Service Science: An Understanding of Dominance

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Abstract

The following essay presents an analysis of the article written by IBM's Jim Spohrer titled *Service Science, Management, Engineering, and Design (SSMED): An Emerging Discipline* [4], where a new vocabulary is defined for the emerging discipline of Service Science. The main ideas of cited article are presented and an economic understanding of them is discussed. Throughout the essay, the deductions are made from what the present author agrees on with the article, leaving to the end the more questionable ideas.

The first thing that comes to mind when any of us finds oneself talking about science, whether one is a scientist or not, is the fact that science can and must be proved. Hence, if we are set to talk about a new emerging -and even dominant- science discipline called Service Science, the first thing to say on its behalf, after reading IBM's article [4], is that service science is fundamentally based on the crude fact that population is increasing. It is a dominant science in the actual economic system due to its roots in the increase of population. One of the many outcomes of the Industrial Revolution is the Law of Acceleration by Henry Adams, where the growth of technology, production and, most evidently, population, can be modelled by an exponential function. But that's when the doubt raged in me: What does the exponential increase in population actually entails in global economy? In the market? In our lives?

Service science involves an specific vocabulary that defines ten key concepts: resources, (Service System) entities, access rights, value proposition interactions, governance mechanisms, (Service System) networks, (Service System) ecology, stakeholders, measures and outcomes. Out of these ten, the first eight are the ones that fundamentally helps one to communicate in the service science field. Therefore, an analysis of what is presented in the article [4] requires some brief definitions for the reader:

I **Resources**: any nameable physical and non-physical thing. There are four types, which are all the permutations of physical, non-physical, with right and without rights. Examples would include people, computers, money.

II **(Service System) Entities**: dynamic configurations of resources, where at least one resource has rights (including access rights to the other resources in the configuration). Examples: people, businesses, organizations, cities, open-source and online communities.

III **Access rights**: these can be of four types: owned, leased, shared access and privileged access.

IV **Value proposition interactions**: a value proposition is a value co-creation mechanism. Entities interact via value propositions, which seek to co-create value for both entities. These mechanisms reconfigure an entity's resources or access to them. The outcome of this mechanism is a win-win relationship.

V **Governance mechanism**: prescribe a process for resoling a dispute. A dispute is is the result of unrealized expected value between entities. Examples of this are Monetary Policies, Fiscal Policies, Exchange Rate Policies, etc.

VI **(Service System) Networks**: the patterns of interaction of a population of entities.

VII **(Service System) Ecology**: populations of entities. The universe of all entities are the (Service System) World.

VIII **Stakeholders**: there are four main stakeholders: customer, provider, authority and competition. From these, one can deduce the Measures: quality, productivity, compliance, innovation.

Once we know these, we can proceed. One of Spohrer's most interesting statements is that service is associated with knowledge-intensive interactions, and thus it is key to keep in mind throughout the analysis of the article [4] that service is expertise, knowledge, and knowledge is about people, as Spohrer [4] mentions. If this is considered, then the mentioned exponential rise in population means an increase in services offered, or an increase in the Aggregate Supply of services in the economy. Let's apply this dynamic in a market: in the diagram below, global service market is presented, where AS_1 moves to the right and becomes AS_2, representing this increase in service supply. The intersection with the Aggregate Demand sets the price [2] [1], and thus we see that the increase in supply would decrease the price people are willing to pay for a service now when compared to the past. Therefore, from an exponential growth in population, and if people are expertise, and at the same time expertise is service, then we can say supply of services grows with population, decreasing the price of services and hence the GDP of an economy.

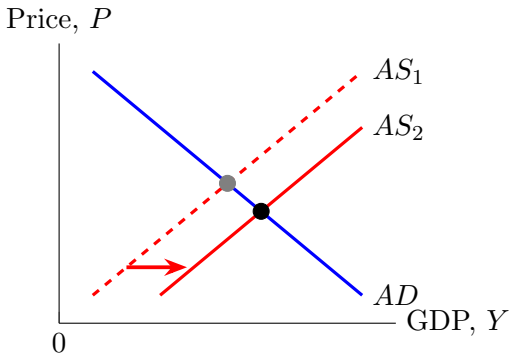

Figure 1: Increase in Aggregate Supply in the service market.

If this is what is happening now, then why would service science be dominating if the price of services is decreasing everyday? This is where the article [4] takes the bull by the horns when it states: *"In cities, division of labor reaches new heights as population increases.*" With this, Adam Smith's theory of absolute advantage and David Ricardo's theory of relative advantage come to the table. Smith noted that countries have different production costs due to differences in input availability, and therefore a country's costs of production would decrease if it traded with a lower cost country, instead of producing it. Then Ricardo stated that a country will benefit from specialization in the production of goods for which it has a lower cost, because trade would happen for goods that the country has trouble producing [1]. Smith's theory results in the division of labor for increase in capacity, while Ricardo's theory results in appropriately dividing tasks among nations for an increase in individual and collective capacity.

Therefore, if there is specialization of labor as Smith and Ricardo suggest, less workers offer the same service, since there is competitive differentiation among them. When the amount of labor for an specific good decreases, the price of labor increases as it becomes scarce [1], and thus I am convinced of the dominance of services nowadays: the theoretical decrease in the price of service

illustrated above is based on the assumption that labor is abundant and thus the offer/supply shifts to the right, but since there is division and specialization of labor, workers' differentiation makes a service unique and hence the labor becomes scarce again, increasing the price people are willing to pay for it, which neutralizes the decrease in price in AS_2 and even suggests that the AS for each service in particular is moving left-wise due to the decrease in supply given by its uniqueness, increasing the price and thus GDP in nations [2], as stated by Spohrer [4].

Let's try to understand this dynamic with an example. If we consider the software services market and pretend the amount of programmers grows exponentially, then some might state that software labor -and software itself- will become cheap because of the excess in programmers. This is exactly what the diagram above shows: a decrease in the price of services (software, in this case) due to the right-wise shift of the Aggregate Supply of said services (programmers/software). If that was the truth, software would be a dead-end career and no one would be a programmer, because it pays cheap. Then what is truly happening, if the number of programmers is growing exponentially? What happens with high densities of population is specialization of labor. In this example, all those programmers are specializing, and so now a small number of them do web pages, others do embedded systems, another group makes desktop applications for MacOS, Windows, Linux. What happened with the market? The software market is divided into many small markets, where the Aggregate Supply of programmers in each moves to the left, since the supply of the many types of software got smaller with the specialization. This increases the prices in each sub-market, making software the trend. We can say thus that software in this example represents services and programmers represent population.

With this dynamic shifting of the curves in the global market of services, we see that offering services requires more than what product offering requires. This has an impact in Marketing as well, since entities interact with value co-creation mechanisms or interactions, which involve communication and thus the Marketing field is in charge of communicating the appropriate image to attract and maintain customers. This lead to the additional three P's in the service marketing theory: apart from the four P's in product marketing (product, place, promotion, price), service marketing adds people, physical evidence and process, all consequences of interactions. It's far from surprising now when we see Amazon's new app interface that has a scrolling feed resembling a social network app, since all services are trying to apply these three P's and promote themselves as social and personal as possible.

Spohrer [4] states that *knowledge and relationships are about people*, and with this the present thesis becomes a full-circle statement: if expertise is service and expertise is knowledge, where knowledge is about people, then service is about people, which is what the phenomenon of exponential increase in population resulting in the dominance of service market is trying to tell us. Service science, apart from being provable by nowadays market phenomena explained above, must also be *measurable*. The measures of service science are a result of what stakeholders measure naturally from their point of view, as stated before: quality (customer), productivity (provider), compliance (authority) and innovation (competitors). Let's analyse these, so as to understand which other disciplines and theories are involved in this new science.

Quality is measured by the customer, depending on what it receives from the provider. Since service is about people, this interaction of value evaluates the quality based on human phenomena, where empirical studies show that service quality levels inside the firm are reflected outside the firm in the value experience of the service. This is a human phenomenon, since humans transmit

their identity (history, experiences, culture) in what they do, which includes providing a service to another entity. This emphasizes business culture practices for the employees, which may be the reason behind the rise of Social Responsibility requiring the evidence of an appropriate working environment inside a company. We see the application of this in any high tech company: Oracle with its multiple recreational areas inside the offices or Intel with its basketball court for employees.

By moving to the Productivity measure, evaluated by the provider, we are also moving towards Operations. Operations and productivity center on the process inside an entity that leads to the delivery of value. By looking at the Operations side of an entity, we unveil a concept that appears more and more inside each measure of service science, which is *balance*. Operations must balance flexibility and optimization of the process, and this measure or stakeholder view relates to the other two remaining by involving balance. What sticks together the four stakeholder views is the sharing of the concept of balance. We can see another example of balance from the authority stakeholder's view: the compliance measure.

The image of Government becomes the biggest and most universal form of authority. The market, considered as "the invisible hand" by Smith, is regulated formally by the government authority, generating the compliance measure. It is a measure and not a constant, since it must shift, and hence involves the balance we mentioned. There must be an ever-changing adjustment of the percentage of compliance and risk, in a way that the sum of the two percentages give out the 100%: the bigger the compliance level percentage is, the smaller the percentage of present risk will be. Risk emerges from the absence of compliance because said absence makes entities self-govern, which gives space for risk due to the increase in possible situations for which decisions are required. By allowing risk in a Service System, there is a steeper (bigger rate) learning curve for the entities, which forces them to change and thus innovate. Therefore, an important conclusion is reached: government mechanisms adjust the learning rate of entities. Whenever risk percentage lowers and compliance increases, it means that government mechanisms act like policies, and these can be either expansionary or restrictive policies [2] [1].

A compliance percentage increase means that policies are applied by the government authority stakeholder to shape the market, and thus risk lowers as possibilities of action for entities narrow towards what the government states: for example, an expansionary monetary policy from a Central Bank often means the increase in money supply so that entities are pushed towards spending more money [1]. But when we say risk lowers, didn't it mean a reduction of learning rate? It is in fact a lower learning rate by the reduction of self-government from entities, but by following a policy whenever there is high compliance, an entity stops exploring (learning) and starts exploiting (applying): policies are used with a purpose (in the expansionary monetary policy example, it would be to increase Aggregate Demand [1]), and this makes a market predictable, which enables an entity to anticipate and prepare if the entity is familiar with previous studied scenarios, and this is in fact exploitation (appliance) of knowledge instead of learning.

Thus, it is important to note that the balance involved in any measure of service is in fact balancing exploration and exploitation: in Operations the balance was between flexibility and optimization, which is reduced to meaning exploration and exploitation basically; in Government mechanisms the balance is between risk and compliance, which has been proved to be the same as exploration and exploitation as well. The last stakeholder view that balances these concepts too would be innovation.

Spohrer [4] mentions that reducing competition in an economic system results in a decrease of innovation, and thus the competitor stakeholder evaluates service resulting in innovation of the markets. Just as productivity measure got us into the Operations field, the innovation measure gets us talking about the Design field. This discipline is an exploration of alternatives and is the one in charge of the definition of the offered experience. The optimal experience design process must balance the customer's anxiety and boredom, and these once again can be reduced to exploration and exploitation, respectively. Anxiety would represent the bigger challenge, the learning, the exploration, whereas the boredom corresponds to the lack of challenge, the mere application of the knowledge gathered, the exploitation. But why was it so important to translate the balanced concepts into exploration and exploitation terms? Apart from showing the reader the common ground where the four measures of service stand, it was intended to make more evident the strong link between service science and computer science today.

Computer science is a relatively new science starting in the 1950's, and due to its short age, most of its concepts acquire names coming from common sense, that is why it is not surprising to find pioneer algorithms with names such as the Travelling Salesman Problem for Graph Theory, or the Coin Change Problem for Dynamic Programming [3], which all come from everyday issues. The Balance of Exploitation and Exploration is also one of the biggest problems in Machine Learning, where the algorithms need even quantum computers to arrive to the proper balance. Thus, science service proves to be the nowadays phenomenon in the market, which makes it transcend towards the computer science field just as other common sense concepts did in the past.

Once we see there is a relationship between computing and service, we can state one of the strongest takeaways from Spohrer's article [4]: *"all information systems are in fact service systems*," since any action is taken by people based on information, and thus information systems serve the entities taking actions. The rise of the internet is therefore one of the biggest reasons why the service market grew exponentially in recent years. With the help of web services, previously product-oriented enterprises are now seeking revenue through *servitization*, which is the combination of products and services to give customer solutions (which also require customer participation). The popularity of internet has also brought alive online environments and now it is more evident that money is information, is data stored in a system. Money has always been bank notes [1] whose core purpose is to give the money's owner the information that said bank guarantees said exchanged amount of money to exist. Money has always been information, but the internet has made it clear.

The rise of the internet and web services lies in the fact that it is a shared access to information across entities. Every information system is a service system because every service entity interacts with another via value propositions, which are a form of shared information since an agreeable plan is communicated between parties and even involved in resolving disputes. Thus, shared information is central to all (service system) entities. In today's market, where an entity has the information of what it needs and another entity has the information on how to solve that need, if information is not shared it has no value.

An emerging science guarantees a nation's base for economic leadership in the following years, but also leaves challenges to be solved: in the case of service science, create new patentable services and keep privacy in the data of others. Service scientists become the market experts, and its rise in it is nothing more than the natural step of humankind towards a more human - and ironically, a more digital - economy. I agree that in fact investing in an emerging science will give economic

advantage to the investor, but I think this advantage will not be exclusive to one nation as noted by the article. In fact, due to the shared and distributed nature of the service science specifically speaking, other nations may join in the benefits of this new discipline, this new understanding.

References

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