Abstract

This paper presents a new practice-based design framework to apply in the design of service innovations. New concepts in business architecture and business modeling, resulting from technological, social and economic change, are integrated with Service Science concepts, tools, and methods, enabling the creation of breakthrough advantages for the enterprise. The framework combines two concepts of customer transformation that change the relationship between service provider and customer, and four concepts of enterprise transformation that change how the firm creates and sustains successful service offerings. The proposed framework combines multiple domains of Business Informatics in a new, practice driven approach to service value creation, and establishes a dynamic, non-linear methodology for sustaining successful value propositions.

Keywords—enterprise and business transformation; service; service science; business architecture; business model; value creation; framework; metrics; KPI’s; architecture of enterprises; business informatics

I. INTRODUCTION

1.1 Service and Service Science.

A radical re-invention of value creation is under way in the global economy, via the interaction of two vectors of change. First, the majority of value creation now occurs in services, and all economies are moving in the direction of an increase in the percentage of GDP generated by the services component. Second, a large and increasing proportion of services are digital, i.e. they are delivered digitally, involve some form of a digital interface and/or are intermediated via digital technology, often via a Cloud platform.

Service Science is an emerging field that strives to bring together many disciplines (computer science, information systems and technology, cognitive science, economics, organizational behavior, human resources management, marketing, operations research, and others) in an attempt to study and understand service systems [2].

1.2 Service Thinking.

Service Thinking derives from Service Science. We define it as:
The application of specialized knowledge and service competencies to create new and more profitable business growth, using processes, tools and methods based on the underlying scientific rigor.

1.3 Impact on Enterprise Transformation.

Service Thinking requires new practical adaptations of business informatics that will transform enterprise design. New challenges are presented, such as new roles for provider and customer in value creation, the qualitative, subjective and potentially idiosyncratic nature of the customer experience, and new realizations of value in the form of value-in-experience and value-in-context. The enterprise must be re-engineered, including business architecture, resource allocation and metrics.

No framework or approach currently exists to design such enterprise responses, although there are partial contributions from multiple sources, including academic research, business research, computer science, analytics and finance. The synthesis we propose is new. The result is a uniquely adaptive non-linear approach, with the potential to catalyze innovative new service initiatives.

II. A 6-POINT FRAMEWORK FOR ENGINEERING VALUE CREATION

Our proposed Service Thinking framework combines six distinctive concepts that, in combination, facilitate the design and implementation of new value creation initiatives. Consistent with design thinking, any one can be an entry point—in combination with some or all of the others—to
assist an engineering group in addressing a service problem or opportunity.

The first two concepts (“Co-Creation of Value” and “Service Systems”) represent transformations of the customer and of the customer-provider relationship. The next 4 concepts are transformations of the enterprise in response to customer changes.

**Figure 2: Service Thinking Framework**

II.1 *Customers co-create value with providers.*

Service is a form of value creation. A service provider constructs a value proposition based on a deep understanding of a customer’s needs. A customer transforms the proposition into shared value by responding in an evolving, ongoing engagement that provides information to deepen the provider’s understanding. This exchange between provider and customer results in co-evolution of technology and processes, whereby new service offerings result in the emergence of new benefits. For example, Web 2.0 enabled uploading of and customer access to video, audio, and complex graphics. Co-creation with customers in this new context resulted in the emergence of new services such as YouTube video posting and sharing, and eventually into completely new experiences such as Massive Online Open Courses (MOOC) which point to a future revolution in education [4]. Co-evolution becomes co-elevation as provider and customer enable each other to be better at creating and experiencing value. The value from this extended relationship is realized over time and monetized through transactions in the applicable business model.

The co-creation concept forces radical changes in business thinking. For example:

- Providers do not create value; they make value propositions, which are converted to value when a customer adds their own resources or effort.
- The co-created value is an experience, perceived by the customer once they participate.

- Two-way information exchange is fundamental to the customer engagement.

Customers may perform “digital work” as their contribution to the two-way service [7]. They click on a website or mobile app, or open and close the door of a refrigerator equipped with an information chip in the “internet of things” and send information to the power company and the refrigerator manufacturer. This is a “data deal”—the customer submits data through behavior in return for the anticipation of a more customized service experience. The data is exchanged and the provider has to be smart to gather, interpret and act upon the aggregate of data from one and many customers.

What about products that are not digital or Internet delivered? Could a soft drink vending machine become a service? If a repeat customer scans a card in a vending machine, a service relationship could be activated. The Coca Cola Company (Provider) could use the information to determine which flavors, sizes, compositions (diet, sweetened) customers prefer (Vanilla-flavored Coke Zero, anyone?) and can change the offering to best customize it for the service user. The customer has entered the “data deal” and the potential of service is opened.

Two of the major implications of the co-creation of value concept for engineers are:

a) The innovation process requires re-designing so that the active input of customers — via both their experience and their perception of that experience expressed as ideas, criticisms, commentary, etc. — becomes the major input, as opposed to the provider’s ideation or technological innovation.

b) The marketing process must be redefined since the relationship between “provider” and “customer” has changed. Marketing can no longer be based on outbound communication, and must focus on fitting in with (consonance) and contributing value to (resonance) the customer’s service perceptions. [6].

II.2 *Value is created in service systems.*

Service is no longer one producer serving one customer. The customer assembles a service system to get a job done, or meet a need. The provider assembles a service system to do that job for the customer or address that customer need. A service system is a combination of people, knowledge, and technologies with a value proposition. Healthcare illustrates one example. The patient and a primary care doctor co-create value in the form of superior health outcomes. Each is part of a much greater service system that supports their co-creation.

The provider system includes other specialist doctors, nurses, information, technology, financial systems, hospitals, and medical equipment. The patient’s service system includes family, information, diet, transportation, insurance, banking, and fitness equipment. The service system of the producer and the service system of the customer combine in a shared value
Consider a provider enterprise seeking to launch an integrated communications campaign. The company does not design, produce or distribute communications itself; it engages one or more third parties (such as a marketing agency, a media buying company and a social media company) to do so. Before a request for proposal can be published to any of these third parties, however, there is an internal provider service system that enables the action. In traditional SBU based companies, the brand manager may be the initiator of the request, and the integrator of the system, with authorization from the Vice President of Marketing. The marketing planning process may have established the need for the advertising and communications, and ROI analysis of historical marketing expenditures may have been conducted to justify the expenditure. The finance department must be involved to confirm that the expenditure can be undertaken. The legal department will be alerted to help ensure that any claims or statements made in communications have legal approval. The executive wing will be involved both for authorizations and approvals. Perhaps the sales department is engaged in advance of the campaign, so as to plan appropriately for additional sales or special customer visits.

Once the internal service system is aligned and activated, the brand manager can make a connection to one or more outside vendors who specialize in communications services. Let’s assume that a marketing agency has already been appointed to respond to service requests such as this one. (The term in the industry is “agency of record” – a recognition of a durable connection between the enterprise and its specialist service supplier for repetitive services. Such durable connections have benefits in faster and clearer information exchanges between the two service systems and accelerated mutual adaptation to facilitate superior service outcomes.)

The marketing agency will assemble a service system for the task that comprises both internal specialist competencies and external competencies. Internally, the account director may be the first line of contact with the client brand manager. The account director will get authorization from his head of department and the agency’s financial department to activate the agency’s resources to respond to the RFP. Those resources will include multiple departments and specialized knowledge, skills and abilities: the creative department specializing in persuasive words and images, the production department specializing in bringing the creative to visual or printed form, the legal department that will both parse the legal risk for the agency and advise the client, the finance department to estimate and approve costs, and senior management for internal co-ordination and executive approvals.

The internal agency specialist will implement some of these specialized functions by reaching out to external super-specialists. For video communications, an agency video production manager typically will engage an independent director and an independent video production company to find a site to shoot the video, facilitate casting and hiring, assemble all the equipment, deliver it to the set, and even cater the event. Actors and actresses are typically independent contractors. If the video is animated, a specialized animation company will be hired.

A marketing campaign is an example of a service system assembled for a specialized service delivery task – the production of communications content – and then immediately disassembled so that the component elements can be reassembled for another customer in the future.

The internal service system at the customer and the external service system of the marketing agency co-create the service of producing an integrated communications campaign. The service systems will be then re-ordered for the next stage of service. A media planning company will be connected to the service system to advise on where the advertisements should be shown and the pricing of purchasing that distribution service. Then the traditional content distribution networks and Cable Networks will be engaged, as well as local television stations; Google Adwords and other Internet based communications platforms may be added as well. A measurement company will be engaged to measure the number of people viewing the content. An analytics company will be added to the service system to ascertain the increase in sales revenues, brand image perception, and customer engagement as a result of the communications campaign. This is a new phase of co-creation of value – the analysis of the experience and behavior of the ultimate customer in order to guide future resource allocation.
Service system thinking represents a major departure in how strategy is developed in business—from prescriptive to emergent. The co-evolution and co-elevation consequences of co-creation within a service system result in emergent new value and new benefits that cannot be predicted with traditional business strategy tools. The prescriptive model-based formulas, processes, and theories from the strategy consulting industry may help provide some basis for understanding, but they are no longer useful in orchestrating the continuous adaptation required to co-create value in a service economy.

II.3: Modular business architecture.

Service systems require a continuous search for the best co-creation partners. Businesses now have an incentive to focus and specialize in order to sustain absolute advantage in their specialty; they should shed disadvantaged competencies. Specialization plus integration is the search for continued relevance and differentiation in the swirling dynamics of service systems and co-creation. Business modules must specialize—perhaps hyper-specialize—is a better term—to maintain the knowledge edge that makes them the best. As specialists, they must integrate smoothly into the service system so that the customer experiences no friction. Just as service systems are composed of specialist modules, so business will become confederations of such specialized modules, loosely coupled as a single enterprise.

![Component Business Model](image)

Figure 4: Key elements of the component business model [1].

The Component Business Model tool is a framework to design the federation of business modules for the enterprise and to map out organizational advancement towards optimum specialization and integration. The framework has two dimensions: competencies and control levels. A generic version is illustrated in figure 4. The horizontal dimension arrays the competencies of the enterprise. Different firms will map their competencies in different ways, but the groupings must (a) contain all the activities the firm undertakes, and (b) include all the capabilities required to compete in the identified field of business. In the illustration in Figure 4, the competencies are defined generically as Manage, Design, Buy, Make and Sell. On the vertical axis are the resources of the enterprise used in business activities: Directing (strategy and planning), Learning (paths to innovation through new knowledge, including KPI’s and metrics), Oversight (management processes and activities), and Implementing.

In modular business architecture, competencies can evolve into self-sufficient components that can be applied for the benefit of the originating enterprise or for any other business that requires the competence to be part of its value constellation. For example, a retailer, as an integrated element of the customer experience, can offer FedEx logistics components such as tracking and overnight delivery.

Componentization represents a complete break with organizational design and architecture of the past, replacing concepts such as Strategic Business Units (SBUs) with a much more fluid and dynamic view of the organization. Business components can be entirely self-sufficient when appropriately equipped with resources, implementing segregated activities not reproduced elsewhere in the enterprise, governed with the right processes and instrumented with the right technologies. Once this self-sufficiency is established and standard interfaces between components are established, the components can be internally linked to the enterprise, or externally linked to other service systems. Such componentization fuels the growth of value co-creation webs. For example:

- Mobile phones, tablets and printers from different manufacturers have a common set of physical parts supplied by componentized firms in the consumer electronics assembly value web.
- Apparel firms like Zara and H&M can link to components for manufacturing, assembly and shipping of their designs to orchestrate a value web in which they own none of the assets but co-create value through rapid inventory replenishment in response to customer purchasing data.

New forms of tightly integrated value webs are continuously advancing the integration capabilities of Internet technologies.

II.4 Scalable Glo-Mo-So platforms.

A platform and set of enabling and implementing technologies are required to scale up the service system for global mass delivery in such a way as to accommodate specialization and co-creation (get the “local” right) while creating scale efficiency (get the “global” right). To enable and implement the collaborative specializations inherent in co-creation, many of the technology tools are “social”, both within the producer (collaboration around specialized knowledge and skills) and between the producer and the customer (collaboration around co-creation of the service experience). For a full and uninterrupted service experience, the tools must include
mobile functionality \cite{10}. Thus, platforms for scaling up the service system are Global-Mobile-Social (Glo-Mo-So).

New value propositions and new business models can be created and activated on available Glo-Mo-So platforms. Github is a collaborative open standards software development platform onto which engineers can place their code and seek the assistance of other engineers in refining it, fixing it or integrating it with existing operating systems such as AppleiOS. The highly social collaborative platform engages many brains so that the process of development, refinement and deployment is accelerated\cite{13}.

II.5 Continuous improvement via learning.
Continuous improvement is required to maintain the service system, sharpen the specialization, integrate new ideas and retain competitive advantage. Therefore, resources must be shifted and re-allocated towards learning. Running the system must be efficient, but minimal resources should be required; more resources must be allocated to transformation (making the current system ever more efficient and lower cost by adopting known external best practices) and innovation (replacing the current best practice with a new, disruptive and superior one). The Run-Transform-Innovate (R-T-I) ratio can become a powerful enterprise governance principle for continuous improvement \cite{12}.

Service thinking companies continually review their Run-Transform-Innovate investment ratios. Are they continuously refining the running of the everyday business operation to ensure efficiency? Are they always seeking ways to transform those operations to find new opportunities for efficiency? And are they investing in the R&D to innovate, i.e. create new revenue and profit streams that might potentially make the current operations obsolete? The hindrances of conventional company strategic planning have been called “the pull of the past”, resulting in extrapolation of the status quo rather than investment in innovation \cite{13}. Service thinking companies are continuously redefining value creation and investing in disruption. Early in the decade of the 2000’s, IBM’s IT organization shifted the percentage of its budget allocated to “Run” by 10% towards “Transform and Innovate”. The baseline was an analysis that the company was spending 73% of its IT budget on keeping systems and services running, and 27% on transformation / innovation. In 2009, the ratio was 63% allocated to “Run” and 37% to “Transform / Innovate”. The goal is now to shift a further 2% from “Run” every year \cite{14}.

II.6 Two-sided metrics.
When value is co-created, metrics center upon co-creation outcomes rather than just on one-sided producer revenues and profits. Service quality is a 2-sided metric – it requires the producer to measure quality and the customer to report their experience. Customer loyalty is similarly 2-sided. Such metrics are often time-released and not limited to the moment of interaction, forcing business to re-think the periodicity of annual results, quarterly earnings and other such time-bound metrics. In large service systems, the outcomes are world changing and quality-of-life enhancing (e.g. IBM Smarter Planet, Smarter Cities, Smarter Workforce, Smarter Education). In smaller systems, the outcomes can be just as world changing: a healthier population around a local community health system, or a more entrepreneurial, innovative and employment-ready body of young people from a university.

One of the unfortunate outcomes of Six Sigma and Lean Manufacturing is the inappropriate transfer of thinking from a manufacturing perspective into the services domain where they have become counter-productive to real innovative thinking and operational agility.

In the service thinking approach to metrics, IT and customer facing functions collaborate to

- Generate insights
- Support positive evaluations by customers
- Monitor and manage customer activations
- Monitor, manage and maximize the customer experience
- Monitor and manage experience sharing

The first 2-sided metric we recommend for the service-centric enterprise is: are we generating insights? The second metric we recommend is a measure of the value of the insights. Value is a function of the number of customers covered by the insight, the likelihood of action to convert them to a desired behavior, and the value to the enterprise of that behavior. Let’s say that the enterprise offers a service that enables customers to track their dietary actions and the calories and nutrients that they intake, along with their caloric expenditure in exercise activities. It is extremely likely that the firm could identify the motivations of potential customers from big data sets (content to which they subscribe or which they read, apps they use, activities they pursue). The firm should also be able to accurately estimate how many individuals share this motivation, and what proportion of them might subscribe to the new service that improves their ability to achieve their motivational goal. If the provider then adds an estimate of the economics of subscription (i.e. either in service subscription fees, advertising to subscribers or sales of associated products to subscribers), then it is possible to place a value on the insight. As a result, providers can prioritize across multiple insights and focus their R-T-I investments on those with the highest potential.

The enterprise should have a portfolio of high value insights, and an R-T-I strategy to invest in them in order to monetize them in the marketplace. Two-sided metrics can inform the enterprise of those that are most likely to be supported by positive customer sentiment, employing a combination of “big data” and predictive modeling.
III. APPLYING THE 6-POINT FRAMEWORK IN PRACTICE

III.1: The hinges of the 6-point framework
Many strategy design models are linear in their application of process steps and aim to be prescriptive in their output choices. The experience of enterprises in the service economy is that more optionality and greater agility is required than these standard approaches can accommodate. The proposed 6-point framework is designed to be non-linear and to embrace non-continuous change.

The application of the framework begins with an understanding of the customer gap between desired experience and actual experience. This can be viewed as a problem to be solved or an opportunity to be seized. The gap analysis generates a choice of “entry points” – any of the 6 chevrons of the model can serve as the entry point; some or all of them can apply in combination (although it is never the case that one of the chevrons applies as a singularity); the sequence of deployment is variable, and can change with customer response to stimulus. This non-linear approach is more applicable than “concrete” processes in contemporary business cases.

III.2: The transformation from product-centricity to service-centricity.
In the case of a manufacturer of non-processed protein food products, initial gap analysis revealed constrained pricing and profitability resulting from a transactional relationship with customers (retail supermarkets and food distributors) focused on daily price negotiations, with limited long-term service relationship attributes. The selected entry point for transformation was the analysis of a service system (Chevron 2) for a shared end-user: the food shopper that the retailers and distributors were aiming to attract and retain.

The value-in-context goal of the end-user was identified as family value, combining functional components (nutrition and eating experience) and emotional components (the joyful togetherness of family meals). A business case was prepared for the shared value created by a service system the protein provider and their retailer / distributor customers. With each major customer, the producer designed a co-creation approach (Chevron 1) to designing individualized end-user acquisition and retention programs.

The KPI’s (Chevron 6) for the co-created programs were revenue per shopping occasion (available via retailer and restaurant POS data analytics) and end-user satisfaction (survey based). An algorithm was identified for the most valuable shoppers – those who purchased fresh protein items were demonstrated to be the most valuable because their total expenditure per occasion was the highest of all shopper segments.

The food producer built a scalable platform (Chevron 4) enabling customized marketing programs via web advertising and engagement, conventional advertising and social media. With a service-oriented architecture, the platform facilitated customized co-created demand creation programs with multiple retailers and distributors.

The results were improved topline revenue for both producer and customer, enhanced gross margins, and measured loyalty of the most valuable shoppers.

III.3: Improving the lives of asthma sufferers through a service science approach to value.
Each year, 1.2 million people in the US visit hospital outpatient care departments with asthma as the primary diagnosis.

Many chronic sufferers have a low compliance rate (inconsistently taking prescribed medication) and a poor understanding of their symptoms (leading to serious complications and trouble when symptoms get out of control). Proper monitoring and action, before an instance of the condition becomes critical, can enable the patient to avoid emergency hospitalization. Conventional doctor visits and medical procedures are inadequate to address these issues in an affordable, scalable way.

An entrepreneurial team of physicians attached to a major medical university (University of California in San Francisco) created the AsthmaMD App that now has 75,000 active users and is the largest mobile app for chronic disease management in the world, based on active users (not just downloads). Their goal is to be the #1 source of information useful for asthma patients, researchers, pharmaceutical companies, and care givers.

The entry point for the service science approach to value creation was the global-mobile-social scalable platform (Chevron 4). The entrepreneurs recognized that increased mobile phone use has created a ubiquitous platform for timely medical information sharing with patients and data aggregation for researchers. Using mobile devices would make this service very scalable to any number of patients (no space constraints as in hospitals); it could be global to reach anyone, anywhere, anytime; and be automated so that professional interaction per use was not necessary.

The second chevron to apply was the creation of the appropriate service system (Chevron 2). The core value web was the patient-physician-researcher connection, sharing data, analytics and activities between three communities that, heretofore, were not well integrated. In this service system patients can self-input and then share their information (exercising co-creation of value – Chevron 1.) There are five input fields—the more data they input, the greater the value to themselves and the other stakeholders:
1. how they are feeling,
2. peak flow measurement,
3. what medication they use (or plan to use),
4. known asthma triggers,
5. additional notes they may enter.

The mobile platform also provides immediacy of data gathering— at the point of suffering. A patient is unlikely to record symptoms, when they occur, with pen and paper, and they are unlikely to be sitting next to a computer. But many patients have a smartphone and can record an event immediately.

Physicians want to access and analyze this data to control asthma among their own patients; it helps their patients to understand their disease better, so they get better results from treatment. Active users have 10% improvement in pulmonary function results - as much as with inhaled cortico-steroids: these are KPI’s – Chevron 6 – but, in this sense, patient self-knowledge can be as good as medication, since knowledge and understanding increases the opportunity to act before a critical situation occurs.

Researchers can aggregate AsthmaMD data in new ways for new analytic insights. For example, they can compare asthma patients’ daily inputs with known pollution data in different geographies, confirming, for example, the correlation of the levels of known pollutants like ozone with the level and characteristics of asthma symptoms. The integrity of the data sets and analytics has proven to be as good as controlled (and very expensive) National Institute of Health studies. A typical university study might be 30 to 50 people; AsthmaMD has 75,000 active users and can easily get data from 5 or 10,000 people.

It is instructive that the monetization of the business model is separate from the service. In the case of AsthmaMD, the entrepreneurial team built a low cost app, made it free with patients, then recorded the data to demonstrate the improvement benefit. Once data was accumulated on tens of thousands of users, the entrepreneurs could transition into a monetization phase, with no loss of integrity (and, arguably, a gain).

- Secure grants from organizations such as NIH, to further refine the platform and the research.
- Offer scaled data sets and patient engagement metrics to attract private enterprise such as health insurance companies wanting to advertise within the service, pharmaceutical companies seeking data, and medical device makers seeking association and endorsement.
- Third, the university medical school wants to support this kind of activity from its faculty.

Physicians are now “prescribing” AsthmaMD as a health solution for patients. Professionals achieve more new patents through word of mouth from users and recommendations. AsthmaMD is now entering its exponential growth phase.

III.4: The 6-point Service Thinking framework maps the pathways to service innovation.

Both the case of the large-scale manufacturing organization making a transition to a service mindset, and the case of the entrepreneurial team creating a new value for both asthma sufferers and the healthcare constituencies that serve them, the 6-point Service Thinking framework facilitates a service transformation. The application of the 6 chevrons of the framework can be applied in a variety of combinations and sequences, adaptive to changing customer responses, and laying a pathway to new business model opportunities.

Concluding inquiries

As enterprises adopt Service Thinking in designing technologies, several questions arise:

- How does a Service Thinking approach change the way engineers should work with marketing, sales and other disciplines in multi-functional teams to develop a customer co-creation strategy?
- How can engineers best incorporate co-creation into the design and evolution of technologies and applications?
- How can digital services deliver higher benefits than the equivalent non-digital service?
- How are customer experiences enhanced and measured? Which experiences and metrics are most important?
- How can service systems and componentization be integrated into the strategic/operational DNA of an established corporate culture that resists change?
- Can entrepreneurs transform service industries through adoption of Service Thinking in the development, design, and marketing of new ventures?

Adoption of Service Thinking should provoke more questions that can lead to better answers to co-create value between service providers and their customers.
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