Bringing Design to Services Science

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Abstract. Design methodologies and principles have long been used by companies in product development. Innovations through design have resulted in more effective production, improved delivery of products, and the creation of more desirable products. We foresee a similar future for services, where service design will become an integral part of service innovation and development. Service design practice helps an organization understand where an offering idea resides in the organization's product-service ecology, how it can shift in the space, and how to make it desirable and sought after because it delivers value and meets a need. However, service design is still in its infancy and there is much to be explored. This paper proposes a definition for service design, provides an overview of service design practice, and discusses research challenges for service design and services science. Topics addressed include the need to (1) bring an understanding of the design objects of service and develop design methods that make human-centered service design possible, (2) bring an understanding of the variation among service cultures for the international marketplace, and (3) develop clear specification and design languages for designers to use in services research, service interface co-production and implementation.

Introduction

In the early stages of the industrial age, individual or regional manufacturers drove product design and development. Over time, as markets began to mature, a demand for more rigorous methods and systematic design grew. Since the 1940s, design has strongly contributed to economic success through the focus of desirability and, more recently, of usability and usefulness. Innovations arising from product design methods and engineering have contributed to more effective production and improved product delivery. However, the same can not necessarily be said about service delivery.

Although investments in research, design and development are an integral part of nearly every industry, services have not been object to the same systematic approach. In general, if investments were made in service, the focus has been on marketing activities versus service research, design and development efforts. The growing economic influence of the service sector in the last three decades has brought new scrutiny to this deficit in the world of service. Services today are moving from manufactured to industrialized solutions and the need for design methodologies and principles is obvious. (1) We see a future when service design will become a central function of every organization’s service innovation and implementation efforts. This will happen when the theoretical framework and methodologies of service design and successful service design practice become an integral part of the field of service science.
What is Service Design?

Daniels [1] states that, “service industries have long been the Cinderella of economic geography. It has been suggested that the ‘service sector is one of the least understood portions of our global economy’ but that ‘no economy can survive without a service sector’” (p. 1). In the recent past, academics, economists, policy makers and businesses, to name a few, have been paying very close attention to the shift from product-based industry towards service-based industry [e.g., 3, 4, 5]. However, services continue to be an enigma to understand, analyze and model due to their complex nature and lack of definition. This is evidenced by the numerous types of service that are information-oriented, product-oriented and location-oriented to accommodate business-to-business, business-to-consumer services and consumer-to-consumer relationships in a person-to-person, person-to-machine and/or machine-to-machine manner.

Ganz and Meiren [6] conducted a study to investigate the current state of knowledge in the field of methodologically-oriented service research. They identified six central fields of research and development essential for services: (1) basic service research, (2) internationalization of services, (3) design of service work, (4) service innovation, (5) technologies in services, and (6) transformation processes in the economy—of which, fields two through six contribute to the first field (basic service research). With respect to the design of service work, they report that there is a need to gain knowledge about the human aspects and social interaction activities of both non-professional and highly qualified knowledge workers. This is due to an intense awareness that service work is considered to be ‘people work’ and too little is known about the human aspect of both the provider and the client in the service definition. The consideration of this human aspect is a key differentiator in the design of a service system.

The idea of Service Design becomes paramount if one believes business and society is moving into an experience economy as explained by Pine and Gilmore [7]. Where, goods and services are sold within a staged experience which requires the identification, definition and design of an experience theme and impression. This paper does not provide the steps to create a compelling staged experience (those can be found in Pine and Gilmore’s book); however it does explore the service design dimension to better understand methods used in the creation of service experiences and innovation. To start with, a definition of service and design are provided separately, followed by a more specific discussion about service design practice.

Definition of service

There are many definitions of service in the literature, however for the sake of this discussion, the definition evolved by Jean Gadrey [8] based on Peter Hill’s 1977 work will be used here. Where, “a service may be defined as a change in the conditions of a person or a good belonging to some economic unit, which is brought about as the result of the activity of some other economic unit with the prior agreement of the former person or economic unit” (p. 41). Gadrey goes on to explain that a service should first be considered a process, and illustrates service as a triangle that includes three primary elements: A. Service Provider, B. Customer/Client/User, and C. Transformation of a Reality (Figure 1).
As stated, the first premise in this definition of a service is that of process or, more precisely, an operation with activities that afford the goal of successful co-productive transformation as resulting output. Gadrey’s primary focus is on productivity concepts for services; however the concepts he presents with respect to service relations, interactions, operation and activity are well suited and very similar to creating a service definition using service design practices.

Given the generalized definitions of service and design provided above, we add the assumption that the services can be viewed as performances: choreographed interactions manufactured at the point of delivery that form a process and co-produce value, utility, satisfaction, and delight in response to human needs [9, 10, 11]. Additionally, activities or events in the process form a product through an interaction with designed elements or resources from representatives of the service organization, the customer, and any mediating technology. We view the design of services as the act of conceiving and iteratively planning and constructing a service system or architecture to deliver resources that choreograph interactions. When a company provides the optimal mix they will have produced a resonating service system [41].

**Definition of design**

Whether we realize it or not, vernacular, planned, and iterated design surrounds all of us (from the utensils we eat with, to the vehicles that transport us, to clothes we wear) and permeates our daily activities. Design, as defined in Wikipedia [13], has planning as the central idea to creation and implementation of product, structure or component. However, design is more complex than having a plan. Herbert Simon [9], in his seminal work “The Sciences of the Artificial” discusses the interstices between the scientific world and the artificial world and the evolution of a science of design. This science of design is based on “a body of intellectually tough, analytic, partially formalizable, partly empirical, teachable doctrine about the design process” (p. 113).

Simon differentiates (natural) science and design as natural science being concerned with how things are and, design being concerned with how things ought to be and devising artifacts to attain goals. Simon then goes on to discuss topics for a theory of design that are applicable to the definition and creation of objects, spaces or experiences. It is assumed here that scientific inquiry into the natural ultimately informs the examination, analysis, modeling, creation, production, and often iteration of a designed element. These ideas can be expanded to beyond the creation of goods and products to influence and direct the creation of services.

**Service Design**

The combination of service and design is a relatively new, albeit needed, phenomena in the evolution of design theory and practice [6, 15]; and service design is often described as being the outside-in perspective on service development [16]. More precisely, service design is concerned with systematically applying design methodology and principles to
the creation, definition and planning of a service. Service design as a field is young, having started in earnest in the 1990s (similar to the timeframe for interaction design for computing systems) and was positioned relative to industrial design [17, 18, 16].

Service design, from our perspective, assumes the client is the starting point or lens for a specific service and, through the use of creative, human-centered and user-participatory methods, participates in the modeling of how the service should be performed or provided. At the same time, service design identifies and integrates possibilities and means to provide a service with the desired qualities within the economic and strategic intent of an organization. Thus, collaborators “visualize, express and choreograph what other people can’t see, envisage solutions that do not yet exist, observe and interpret needs and behaviors and transform them into possible service futures, and express and evaluate, in the language of experiences, the quality of design” [19, p 1]. As a discipline service design should not be viewed in isolation, but as complement to service development, management, operations and marketing [19, 16, 4].

Design activities appear throughout a service or product development process [e.g., 20, 4, 15, 22]. In our approach to designing for service innovation we integrate these activities across a service development process that includes exploratory, generative, and evaluative research that spans the entire design process—from discovery to release [17]. The process differs from conventional approaches (such as those defined by Booz and Hamilton [23], Bowers [24], Khurana and Rosenthal [25] and Zeithaml, Bitner and Gremler [26]) where strategy is defined prior to investigation creates the definition of the service that has to then be ‘filled-in’. Instead of starting by defining strategy, we start with exploratory or immersive research to lead to opportunities for innovation in strategy. This, in turn, provides context (or the fill) for the service to be created.

Another difference is that service design as a design discipline is not singularly focused on designing processes, which has become a predominant perspective in other service sciences disciplines [3, 4, 5]. Service design contributes to service development in areas such as user orientation, contextualization and design as a strategic instrument with process analysis as one dimension of our approach to designing for service [4, 27, 28, 29, 30, 31]. The human-centered approach to designing for service innovation draws on a variety of methods and ultimately depicts through enactment and prototyping what qualities the service should be characterized by, and how the service should be co-performed [19, 32]. Service design in this sense aims to create services that are useful, usable, desirable, efficient and effective.

Elements of Service Design

In order to meet the aims of service design, elements such as design principles, objects and communication need to be identified, explored, understood and developed to effectively articulate the implementation, delivery and expected experience of the service system. The process associated with a service design is called the service journey and includes how the service is experienced from all of the different stakeholder perspectives during a specific stakeholder’s life cycle with the service [34, 42]. This section discusses
many of the known elements that assist in understanding, defining, creating and communicating the service journey.

**Design Principles and Design Objects**

Given that services include products, performance, and processes co-produced by client(s) and service personnel and, supported by differing degrees of technologies, a wide range of designed objects are often required to bring them to life. Different design disciplines view and handle design objects in different manners. Buchanan [15] defined an analytic framework defining different orders of design that are distinguishable by their primary objects of design. These design objects are signs, products, actions and thought. He also assigned corresponding design disciplines to the design orders which are graphic design, industrial design, interaction design and environmental design, respectively. Some analyses of design disciplines that cut across Buchanan’s design orders have been performed. Edeholt & Löwgren [35] identifies a challenge for digital interaction design when dealing with ubiquitous computing artefacts. They identify the importance of interdisciplinary design work, in their case cutting across the design orders of products and actions. Holmlid [31] performed a similar analysis, where the characters of design objects and design work from the interaction and service design disciplines were used as the basis for the analysis.

Service design includes all four of Buchanan’s objects of design and spans person-to-person, person-to-machine and machine-to-machine interactions. These interactions are mediated by physical evidence, technologies and interpersonal communications. Examples of these mediated interactions include:

- **physical evidence** such as a piece of paper with a cue-number, a prescription from a doctor telling the pharmacist that you are allowed to buy a specific medicine or a receipt indicating that you have performed your part as a client by paying for a service.

- **technologies** that support mediation of service. In self-service banking the web-browser mediates between a person and their funds; at the airport the flight system mediates between the person and their destination; a computer agent mediates the entire selling of a stock when it reaches a prescribed level.

- **interpersonal communication** mediation occurs in a context which may or may not be a co-located physical setting. A servicescape, as described by Bitner [36], is a physical setting that provides boundaries or zones meant to encourage or discourage interpersonal communication based on the physical structure such as in an office environment or the way that furniture and fixtures are structured at a self-service coffee shop. Interpersonal communications range from the way a company’s personnel answer the phone to how a waiter takes an order in a restaurant. Having a discussion with a customer sales representative over a telephone is an example where a physical setting is not shared, where other types of resources for mediation are needed.

However, knowing service-relevant design principles and objects will not guarantee a proper or adequate service. Design methods and tools are needed to aid in investigating
and understanding what service should be provided and which of the principles and objects are needed to support the service.

**Methods and Tools**

Design methods and tools result in evidence that can be used to define elements of the service and combined elements that become service touchpoints that ultimately result in a stakeholder-oriented service system interaction design [15]. These groups of resources into touchpoints become the milestones in a person’s experience with the service. These milestones help to illustrate the service journey for all stakeholders (provider and client), along with the design objects and principles needed to support the service [42, p 105].

**Human-centered research methods**

In other design traditions, a human-centered research methodology has been a central part of practice since the 1980s [23]. Service design builds on this practice by involving people in all stages of the design process as co-designers and ultimately as co-producers of the service experience. A human-centered service design research approach begins with people: their goals, what they do, what they want to achieve, what they experience [27, 30, 33, 37]. The overall process is iterative, that is, service design resources and evidence are vetted with the client stakeholders and their input heavily influences everything from incremental changes to breakthrough innovations.

One critical component to the research in designing for service is to understand and experience the customer journey—just the way a client would. There are a variety of techniques for understanding the journey such as shadowing, using cultural probes [36], self-documentation or video ethnography. The resulting documentation of such a journey is often produced as service blueprint which is similar to a process map. The original service blueprint concept created by Shostack [12] was heavily focused on person-to-person interactions and actions in the back-stage (the background support) and the front-stage (interaction with the client) to deliver a service.

Understanding the role that people’s expectations play in approaching a service is an important topic in service research [38]. Working with genres as a framework for design is also a powerful technique [39]. Simplified, a genre can be described as an implicit contract between producer and consumer, directing both the production process and the expectations of the consumer. For example, in the United States there are several genres in health care delivery, from local clinics to large medical conglomerates. Explicitly exploring what evidence communicates attributes within and across the genre helps in setting expectations for the service encounter and overall experience.

**Modeling, prototyping and enacting methods**

In the service design process models, prototypes and enactment play a critical role in bringing the design to life at a variety of levels of abstraction [32]. Live|work and other service design firms have pioneered methods for modeling stakeholders at abstracted levels as mappings that illustrate the influence and relationships between providers, partners, clients and peripheral influencers to the service. Others have used these mappings and real-world observation to create personas that capture and communicate
different goal-oriented customer categories and to maintain a deep connection to the activities of the service [33].

Modeling what happens, how people act, in what order things happen and coordination of back-stage and front-stage activities is done through scenarios. Story-boards are created as a narration, often in the form of comic strips, to describe the activities of a particular stakeholder (or persona) in the service process. Prototyping in service encompasses the experience as well as the touchpoints. Prototypes can range from rough sketches of ‘moments of truth’ to full scale brick and mortar facilities [4]. Working with dramaturgic methods allows designers and stakeholders to enact, or perform and test, the service experience before it has been established in an organization. These activities allow for anomalies and alternative solutions to be found.

The design principles, objects, methods and tools discussed thus far are all elements in creating a service design. There is an additional element that has to occur to accurately portray and communicate the service design for development and delivery. The service design has to have a clear service design language and specification methodology.

**Service Design Languages**

Just as spoken languages are the basis for our conversations with people, so design languages are the basis for how we create and interact with service interfaces and other artifacts. People use spoken language to express themselves; services designers use service design languages to express the service, what it does, how it is to be used, and what experiences or journeys are made possible through it.

Spoken languages consist of words and rules of grammar. Design languages consist of design elements or resources that are combined into constructs, such as a touchpoint, and the principles and guidelines for their combination. Natural verbal language supports the production of meaningful expressions by allowing people to combine well known sets of words and rules of grammar to create previously unknown but usually comprehensible expressions. In addition, natural language is generative and inherently open. Research into creating a service language, so that the language is open in the way as natural language, will be invaluable in articulating person-to-person, person-to-machine and machine-to-machine interactions.

With a service design language it is possible to visualize, express and choreograph the resources for interaction. Design languages are general to a servicescape such as a coffee shop, with a condiment station for tailoring the coffee that has a flat place large enough to hold several drinks, trash receptacles, sugars, creamers, etcetera and specific to a particular brand (e.g., in the way Starbucks expresses a condiment station). Essentially, design languages are the means by which:

- designers build meaning into the service interface;
- service interfaces express themselves and their meanings to people;
- people learn to understand and use the service and engage in experiences associated with service journey; and
companies establish new industry standards for quality, market presence and customer satisfaction.

When an effective service design language is deployed consistently, people who use or access services become fluent in their interactions with the service. Designers and developers are also articulate and skilled at the production of the resources for service delivery. Research into design languages is likely to influence service design in multiple ways. An exploration of service design languages will augment or change existing business process description or blueprinting methods that are currently used for describing the current state of service experiences. This work is a natural compliment to research into specification, choreography, improvisation and, most importantly, implementation.

**Service specification**

Services are complex. Specifying service encounters can be challenging because interactions in service are a dynamic dance between people-and-people, people-and-machines and machines-and-machines. The choreography of different processes among humans and machines often requires seemingly individual responses. The way one person reacts to a cue at and automatic teller machine is often very different from another, for example. In some sense, services may need to always be underdetermined, which is what makes the specification and documentation so challenging.

The reciprocal effect of these different dimensions in service organization and development is challenged by linear thinking and representational forms. Blueprinting, introduced by Lynn Shostack [12] is one of the only tools available in analysis and design that really attempts to address the multiplicity of dimensions. Though an excellent tool, there is a need for more and better notation systems to capture the ‘essence’ of the service to communicate the facilitation of the experience, which is directly connected to the co-production and consumption of a service. Many expressive arts (music, dance, theater) have a long tradition of documentation with unique forms and design languages for authors to express their intents of performance. These traditions also enable others to read and express the performance without being over-determined and with some relation to the author’s intent.

In the past 10 years some isolated attempts in service marketing and service design have drawn from art similar models to further discussion, innovation and tools generation in support of services. Basic investigation into the possible use of the concept of genres and the application of style analyses and style charts such as film scripts, descriptions of role, service acting and stage setting have been drawn from theory and tested in facets of practice. Concepts such as service production and service dramaturgy also reference front-stage and back-stage—terms that are found again and again in the description of services.

These terms rise from equivalent art movements, in which the participants are orchestrating experience as the experience happens over time. It seems that many art worlds parallel services in their dynamics and complexity, that is, the multilayeredness,
interactivity and animation or life of service systems. A systematic analysis of the art-similar thinking, representational forms and notation systems as applied to the development and communication of service systems is however still pending. A first phase of this research on “The Art of Service” is being conducted in collaboration between Carnegie Mellon University and sedes-research at the Köln international School of Design.

Investigation and specification into the design of a service system is not a simple feat. As stated above, there are a number research, design and interaction methodologies from multiple disciplines that can be drawn upon and extended to support service design. However, one topic that is one of the more difficult to define is understanding of the variation among service cultures for the international marketplace.

**International Service Cultures**

Services are no longer regionally bounded or restricted. They are goods of international trade that are developed, planned and designed accordingly [40]. Today, the requirements for service design are changing with the “industrialization” of service and business strategies such as insourcing, outsourcing and offshoring on the one hand often competing with personalization, customization, quality and a total customer orientation on the other [1]. Taking different cultural conditions into account is an enormous challenge within such a dynamic environment. So far there is little research and knowledge of the similarities and differences among service cultures in an international context. Knowledge gained through the experiences of organizational divisions, teams or individuals frequently remains untapped by the corporation as a whole. Up to now, systematic research only exists to a very limited degree and is usually not known or available to the decision-makers.

The research project “International Service Cultures” addresses these gaps and makes a contribution to culture specific configuration and adaptation of service systems. The outcomes of the research and increased knowledge support companies making hard decisions about service design and delivery that will ultimately influence service success. The research has two threads. One thread explores general cultural distinctions in the international context. Cultural and social conditions, cultural expectations and specific service context expectations are examined across a variety of venues. The other thread seeks to document the untapped experience of the investigating venture partners and focuses on their branch specific questions. Together these threads build on experience while at the same time define new ground for designing adaptable, platform-based services.

**Concluding remarks**

Service design is an emerging discipline. To date, service design pioneers have borrowed heavily from interaction design. This was a logical starting point, since interaction design has an established set of tools, methods and growing body of literature. Many interaction design practices such as using ethnographic research methods, or creating personas to bring a person’s goals and needs to life, have, over time, become necessary components in any service design process, but there are many challenges that still must be addressed.
An obvious challenge lies in communicating and specifying services in the complex choreography of service systems. Understanding the dynamics of scaling systems from small demonstrations into full-scale implementations is another. The list goes on. To address these and other research challenges service design will surely draw from fields as diverse as service marketing, psychology, human factors, environmental architecture, and systems engineering. No matter what, the growth of this discipline will surely be an exciting journey.

References
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Biographies

Shelley Evenson. Shelley Evenson is an associate professor and director of graduate studies at Carnegie Mellon University’s School of Design. Shelley has worked for more than 25 years in multidisciplinary consulting practices. She teaches in the area of interaction design, but more recently has focused on developing an approach to designing for service. Prior to joining the faculty at Carnegie Mellon University, Shelley was cofounder of seeSpace an experience strategy firm, and Chief Experience Strategist for Scient. She is a frequent speaker at design conferences and conducts design strategy workshops with large and small corporations. Shelley has worked with clients such as Apple Computer, Bank of Montreal, CIBC, Kodak, Motorola, Texas Instruments, Williamsburg Institute, and Xerox on a wide variety of design and development projects. Her current interests include design languages and strategy, experiences that skill, organizational interfaces, design for service and what lies beyond user-centered design.

Stefan Holmlid. Stefan Holmlid is assistant professor in Interaction and Service Design at the Department of Computer and Information Science. He heads the Interaction and Service Design research group of the Human-Centered Systems division. He is also a member of the Santa Anna Research Faculty of The Swedish Institute of Computer Science, where he initiated and manages a design studio as a means for collaboration between Linköping university and organizations that is developing strategically through the use of design. He pioneered the development of interaction design education in Sweden in the 90's. Currently he is involved in a set of research projects mainly focused on developing the understanding of the design object of service design, defining theories of design for service and interaction design, as well as developing and understanding service design as a praxis for acquirers of system development.

Cheryl Kieliszewski. Cheryl Kieliszewski has been with IBM since November 2000, having most recently joined Services Research at the IBM Almaden Research Center in 2006, previously having worked in the IBM Systems and Technology Group. She is currently a Research Staff Member with a focus in understanding the impact of work practices on technological and organizational design to inform decision-making for human-system relationship definition within service systems. Prior to IBM, Dr. Kieliszewski was responsible for the technical research management of a multi-year FWHA project at the Virginia Tech Transportation Institute investigating driver error, which also contributed to her Ph.D. research. Cheryl has over 10 years of research and applied human factors engineering experience investigating human behavior,
investigating the implication of human behaviors and expectations on technology design and implementation, and designing technology in support of human behavior and expectations. She received her Ph.D. from Virginia Tech in Industrial and Systems Engineering with an emphasis in Human Factors Engineering.

**Birgit Mager.** After her studies of psychology Professor Birgit Mager has worked as an in-house consultant with companies like Hewlett Packard, specializing on the development and improvement of services: its strategies, its organization, interaction. Since 1995 she holds the first European professorship on "Service Design" at the University of Applied Sciences Cologne, Germany. Her numerous lectures, her publications and her projects have strongly supported the implementation of a new understanding of the economical, ecological and social function of design and the recognition of the immaterial aspects of design. Birgit Mager works as a consultant for companies like Siemens, Hewlett Packard, and Lufthansa. She taught Service Design as a guest lecturer in Switzerland, Austria, China, Japan and USA. For the German Ministry of Science Research she conducted different research projects on the topic of design and services. She is Co-Funder of the International Service Design Network and founder and manager of sedes|research, the Center for Service Design Research at Köln International School of Design.

**Figures**

Figure 1. The service triangle as illustrated and defined by Jean Gadrey [28, p. 42].