people.

The parallels to the current era of *Service Science* are uncanny. At the beginning of the 2000s, the services industry was heavily people-based. Each person embodied a corpus of knowledge and skills that enabled him or her to produce targeted business solutions and or optimizations for their clients, who tended to do business in the service practitioner's area of expertise. An increased need for these services professionals, heightened recognition of the high profit margins of these individuals and an influx of firms into the field to capture some of this profit created pressure for the entire industry to grow. The first technique employed was to train and deploy as many practitioners as possible. However, the rate at which qualified services individuals were entering the field could not keep pace with the ever-increasing need to grow. Corporate executives sought to utilize technology innovations to streamline the efforts of their existing team of services professionals, with the intuition that this would allow them to increase the output of each practitioner. As with the automotive industry in the industrial era, this process of assetization of its core business is leading to a reduction in their most significant cost centers – their people.

As we follow the evolution of the automotive industry, this provides a deeper glimpse of what is occurring (and will occur) in today's service economy. The automotive industry managed to reduce the number of people involved in the manufacture of a car by an order of magnitude. This had the immediate effect of lowering their operational costs, increasing their profits and occasionally reducing the costs of the cars. It also had the non-obvious by-product of transforming the nature of the skill sets of their employees – who went from skilled technicians in specialized fields to individuals proficient at using the physical assets performing their task in the production process. As the 1990s progressed, companies decided to take this concept even further. They started to outsource and off-shore larger and larger portions of their business; in order to get even more cost savings and be more competitive. This decision had different effects in the West and the East. In the West, where the expertise went with this transfer, the automotive companies found it difficult to remain profitable; highlighting that there is an equilibrium point that may have been passed. In the East, where expertise was retained and fostered, the car companies came up with newer innovations that not only increased their bottom line, but led to new business models and products.

In the current services world, the creation of assets that are well catalogued and easy to access is having a similar effect. Service engagement costs are starting to decrease,

compared to similar deals without assets, as companies use technical innovation to supplement their offerings. Asset reuse has also begun to shift the skills requirements for service professionals from deep expertise in a specific domain to general comprehension of the domain and deeper knowledge on integrating and applying assets. The future requires businesses to choose if they want to go West or East.

Services innovation has been historically dependent on the people in the service system. Sustained growth of the discipline is strongly dependent on navigating the fine balance between scaling the industry and not removing the core of services – the *Services Science* practitioner. With (too many) people taken out of the equation, the uptake of *Service Science*, the continued use of services and the wealth to be garnered from service experiences will, with high probability, decrease significantly (as in the case of the automotive companies in the West).

VIII. DISCUSSION

In this section, we want to draw the reader's attention to general themes in the text, highlight salient points and present recommendations.

The crux of services science is knowledge. Knowledge, in general, and assets, in particular (since they represent small nuggets of knowledge) are extremely important and critical in the success of service science and service innovation. Balancing the appropriate levels of knowledge to be maintained in people and in assets before the law of diminishing returns sets in is the new challenge that the industry must address. We should learn from history and be cognizant of the impact of asset reuse, or rather the mass production of assets and their over-use.

For successful service deployments, knowledge management is critical. It is not just about the assets and the reuse of them, but the knowledge and context that surrounds their reuse (and being able to access it) that will enable *Service Science* to thrive (and scale). This is sometimes thought of as following best practices; or better, rethinking work practices and creating new ones. The transfer and sharing of knowledge hold considerable potential for performance gains. A pitfall here is the difference between “knowing that” and “knowing how” [16]. Sometimes knowledge cannot be made fully explicit. For example, an physicist can explain the physics behind being able to ride a bike on two wheels, but one can only learn to ride a bike through both experience and practice. Additionally, there is benefit to going beyond the mere transmittal of codified knowledge, focusing instead on and trading stories for context and working in teams [14]. Assets do not exist in a bubble and reusable assets are not the be all to end all. If practitioners consciously sacrifice that which makes services special, i.e. people and the role and relationship of people in the service system, then services and service innovation will die.

There needs to be different ways of conceptualizing and measuring services if *Service Science* and service innovation is to thrive. The other option is death by way of commoditization and standardization. Organizations are as varied as grains of sand and that variety is what makes services so impactful on our everyday lives. Not losing sight of this, in favor of being cheaper, better and faster, is the reason why industries, like the entertainment industry, hotel industry and education industry, are so valuable and viable today.

“Being better” and “Getting cheaper” is a trap to avoid especially for *Service Science* [17]. Instead, a better long-term strategy is to find ways to continually and strategically innovate to differentiate one’s service from the rest in terms of quality of service experience. It may also be beneficial to avoid the tendency to standardize offerings and commodity experience, as opposed to a service experience, which ultimately leads to decreasing profit margins.

The key message of this paper is about “putting people back into the equation” and recognizing that people are the critical variable in the equation. “People are the primary source of market leadership during the delivery of services” [17]. Employees know that having a satisfying work environment and experience is important because it fosters creativity, the development of knowledge and skills, and innovation. Employees also know that employing all of these elements is the best way of meeting customer needs. However, most service organizations have chosen the path of automation, process and controls, which eliminates variability and often stifles creativity and innovation, which are paramount to the success of services. This cycle eventually kills innovation, leads to poor morale and further decline in services. The past is bound to be repeated, if its lessons are not heeded.

IX. CONCLUSION

In this paper, we presented fundamental definitions for a service and a service system, highlighted the services model, walked through the history of services science, discussed service productivity and innovation, described services assets and asset reuse, examined their implications and provided a discussion of current trends.

The central message is that knowledge and skills, embodied in people, and those embodied in assets can co-exist and they must, if service science and service innovation is to grow, i.e. scale. However, practitioners should be aware

of the balancing act and careful not to assetize to their demise. If people and their knowledge (and skills) are removed from the co-creation equation, in favor of reusable assets, then service science and service innovation will suffer greatly.

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