

9 July 2011

# A Proposed Conceptual Framework For Identifying The Logic Of Digital Services

Soumitra Chowdhury

*Halmstad University*, [soumitra.chowdhury@hh.se](mailto:soumitra.chowdhury@hh.se)

Maria Akesson

*Halmstad University*, [Maria.Akesson@hh.se](mailto:Maria.Akesson@hh.se)

ISBN: [978-1-86435-644-1]; Full paper

---

## Recommended Citation

Chowdhury, Soumitra and Akesson, Maria, "A Proposed Conceptual Framework For Identifying The Logic Of Digital Services" (2011). *PACIS 2011 Proceedings*. Paper 47.

<http://aisel.aisnet.org/pacis2011/47>

This material is brought to you by the Pacific Asia Conference on Information Systems (PACIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in PACIS 2011 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact [elibrary@aisnet.org](mailto:elibrary@aisnet.org).

## A PROPOSED CONCEPTUAL FRAMEWORK FOR IDENTIFYING THE LOGIC OF DIGITAL SERVICES

Soumitra Chowdhury, School of Information Science, Computer & Electrical Engineering,  
Halmstad University, Sweden, soumitra.chowdhury@hh.se

Maria Åkesson, School of Information Science, Computer & Electrical Engineering,  
Halmstad University, Sweden, maria.akesson@hh.se

### Abstract

*In this paper, we propose a conceptual framework for identifying the logic of digital services. Digital services are those services that we acquire after the digitalization of previously non-digital products or services. The objective of the framework is to apply it in identifying the logic of digital services which are the results of digital innovation in the context of remote diagnostic services in the vehicle industry. While building the framework, looking at the transformation of the non-digital to digital service and the involvement of physical products, i.e., digital devices in the transformation, it was found essential to identify the logic of the digital services on the basis of service logic and goods logic. For that purpose, we have reviewed the literature on service logic and goods logic as those logics discuss differently about the determination and meaning of value, role of customer, role of physical products, primary unit of exchange and some other aspects which are important to know in case of transforming a non-digital service to digital service. These logics and the concept of digital innovation are utilized in building the framework for identifying the logic of digital services.*

*Keywords: Service Logic, Goods Logic, Digital Services, Digital Innovation, Digital Service logic.*

## 1 Introduction

There are numerous examples where introduction of IT enabled innovative services transformed various businesses (Brynjolfsson and Hitt, 2000; Sawyer and Yi, 2008; Yoo et al., 2010a). However, such transformation is not simple and requires fundamental changes (Andersen and Aanestad, 2008). For example, there are cases in vehicle industry where famous car manufacturers such as GM, Fiat, Renault, Mercedes and BMW started innovative projects by introducing digital services in the cars but very few of them got success with the introduction of these digital services (Lenfle and Midler, 2003). The reason behind this difficulty relates to the challenge of defining and assigning value to digital services (Lenfle and Midler, 2003). An innovative digital service may offer variety of solutions and it can become difficult for the service designer to choose which one will be the principle solution (Lenfle and Midler, 2003). In addition, there are difficulties in anticipating all possible ways a digital service will be used such as the case with Google Maps (Yoo et al. 2010a).

Defining digital services is different from the conventional logic of services from marketing literature. In general, services are assigned the following characteristics: intangibility, heterogeneity, inseparability and perishability (Zeithaml et al., 1985). Intangibility refers to the fact that services cannot be seen, felt, tasted or touched. Services have variable quality which is hard to control which is known as heterogeneity. Inseparability means services are produced and consumed at the same time, and finally, perishability means services cannot be stored (Zeithaml et al., 1985). These characteristics distinguish service from a physical product or goods. But when thinking about digital services, their service characteristics do not fully go with the four characteristics that are mentioned above. For example, when music comes in digital format such as mp3, related services are not perishable but rather enabled by the fact that it is storable in a digital format (Yoo, 2010). Other forms of digital products or services have some characteristics that differ from the general characteristics of a service or a product.

Digital services and technology are related in a four layered architecture according to Yoo et al. (2010a). These four layers are: devices, networks, services and contents. The device layer deals with hardware and operating systems, network layer manages logical transmission and physical transport, service layer provides application functionality that directly serves users during storage, manipulation, creation and consumption of contents and finally the content layer contains data. In case of a purely mechanical product (for example an automotive), this kind of architecture did not exist but through digitalization, these four layers can be de-coupled or loosely coupled (Yoo et al., 2010b). This architecture leads to boundary-spanning notions of the relation between services and goods where goods are seen as service-delivery mechanisms and the customer and supplier co-create value (Vargo and Lusch, 2008). Drawing on this, we argue that digitalization of a purely mechanical product will give it a different logic other than service logic or goods logic.

Recently, IS research is taking an interest in what a 'digital technology implanted service' really means in relation to traditional notions about service innovation (see e.g. Barrett et al., 2010; Yoo et al. 2010a). As a response, the aim of this paper is to propose a framework in order to address the research question: *what is the logic of digital services in relation to traditional notions of service logic and goods logic?* This framework will be applied in a research project with a vehicle company to explore new opportunities with digital services enabled by remote diagnostic systems embedded in vehicles.

Remote diagnostic service is an example of digitalization of a physical entity (a vehicle). Digital technology is embedded in vehicles that enable remote detection and diagnosis of machinery faults of the vehicles while on the road (Kuscel, 2009). This means that there will be embedded computer systems with the vehicles that will transfer signals to the server and through the analysis of the signals existing fault can be detected and diagnosed remotely. The hope is that this will help the vehicle manufacturer to provide state-of-the-art vehicle maintenance services to their customers and that it in turn will reduce the current cost of maintenance services. The current maintenance service offers preventive maintenance services where the vehicles are brought to the service centre on a regular basis irrespective of the occurrence of any problem.

The new possibility offers new opportunities for maintenance services to their customers. However, the vehicle manufacturer is not really sure about the logic of these new digital services, i.e., role of customers, determination and meaning of value, role of physical product (in this case the digital device) and some other aspects. It is against this background the identification of the logic of digital services rests. The aim of this paper is to propose a conceptual framework to identify the logic of the digital services that can be applied in future empirical studies.

This paper proceeds as follows, first based on a literature review the conventional notions of service logic and goods logic will be described. Thereafter, an overview on literature describing the characteristics of digital services is presented. Later the concept of digital innovation is explained. That is followed by a section presenting the proposed framework and the paper is concluded by a discussion of the framework in relation to the empirical of the future research context, i.e., digital services enabled by remote diagnostic technology.

## 2 Literature Review

Fundamentally, there are two types of logics found in service management and traditional marketing literature: service logic and goods logic. The notion of service logic opposes the goods logic in several ways. Goods logic is a traditional school of thought in marketing management. Smith (1776, cited in Vargo and Lusch, 2006) laid the foundation of this logic which is based on tangible outputs that means physical products, embedded value and transactions. Later Marshall (1890), Shaw (1912), Weld (1917), Drucker (1968), Kotler (1967) and many other scholars contributed to this school of thought.

Researchers like Grönroos, Gummesson, Parasuraman, Zeithaml and Berry, Normann, Lovelock discussed the concept of service and service management (see Grönroos 1978, 1984, 1996, 2000; Gummesson 1979; Normann, 1983; Parasuraman et al. 1985; Lovelock, 1984). Vargo and Lusch (2004a) present a service-dominant logic by comparing service-centered logic with goods-centered logic. After the differences shown between goods-centered logic and service-centered logic by Vargo and Lusch (2004a), many other researchers have contributed to that school of thought in different ways.

Service logic describes exchange of knowledge and skills, value co-creation, value-in-use, intangibility, heterogeneity, inseparability and perishability. On the other hand, goods logic describes exchange of physical products, embedded value, customer only as a recipient of goods, tangible output, standardization, separate production and consumption, storage of products.

The digital services that we are discussing here are rendered via digital devices, i.e., physical products. So, in the process of identifying the logic of digital services, it is relevant to review the literatures of service logic and goods logic as it will provide the frame to understand how for example value can be determined for digital services, what the customers' role might be in the creation of digital services, and what might be the role of physical digital products in relation to services (Barrett et al., 2010). It is also important to know the general service characteristics such as intangibility, heterogeneity, inseparability and perishability as looking at the example of digital music service such as iTunes, where, for example, the characteristics of perishability do not fully match (Yoo et al. 2010a).

### 2.1 Service Logic and Goods Logic

In case of *primary unit of exchange*, service logic explains that people exchange to acquire the benefits of specialized knowledge and skills (Vargo and Lusch, 2004a). The first fundamental premise that Vargo and Lusch (2004a) describe to present the emerging service-dominant logic is "Application of specialized skills and knowledge is the fundamental unit of exchange" (p. 6). Ballantyne and Varey (2006) disagree about the phrase 'unit of exchange' and propose the phrase 'enabler of exchange' as they mean the phenomena under reference is a process, not an object and so cannot be a purely fundamental unit. Later Vargo and Lusch (2008) modify the phrase as 'basis of exchange'. As Vargo and Lusch (2004a) define application of skills and knowledge for the benefit of third party as service, in their later work Vargo and Lusch (2008) simplify the first fundamental premise in stating that

service is the fundamental basis of exchange. In contrast, in goods logic, the *primary unit of exchange* is physical product. As Converse (1921, cited in Fisk et al, 1993) explain, the main function of 'business' is to market goods. Services such as insurance, transportation are only aids to the production and marketing of goods.

As far as *role of customer* is concerned, according to Vargo and Lusch's (2004a) service logic, service is *co-produced* with the customer and the customer's role is not merely being the recipient of goods as in goods logic. As the term 'production' refers to making units of outputs what service logic is not about, rather it is about value *co-creation* which means that the customer is co-creator of value, so the term co-producer is replaced with co-creator in Vargo and Lusch (2008) . It implies that value creation is interactional (Vargo and Lusch, 2008).

Grönroos (2008) also explores the concept of *value creation*. By applying service logic, the firm creates opportunities to develop interactions with its customers during their value-generating processes and directly engages itself in a value fulfillment for the customers and thus becomes a co-creator of value (Grönroos, 2008). In his previous work Grönroos (2006) states that suppliers only create the resources or means required to make it possible for customers to create value for themselves. When customers and suppliers interact they get involved in value co-creation (Grönroos, 2006). In other much earlier work Grönroos (1994) focuses on customer relationship in service marketing where personal contacts with customers, customer perceived quality, customer satisfaction monitoring are given extra importance.

Cova and Salle (2008) highlight the limits to current offering strategies in terms of co-creation and involving customer network actors. They suggest an approach to co-create value in customer networks based on a switch from customer value proposition to customer network value proposition. Ballantyne and Varey (2006) argue that the application of knowledge can be explicit or tacit, co-produced or co-created. Töhönen et al. (2010) show empirical examples of value creation. Edvardsson et al (2005, p. 118) also state that co-creation of value with customers is key and the interactive, processual, experiential and relational nature from the basis for characterizing service.

On the contrary, in goods logic it is assumed that customer is only the recipient of goods (Weld, 1917). Weld (1917, p. 314) emphasizes the delivery of goods by pointing out, "The carriage of goods from store to consumer's has to be performed, and it is simply a question whether the consumer is willing to perform this function, or pay to have performed for him". Nothing is discussed about customer's role as a co-producer or co-creator of the goods.

In case of *value determination*, Vargo and Lusch (2004a) argue that value is perceived and determined by the consumer on the basis of value-in-use. Value results from the beneficial application of skills and knowledge. Firms can only make value proposition. Grönroos (2008) also supports this statement by describing that the firm cannot create value for customers. Goods and services are consumed in the customers' self service processes. These self-service value generating processes create value for themselves. The firm's role is to serve as value facilitator (Grönroos, 2008). On the other hand, it is explained in goods logic that the producer determines the value of a product as the value is added with the product (Kotler, 1967; Drucker, 1968; Smith and Skinner, 1999; Marshall, 1890; Shaw, 1912). Shaw (1912, p. 735) clearly mentions, "Consumers satisfaction depends on the quality of the goods". On the other hand,

Concerning *role of goods*, Vargo and Lusch (2004a) argue in their service-dominant logic that goods are not the common denominator of exchange, i.e., they are not the end products as mentioned in goods logic (Weld, 1917). Rather it is the application of specialized skill that is the common denominator of exchange in the form of embedded knowledge. Goods are the intermediate products that are used by the customers as appliances in the value creation processes (Vargo and Lusch, 2004a). However, Grönroos (2006) argues against this view by stating that goods alone do not transmit services. Goods are seen as one type of resource alongside others, such as people, systems, infrastructures and information.

As far as *tangibility/intangibility of output* is concerned, in general, services are characterized to be intangible (Zeithaml et al., 1985). Intangibility refers to fact that services cannot be seen, felt, tasted or touched. However, Vargo and Lusch (2004b) argue against the intangibility characteristic of service.

They explain that services often have tangible results. For example, through the healthcare service in a hospital, a patient who is recovering from illness can really feel the service outcome. Goods logic discuss that tangible products are the fundamental components of economic exchange (Smith and Skinner, 1999).

In service logic services are referred as *heterogeneous* (Zeithaml et al., 1985). Heterogeneity refers to the fact that performances of services have high variability (Zeithaml et al., 1985). This means that the quality and nature of a service can vary from producer to producer, customer to customer and from day to day. For example, if we think about a restaurant meal as a service, the same meal in the same restaurant can have different quality on different days. However, Vargo and Lusch (2004b) differ in their view by stating that many services are standardized. Franchised restaurants such as McDonald's serve standardized meal services all over the world. In goods logic, goods are viewed as having *standardized/homogeneous* outputs where every physical product delivers the same performance (Smith and Skinner, 1999; Marshall, 1890; Shaw, 1912).

Services are *inseparable*, i.e., services are typically produced and consumed simultaneously (Kotler and Keller, 2006). Since the customer must be present during the production of many services (e.g. airplane trips), inseparability forces the customer to have close contact with the production process (Zeithaml et al., 1985). Grönroos (2006) also agrees that services are produced and consumed simultaneously. Vargo and Lusch (2004b) argue that this is not always the case by mentioning that entertainment and information services are partially produced separate from the consumers. Goods logic states that goods are produced and consumed at separate places (Kotler, 1967; Drucker, 1968).

Services are *perishable*. Services cannot be stored or inventoried to meet future demand (Zeithaml et al., 1985). Due to the fact that services are performances that cannot be stored, it is often difficult to synchronize supply and demand of services (Zeithaml et al., 1985). For example, during a trip an airplane sit that is not purchased will remain unsold (Zeithaml et al., 1985). However, as pointed out in Vargo and Lusch (2004b), services can be stored in systems, machines, knowledge and people. According to goods logic, goods are stored or inventoried so that it can be used when it is demanded (Smith, 1999; Marshall, 1890; Shaw, 1912).

In the following tables, summary of literature review about the traditional notion of service and goods logics is presented.

<b><i>Service Logic</i></b>	<b><i>References</i></b>
Exchange of knowledge & skill	Vargo and Lusch (2004a; 2008); Ballantyne and Varey (2006)
Value co-creation with the customers	Vargo and Lusch (2004a; 2006); Grönroos (2006); Cova and Salle (2008); Ballantyne and Varey (2006); Edvardsson et al. (2005); Töhönen et al. (2010)
Value-in-use	Vargo and Lusch (2004a; 2006); Grönroos (2008)
Goods are transmitters of service	Vargo and Lusch (2004a; 2006); Grönroos (2006)
Intangibility	Zeithaml et al. (1985)
Heterogeneity	Zeithaml et al. (1985)
Inseparability	Kotler and Keller (2006); Grönroos (2006)
Perishability	Zeithaml et al. (1985)

*Table 1. Summary of literature review about traditional notion of service logic*

<i>Goods Logic</i>	<i>References</i>
Exchange of goods	Converse (1921, cited in Fisk et al., 1993); Smith and Skinner (1999)
Customer is only the recipient of goods	Weld (1917)
Embedded value	Kotler (1967); Drucker (1968); Smith and Skinner (1999), Marshall (1890); Shaw (1912)
Goods are the end products	(Weld, 1917)
Tangible outputs	Smith and Skinner (1999)
Uniformity/Standardization	Smith and Skinner (1999); Marshall (1890); Shaw (1912)
Separability	Kotler (1967); Drucker (1968)
Imperishability	Smith and Skinner (1999); Marshall (1890); Shaw (1912)

*Table 2. Summary of literature review about traditional notion of goods logic*

Drawing on the service management and marketing literature, there are, as shown in Table 1 and Table 2, substantial differences between goods and service logic. Moreover, these two logics do not elaborate anything regarding the logic of either digital goods or digital service. Our focus of discussion is not about the e-services that are provided via website. Rather we focus on digital services that must be provided with the help of a physical product (digital device) that will be embedded with another physical object (e.g., a vehicle). So, identification of the logic of those digital services requires the study of both goods logic and service logic. Recent interests in IS community indicate that parts of both logics may apply to digital services (Barrett et al., 2010; Fielt et al., 2010).

## **2.2 Digital Services**

Driven by advanced development of digital technology, digital services are emerging in many new businesses. Digital services differ from conventional services in several ways. Williams et al. (2008) show some differences between digital and non-digital services where they argue that the idea of ownership of digital services is more subtle than non-digital services. Non-digital services are often based on a personal relationship with the customers while for digital services, the service provider might never know the service receiver and the emotional, aspirational, cultural, and social needs are recognized as more important than functional needs. The differences between digital and non-digital services are summarized as: in digital service, at least a portion of the interaction will be digital, digital and non-digital services have a different sense of tangibility and intangibility, often the digital service is a coordination or arrangement of something physical and the idea of ownership is more subtle (Williams et al., 2008).

Although the work of Williams et al. (2008) to find out the difference between digital and non-digital services is very interesting, their focus is on the digital services that are provided by the website such as amazon.com, myspace.com, itunes.com etc. Whereas the digital services that are the focus of this paper are those services that can be embedded with the physical object. So, all the differences that are mentioned in their work do not consider the embedded systems. Moreover, their work does not clarify the issues like value co-creation, value-in-use, knowledge exchange, heterogeneity, inseparability etc.

As mentioned little earlier, digital services are in some cases connected to embedded systems such as in the case with remote diagnostics systems for vehicles. Embedded systems are placed into other object and enable a type of ubiquitous computing (Lyytinen et al., 2004). Ubiquitous computing is partly driven by digital convergence. Digital convergence can be described as uniting the functions of computers with other electronic and telecom equipments (Yoffie, 1997). Providing a particular digital

service might require this digital convergence. Tilson et al (2010) describe that as a result of digitalization, a rapid divergence is emerging that shows how service creation, distribution and use occur. There is tension between digital convergence and divergence which is driven by increasingly ubiquitous and capable digital infrastructures that affects all the phenomena studied by the IS field (Tilson et al, 2010).

In recent work, Yoo (2010) differentiates digital artifacts from their non-digital counterparts with the following seven material properties: programmability, addressability, communicability, memorability, senseability, traceability, associability. Yoo et al. (2010b) define programmability as the ability of a digital artifact to accept new sets of instructions and to perform additional and extensive functions beyond their original purpose. Addressability means that the programmable chip makes the digitalized artifact uniquely identifiable within a particular circumstance. Sensibility refers to that capacity of the digital artifact with which it senses and responds to changes in its environments. The ability of a digital artifact to send and receive digitized messages is referred to communicability and the capability to store information that it generates senses and communicates is called memorability. Traceability means the capability of a digitalized artifact to identify, store and relate encounters with events and entities in consecutive time. Yoo (2010) also points out that usually the non-digital products and services have very contrasting life-cycles and customer expectations in comparison with the digital products and services.

Given this literature overview of digital services it becomes clear that digital services are not similar to other services and thus they might not totally follow the service logic. As there is physical product (digital device) involved in providing the digital services, it might follow some of the aspects of goods logic. So, digital service logic might relate to both service logic and goods logic and it might also have new logic.

### **2.3 Digital Innovation**

As we are discussing here the digital innovation of previously non-digital services, we need to discuss the issue of digital innovation. Yoo et al. (2010a) defines digital innovation as the carrying out of new combinations of digital and physical components to produce novel products. A necessary combination of digital innovation is that the new combination depends on digitization, i. e., the encoding of analogue information into digital format (Yoo et al., 2010a). Moreover, digitization causes a physical product to become programmable, addressable, communicable, memorable, sensible, traceable and associable (Yoo, 2010). The digitalization of non-digital products leads to an emergence of a generic model of digital technology architecture with four layers as shown in the Figure 1 below: devices, networks, services and contents (Yoo et al., 2010b). The device layer deals with hardware and operating systems, network layer manages logical transmission and physical transport, service layer provides application functionality that directly serves users during storage, manipulation, creation and consumption of contents and finally the content layer contains data (Yoo et al., 2010b). Because of continuous digitalization of earlier non-digital products and services, this four-layered architecture of digital technology has become more expansively applicable for all types of digitalized products (Yoo et al. 2010b). Before digitalization, these four layers were tightly coupled together with a particular product boundary and in case of some purely mechanical products such as an automotive, these layers did not exist (Yoo et al. 2010b). As a consequence of the digitalization, these four layers will be decoupled or loosely coupled to a greater extent (Yoo et al. 2010b).

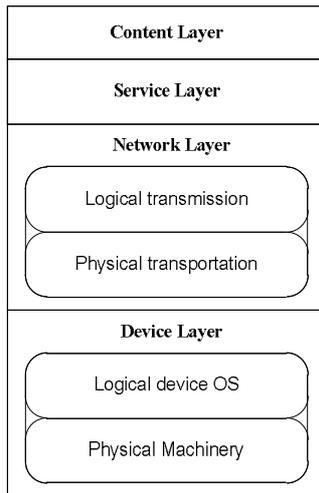


Figure 1. The Layered Architecture of Digital Technology (Yoo et al., 2010a)

Yoo et al. (2010a) show the examples of Apple’s iPad and Amazon’s Kindle where Amazon offers its application for iPads and in this way Amazon becomes the component provider at the service layer of the iPad. In the same way, Apple’s iPhone has been a necessary component for Google’s mobile search platform which implies that Apple is providing component at the service layer of Google. The above examples of digital entities show the fluidity of their characteristics as they can be used as a single purpose product or they can be used for other services.

Drawing on this architecture, Yoo et al. (2010a), present a continuum (Figure 2) where one end of the continuum shows modular architecture with the traditional industrial-age, single purpose products and the other end represents the layered modular architecture with conventional digital products with general computer hardware. Many digital products will fall into somewhere in the middle of the continuum (Yoo et al. 2010a).

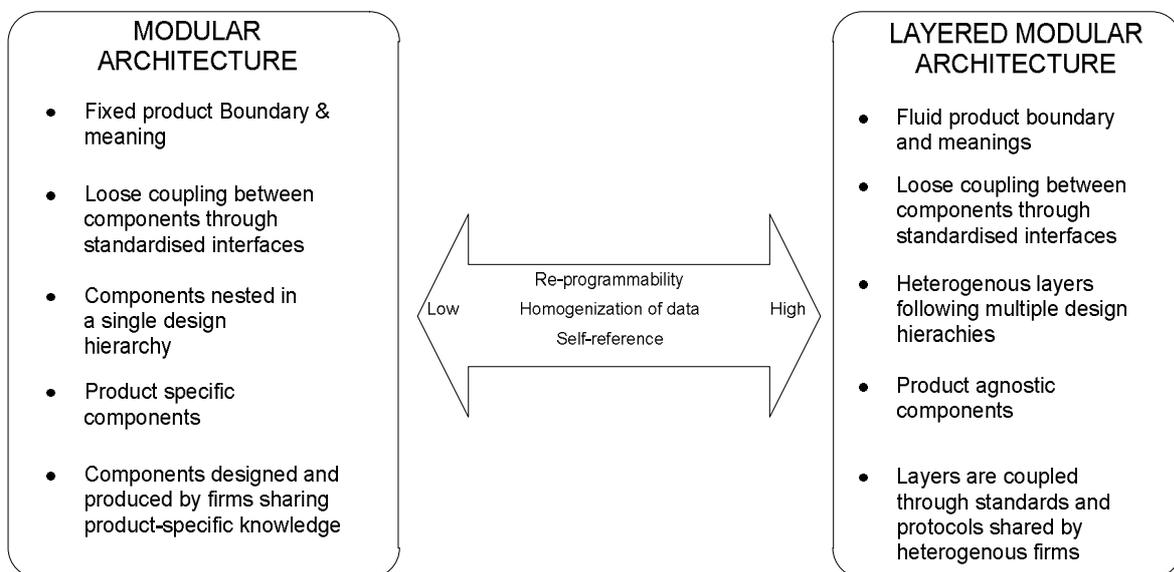


Figure 2. The Layered Modular Architecture Continuum (Yoo et al, 2010a)

In the middle, the architecture continuum shows three unique characteristics of digital innovation: (1) the re-programmability, (2) the homogenization of data, (3) the self-referential nature of digital technology (Yoo et al. 2010a). The re-programmability allows a digital device to perform a wide array of functions such as, calculating distances, word processing, video editing and web browsing.

Homogenization of data refers to the fact that any digital contents such as audio, video, text and image can be stored, transmitted, processed and displayed using the same digital devices and networks. Self-reference means that digital innovation requires the use of digital technology, e.g., computers. The architecture continuum shows that the presence of these three characteristics is low in case of modular architecture and high in case of layered modular architecture (Yoo et al. 2010a). This means that these three characteristics drive the digital innovation.

Although in both the architectures there exists loose coupling between components through standardized interfaces, from Figure 2, we can see substantial differences. Modular architecture has fixed product boundary & meaning and product specific components which mean that the use of the product is very much fixed and single purpose. On the other hand, layered modular architecture has fluid product boundary and meanings and also product agnostic components. This means that as a result of digital innovation of a previously non-digital product or service, the resultant digital product/service can be used in different ways. Yoo et al. (2010a) discuss Google Maps as a prime example of digital innovation which can be used just as standalone product and it can also be used in different ways with the help of heterogeneous devices like cars, digital camera, mobile phones etc. iPhone is another example of digital innovation where it is not just a phone rather it has lot of other meanings.

### **3 Proposed Conceptual Framework for Identifying the Logic of Digital Services**

Drawing on the literature study on traditional notions of goods and service logic from marketing literature and the literature on digital services and digital innovation in IS, we propose a framework for identifying the logic of digital services. This framework is inspired by the layered modular architecture continuum (Figure 2) described by Yoo et al. (2010a) and the overview from the goods logic and service logic (Table 1 and 2).

In the case of the type of digital services that we are focusing in future work, the remote diagnostic services for the vehicles, the logic is unknown. We therefore propose a framework for identifying the logic of digital services in relation to traditional notions of service and goods logic. In this framework digital services are regarded as being based upon the layered modular architecture continuum. Moreover, digital services are regarded as having characteristics from both service logic and goods logic. The conceptual framework is illustrated in Figure 3.

The framework shows that the aspects from both service logic and goods logic are helpful to form digital service logic as illustrated by the arrows in Figure 3. Given the influence from digital innovation characteristics (re-programmability, homogenization of data and self-reference), presumably the logic of digital service will move along the continuum of goods logic and service logic. It implies that at certain period of time, less utilization of digital innovation characteristics will make the digital service logic inclined towards the goods logic whereas more integration of digital innovation characteristics over a certain period of time will move it more towards the service logic. The influence is shown by the block arrow in the Figure 3. The framework also shows that some aspects of goods logic are more closely related to some of the aspects of modular architecture and some aspects of service logic are more closely related to some aspects of layered modular architecture as shown by the two-directional arrows in the Figure 3. Other aspects of goods logic and service logic which are at this moment do not seem to be related to the aspects of modular architecture or layered modular architecture, those will also be helpful to form the digital service logic with the influence of digital innovation characteristics.

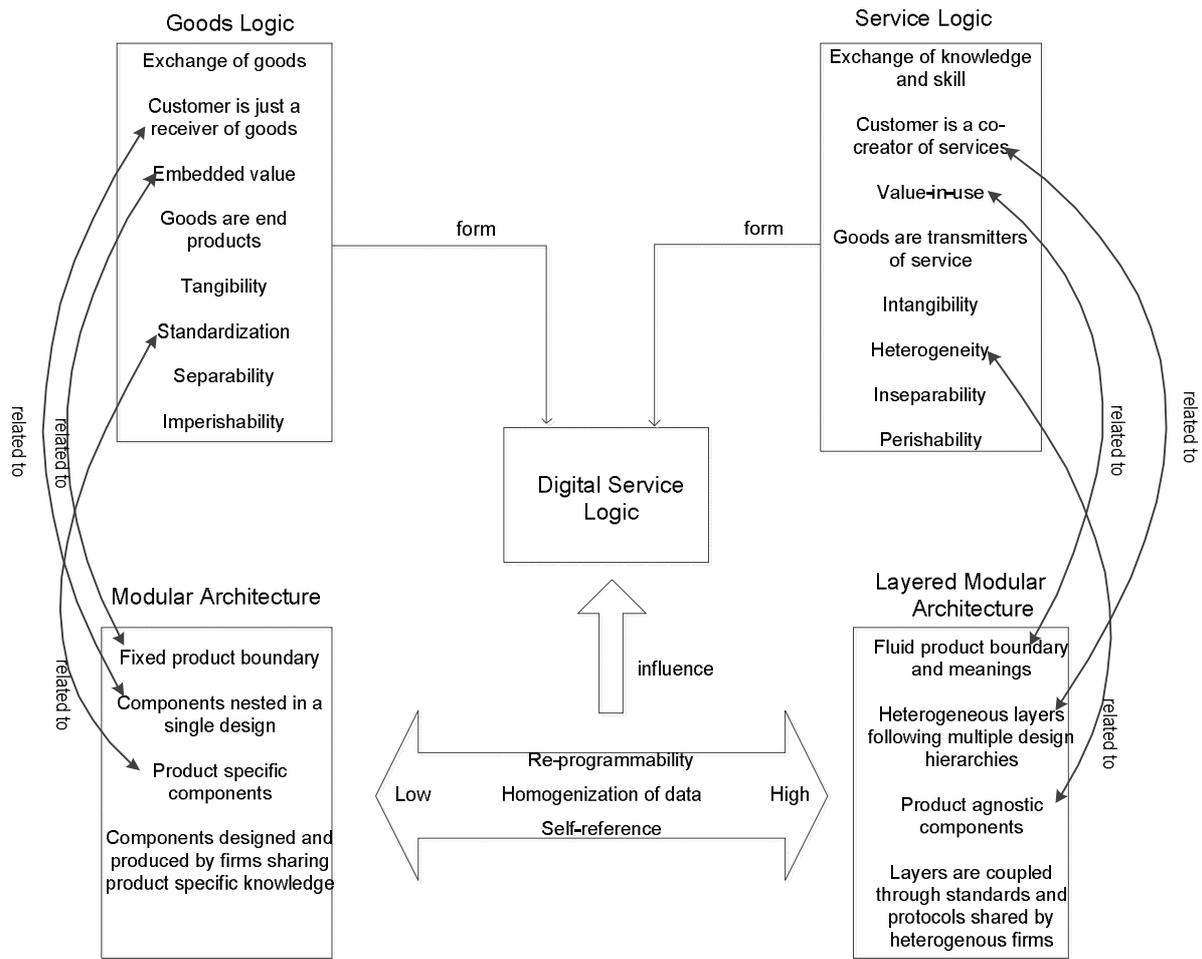


Figure 3. Framework for identifying the logic of Digital Services in relation to traditional notions of service logic and goods logic

In Figure 3, the digital service logic is regarded as based upon the architecture of digital innovation. As Yoo et al. (2010a) point out that many digital products will fall into somewhere in the middle of the layered modular architecture continuum, in this framework we are proposing that the digital service logic will fall into the somewhere in a continuum between service logic and goods logic as in the course of time, the digital service logic will be influenced by the three characteristics (re-programmability, homogenization of data, self-reference) of digital innovation. A digital service (e.g., iTunes) is neither a conventional physical product nor just a digital product with general computer hardware. Digital services embedded with a physical product will thus have different logic. If two services are obtained through the enabling of the remote diagnostic technology in vehicles, one service might have more of goods logic and less of service logic than another service based on its design. The digital service logic might also entail new emergent characteristics. The argument behind using the layered modular continuum is, in the course of time, the digital service logic will be influenced by the three characteristics (re-programmability, homogenization of data, self-reference) of digital innovation. For example, more integration of re-programmability characteristic in the services enabled by digital technology might take the digital service logic more towards service logic.

Modular architecture describes fixed product boundary and meaning that means that the product will have single purpose use as the way it is manufactured by the producer (Yoo et al. 2010a). It actually supports the aspect of embedded value of goods logic where the producer determines the value of a product by embedding value in the products without depending on the aspect of value-in-use. Whereas

layered modular architecture shows fluid product boundary and meaning where same digital device might be used in different ways by the customers and thus the value will be determined by the customers by the use of it and that supports the aspect of value-in-use discussed in service logic (Vargo and Lusch, 2004a). However, digital devices are complex. They have two things: the physical device and the services that the physical device renders. Due to the complex technology embedded inside the physical device, it might not be possible to say that value will be totally determined through value-in-use as the producer of the device has to embed the features inside it and the customers have to depend on the features that are provided. Neither it can be said that value is totally embedded in the product as the producer cannot fully anticipate all possible ways the digital device can be used by different users (Yoo et al., 2010a). For example, in spite of having many features, many users use iPhones mostly for making phone calls. If a digital device is reprogrammable, i.e., if it provides wide array of functions, those functions might not be totally under control of the users due to the complexity of the functions. Remote diagnostic services that we are focusing here will have various functions. But due to technological complexity, it might not be easy for the customers to know all technological aspects of the services and thus making the value determination (embedded value or value-in-use) process difficult. So, the value determination aspect of digital service logic is not so clear and the framework will be helpful to understand that aspect. It might be embedded value or value-in-use, but it will be interesting to investigate. It might give a totally new idea through the empirical work.

Layered modular architecture also supports heterogeneous design hierarchies which allow giving new meanings to a digital device (Yoo et al. 2010a) that we can see in case of an iPhone where the users can add their favorite applications to their iPhones thus giving the customers a chance to use their preferred applications in their iPhones. This particular aspect is actually similar to the value co-creation concept of service logic where the producer of service involves customer in the service creation process and thus it becomes a co-creation process (Vargo and Lusch, 2004a). Modular architecture does not support this feature and thus making customers just a recipient of a product as described in goods based logic (Weld, 1917). But we must not forget the fact that many customers are not that technology savvy who can help the digital services producers in the value co-creation process. Not all iPhone users add additional applications to their iPhones. Perhaps, it is due to less knowledge about the applications or less interest about them. The future digital services, remote diagnostic services that we are talking here might face the similar challenge. Due to the complicated nature of the technology, it looks hard to involve the customers in the technology development process. So, from that point of view co-creation looks difficult. But the customers may be involved in some other ways to get the future vision of this business. Therefore, investigating the aspect of customers' role in digital service logic through the use of the proposed framework will give us new understanding in that regard.

The heterogeneity aspect of service logic describes that the nature of service varies from customer to customer (Zeithaml et al., 1985). This is related to an aspect 'product agnostic components' of layered modular architecture that states about variable uses of a digital artifact (Google Maps) by different users (Yoo et al. 2010a). However, not all digital services have options for variable uses and standardization is very much possible where the service producer can really know how their services are consumed. So, the influence of re-programmability characteristic on different digital services will allow the services to move along the continuum between goods logic and service logic over the course of time. In case of remote diagnostic services the proposed framework will help us to understand whether it will have variable use or standardized use.

Another service logic aspect refers that services are produced and consumed at the same time. If we think about Spotify<sup>1</sup>, the online music service provider, the songs are collected and then the customers can listen to the available songs by paying the charge. The entertainment industry also works in the same way. Many other digital services definitely do not follow this aspect of service logic. It seems like remote diagnostic services might also not follow that aspect. In case of perishability aspect of services where it claims that services cannot be stored, as mentioned before we have the proof against it in case of music industry where they provide music stored in the form of DVDs. The purpose of

---

<sup>1</sup> <http://www.spotify.com>

using service logic/goods logic in the proposed framework is also due to fact that different aspects mentioned in those logics need to be tested in case of the aforementioned remote diagnostic digital services.

As Yoo (2010) points out, usually the non-digital products and services have very contrasting life-cycles and customer expectations in comparison with the digital products and services. So, the way those products and services are designed and implemented require very different knowledge resources. Similarly as a digital service, the remote diagnostic service will also require different knowledge about the matters that are described in service and goods logic such as primary unit of exchange, role of customers, determination and meaning of value, customer expectation etc. for proper implementation of the service.

Yoo et al. (2010a) show that Google Maps consist of maps which come under content layer. It also has options for search, browse, traffic and navigate which come under the service layer of the layered modular architecture. Layered modular architecture opens new meanings such as a digital camera can also be used as a video player, photo editor, internet client (Yoo et al., 2010a). Similarly, the remote diagnostic system that will be placed in the vehicle might render additional services that might create more value to the vehicle users. But how they will create value is right now unknown and it will be interesting to identify.

Digital services are accessible to the mobile users through different channels and those services will be configured dynamically and will be obtained from many sources. New means of creation, configuration and distribution of services will be necessary for dynamic service discovery, assembly and purging (Lyytinen and Yoo, 2002). As a form of digital service, the fault detection and remote diagnostic services also need new means of distribution as it is not clear right now.

#### **4 Concluding Remarks**

The framework proposed in this paper is going to be applied in a case of a new digital service. The role of customers, determination and meaning of value, several customer related aspects of hardware or software for this new digital service will be explored with help of the proposed framework which will be supportive to make a significant contribution in the field of Information Systems as the findings of the study will clarify the logic of the digital services.

However, as the proposed framework is primarily going to be applied to a research project of a vehicle company, the findings might be more suitable for the particular digital service that is going to be implemented for the vehicles. Even if the findings might not be totally applicable for all digital services, it will be helpful to understand the logic of many other digital services as given that they are based on the layered modular architecture continuum of digital innovation.

## References

- Andersen and Aanestad (2008). Possibilities and Challenges of Transition to Ambulant Health Service Delivery with ICT support in Psychiatry. In *Proceedings of the IFIP TC8 International Working Conference on Information Technology in the Service Economy: Challenges and Possibilities in the 21<sup>st</sup> century* (eds. Barrett, M., Davidson, E., Middleton, C. and DeGroos J), pp. 129-142, Toronto, Canada
- Ballantyne, D. and Varey, R.J. (2006). Creating value in marketing interaction: the exchange logic of relating, communicating and knowing, *Marketing Theory*, Vol. 6, No. 3, pp. 335-348.
- Barrett, M., Davidson, E., Prabhu, J., Vargo, S.L. (2010). Service Innovation in the Digital Age. Call for Papers- MIS Quarterly Special Issue on Service Innovation in the Digital Age (Available at: [http://www.misq.org/skin/frontend/default/misq/pdf/CurrentCalls/SI\\_ServiceInnovation.pdf](http://www.misq.org/skin/frontend/default/misq/pdf/CurrentCalls/SI_ServiceInnovation.pdf))
- Brynjolfsson, E. and Hitt, L.M (2000). Beyond Computation: Information Technology, Organizational Transformation and Business Performance, *Journal of Economic Perspectives*, Volume 14, Number 4, Pages 23–48
- Cova, B. and Salle R. (2008). Marketing solutions in accordance with the S-D logic: Co-creating Value with customer network actors, *Industrial Marketing Management*, Vol. 37, No. 3, pp. 270-277
- Drucker, P.F (1968). *The Practice of Management*, New York: Harper and Row.
- Edvardsson, B., Gustafsson, A. and Roos, I. (2005), Service portraits in service research: a critical review, *International Journal of Service Industry Management*, Vol. 16, No. 1, pp. 107-121.
- Fano, A. and Gershman, A. (2002). The future of business services: in the age of ubiquitous computing, *Communications of the ACM*, Vol. 45, No. 15, pp. 83-87
- Fielt, E., Gable, G., Korthaus, A., Conger, S., Böhmman, T. (2010). Service Management and Engineering: Aligning Business and IT services. Call for Papers – The Journal of Strategic Information Systems (Available at: <http://www.elsevier.com/locate/jsis>)
- Fisk, F. P., Stephen, W.B. and Bitner, M.J. (1993). Tracking the Evolution of the Services Marketing Literature, *Journal of Retailing*, Vol. 69 (Spring), pp. 61-103
- Grönroos, C., (1978). A Service-Oriented Approach to Marketing of Services, *European Journal of Marketing*, Vol. 12, No. 8, pp. 588-601.
- Grönroos, C. (1984). A service Quality Model and its Marketing Implications, *European Journal of Marketing*, Vol. 18. No. 4, pp. 36-44
- Grönroos, C. (1994). From Marketing Mix to Relationship Marketing: Towards a Paradigm Shift in Marketing, *Management Decision*, Vol. 32, No. 2, pp. 4-20
- Grönroos, C. (1996). Relationship Marketing Logic, *The Asia-Australia Marketing Journal*, Vol. 4, No. 1, pp. 7-18
- Grönroos, C. (2000). *Service Management and Marketing: A Customer Relationship Approach*. Chichester: Willey.
- Grönroos, C. (2006). Adopting a Service Logic for Marketing, *Marketing Theory*, Vol. 6, No.3, pp. 317-333.
- Grönroos, C. (2008). Service Logic Revisited: who creates value and who cocreates, *European Business Review*, Vol. 20, No. 2, pp. 298-314.
- Gummesson, E. (1979). The Marketing of Professional Services – An Organizational Dilemma, *European Journal of Marketing*, Vol. 13, No. 5, pp. 308-318
- Kotler, P. (1967). *Marketing Management Analysis, Planning and Control*, Eaglewood Cliffs, NJ: Prentice Hall
- Kotler, P. and Keller, K.L. (2006). *Marketing Management*, 12<sup>th</sup> Edition, NJ: Pearson Prentice Hall
- Kuschel, J. (2009). *Vehicle Services*, Ph.D. Thesis, Department of Applied Information Technology, Chalmers University of Technology & University of Gothenburg, Sweden
- Lenfle, S., and Midler, C. (2003). Innovation in automotive telematic services: characteristics of the field and management principles, *International journal of automotive technology and management*, Vol. 3, No. 1, pp. 144-159
- Lovelock, C. H. (1984). *Services Marketing*. Englewood Cliffs, NJ: Prentice Hall.

- Lyytinen, K., Yoo, Y., Varshney, U., Ackerman, M.S., Davis, G., Avital, M., Robey, D., Sawyer, S., Sorensen, C. (2004). Surfing the next wave: Design and implementation challenges of ubiquitous computing environments, *Communications of the Association for Information Systems*, Vol. 13, pp. 697-716
- Lyytinen, K. and Yoo, Y. (2002). Research Commentary: The next wave of nomadic computing, *Information Systems Research*, Vol. 13, No. 4, December 2002, pp. 377–388
- Marshall, A. (1890). *Principles of Economics*, Reprint, London: Macmillan
- Normann, R. (1983). *Service Management*. New York, Wiley.
- Parasuraman, A., Zeithaml, V.A. and Berry, L. L. (1985). A Conceptual Model for Service Quality and Its Implications for Future Research, *Journal of Marketing*, Vol. 49, pp. 41-50.
- Sawyer, S and Yi, F. (2008). The Computerization of service: Evidence of Information and Communication Technologies in Real Estate. In *Proceedings of the IFIP TC8 International Working Conference on Information Technology in the Service Economy: Challenges and Possibilities in the 21<sup>st</sup> century* (eds. Barrett, M., Davidson, E., Middleton, C. and DeGroos J), pp. 198-209, Ontario, Canada
- Shaw, A. (1912). Some Problems in Market Distribution, *Quarterly Journal of Economics*, Vol. 12, pp. 703-765
- Smith, A. and Skinner, A. (1999). *Wealth of Nations*, Penguin Classics, London
- Töihonen, H., Heiskala, M. and Hannula, E. (2010). Making Service Logic Explicit: Findings from Business to Business Case Study. In *Proceedings of International Conference on Service Sciences 2010*, Hangzhou, China
- Vargo, S.L. and Lusch, R.F. (2004a). Evolving to a New Dominant Logic of Marketing, *Journal of Marketing*, Vol. 68, pp. 1-17.
- Vargo, S.L. and Lusch R.F. (2004b). Four service-marketing myths: Remnants of a Goods-based Manufacturing Model, *Journal of Service Research*, Vol. 6, No. 4, pp. 324-335
- Vargo, S.L. and Lusch, R.F. (2006). Service Dominant Logic: What it is, what it is not, what it might be. In Lusch, R.F., and Vargo, S.L. (Eds.), *The Service Dominant Logic of Marketing: Dialog, Debate and Directions*, Armonk, NY: ME Sharpe
- Vargo, S.L. and Lusch R.F. (2008). Service-dominant logic: continuing the evolution, *Journal of Academy of Marketing Science*, Vol. 36, No. 1, pp. 1-10
- Weld, L.D.H. (1917). Marketing Functions and Mercantile Organizations, *American Economic Review*, Vol. 7, pp. 306-318
- Williams, K., Chatterjee, S., Rossi, M. (2008). Design of emerging digital services: a taxonomy, *European Journal of Information Systems*, Vol. 17, pp. 505-517
- Yoffie, D.B., ed. (1997). *Competing in the Age of Digital Convergence*, Harvard Business School Press, Boston.
- Yoo (2010). Computing in everyday life: A Call For Research on Experiential Computing, *MIS Quarterly*, Vol. 34, No. 2, pp. 213-231
- Yoo, Y., Henfridsson, O. and Lyytinen, K. (2010a). Research Commentary - The new organizing logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research*, 21(4), 724-735
- Yoo, Y., Lyytinen, K., Boland, Richard J. and Berente, N. (2010b). The New Wave of Digital Innovation: Opportunities and Challenges: A Report on the Research Workshop 'Digital Challenges in Innovation Research' (June 8, 2010). Available at SSRN: <http://ssrn.com/abstract=1622170>
- Zeithaml, V.A., Parasuraman, A. and Berry, L.L. (1985). Problems and strategies in services marketing, *Journal of Marketing*, Vol. 49, pp. 33-46