Editorial

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Welcome to the special issue of *IJWET* on service science management and engineering (SSME) or service science. As SSME is new to many readers, a brief introduction is given.

In today's economy, more than 80% of the country's gross domestic product (GDP) results from services and more than 80% of the workforce is now employed in services. Despite this, there is very little we know about the design of service systems. In response to this, IBM initiated a corporate-wide programme known as Service Science. Service Science is concerned with the evolution, interaction and reciprocal co-creation of value among service systems. It is an interdisciplinary subject combining organisation and human understanding with business and technology understanding to categorise and explain the different service systems that exist, as well as how service systems interact and evolve to co-create value [Maglio and Spohrer, (2008), p.18].

SSME is an emerging domain that is attracting more and more attention from academics and practitioners in recent years. An important part of the IBM initiative is that it has enabled academics around the world to participate in the development of the subject called service science in the same way as IBM assisted in the development of the academic programme in computer science four decades ago. This initiative has generated a wave of activity within universities, business communities and nations to study this subject and to develop academic programmes. IBM has since been collaborating with more than 400 universities that are offering service science courses and degree programmes in over 55 countries.

The shift to a service economy has created a skills gap in the area of high value services that requires workers who are knowledgeable about information technology, business and human factors. SSME brings together work in computer science, operation research, industrial engineering, business strategy, management sciences, social and cognitive sciences and legal sciences to develop the necessary skills in our service economy (IBM, 2007). IBM has pioneered the research in this area, trying to stimulate research and development among universities. SSME has the aim of producing students with combined business and technology skills for the future workforce.

Sheehan (2006) gives the following reasons for the growth. Firstly, at the macro-economic level, increasing manufacturing productivity and growing competition from developing countries limit employment growth in manufacturing, and motivate efforts to focus on higher value-added activities. Secondly, at the firm level, rising investment in intangibles, growing emphasis on knowledge management, a renewed focus on core competencies and outsourcing play a major role. Thirdly, services previously produced in-house within the manufacturing sector are now obtained via outsourcing. Fourthly, many manufacturing firms also relied heavily on telecommunications, business and computer services to stimulate greater productivity. Fifthly, manufacturing firms also moved to more closely link products to services by providing their clients with integrated product-service packages and integrated solutions. Despite the economic domination of services, there is relatively little focus from companies and government on service research and innovation compared with tangible products and technologies (Bitner and Brown, 2008).

There are many definitions given to services. Services are deeds, processes and performance (Zeithaml et al., 2006). Grönroos (1990) defines a service as an activity or series of activities of more or less intangible nature that normally, but not necessarily, take place in interaction between customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as solutions to customer problems. According to Lovelock and Wirtz (2007), services are economic activities offered by one party to another, most commonly employing time based performances to bring about desired results in recipients themselves or in other assets for which purchasers have responsibility. However, they do not normally take ownership of any of the physical elements involved. Vargo and Lusch (2006) define service as the application of specialised competence (knowledge and skills) through deeds, processes and performances for the benefit of another entity or the entity itself.

Although there are different definitions given to service, we concur with Vargo and Lusch (2006) that service is the application of resources for the benefit of another. Sporher et al. (2008) define services informally as collections of resources that can create value with other service systems through shared information. Service is now seen as the process of doing something for and with another party. Value creation is a collaborative

process and value is always co-created. Sporher et al. (2008) argue that the purpose of economic exchange in service is service provision for (and in conjunction with) another party in order to obtain reciprocal service – that is, service is exchanged for service. Although goods are involved in the process, they are appliances for service provision – they are conveyors of competencies. According to these authors, services provided directly or through a good are the knowledge and skills (competencies) of the providers and beneficiaries that represent the essential source of value creation, not the goods that are sometimes used to convey them. Because of this, Sporher et al. (2008) argue that service involves at least two entities, one applying competence and another integrating the applied competence with other resources and determining benefits (value co-creation). These interacting entities are service systems. Therefore, a service system is defined as a dynamic value co-creation configuration of resources, including people, organisations, shared information (language, laws, measures, methods) and technology, all connected internally to other service systems by value propositions. Service systems overlap significantly with market-facing complex systems and generally involve economic exchange (Wladawsky-Berger, 2006).

The basic unit of analysis in service science is service systems. These service systems can range in size from an individual person to a world-wide exchange system (e.g. the global economy) (Maglio and Spohrer, 2008). Every service system is both a provider and client of service that is connected by value propositions in value chains, value networks or value creating systems (Normann, 2001).

Service systems that have dynamic network structures are conceptualised as open systems (Vargo and Akaka, 2009):

- capable of improving the state of another through sharing or applying its resources

- capable of improving its own state by acquiring external resources (Spohrer et al., 2008).

According to these authors, the normative function of service systems is to connect people, technology and information through value propositions, with the aim of co-creating value for the service systems participating in the exchange of resources within and across systems.

The transfer and sharing of resources within and among service systems is at the heart of service science (Vargo and Akaka, 2009).

Maglio and Spohrer (2008) identified four categories of resources, namely:

1 resources with rights

2 resources as property

3 physical entities

4 socially constructed entities.

They further explained that entities within service systems exchange competences along at least four dimensions:

- information sharing

- work sharing

- risk sharing

- goods sharing.

Maglio and Spohrer (2008) suggested that the key to understanding the exchange of resources within service systems is found in the distribution of competences, such as knowledge and skills, among service systems and understanding the value propositions that connect such systems. Spohrer et al. (2008) argued that the purpose and driver of interaction and exchange in service systems is the co-creation of value. Service systems engage in three main activities in order to create value:

1 proposing value

2 accepting a proposal

3 realising the proposal (Spohrer et al., 2008).

At least two service systems must engage in both applying and integrating resources in order for service to be realised and the co-creation of value to occur.

Foundations for service science

There are two perspectives that can be used to inform service system design. One is grounded in the traditional view of economic exchange and value creation as primarily involving goods (tangible products). Services are conceptualised relative to goods, either as add-ons to (e.g. after-sales service) or a special type (i.e. tangible products). This perspective is generally known as good dominant (GD) logic.

Good dominant logic

In GD logic, economic exchange is seen in terms of the production and distribution of units of output (Vargo and Lusch, 2004). Value is acquired during the design and manufacturing process. Services in GD logic are typically conceptualised as outputs that are characterised as intangible, heterogeneous, inseparable and perishable (Zeithaml et al., 1985).

According to Vargo and Lusch (2004), the good-centred view postulates the following:

1 The purpose of economic activity is to make and distribute things that can be sold.

2 To be sold, these things must be embedded with utility and value during production and distribution processes and must offer to the consumer superior value in relation to a competitor's offerings.

3 The firm should set all decision variables at a level that enables it to maximise the profit from the sale of output.

4 Goods should be standardised and produced away from the market for maximum production control and efficiency.

5 The goods can be inventorised until they are demanded and then delivered to the consumer at a profit.

Services are what goods are not. The outputs are produced away (separate) from the customers. They are standardised and capable of being inventorised until sold.

The new perspective for service is that of service dominant (SD) logic that has revised market logic focused on intangible resources, the co-creation of value and

relationship (Vargo and Lusch, 2004). According to Vargo and Lusch (2004, p.1), marketing is increasingly shifting its dominant logic away from the exchange of tangible goods (manufactured things) towards the exchange of intangibles, specialised skills and knowledge processes (doing things for and with). This approach points toward a more comprehensive and inclusive logic, one that integrates goods with services.

Vargo and Lusch (2004) believe that the service-centred view of marketing implies that marketing is a continuous series of social and economic processes that is largely focused on operant resources with which the firm is constantly striving to make better value propositions than its competitors. This view perceives marketing as a continuous learning process (directed at improving operant resources). Vargo and Lusch (2004) postulate that the service-centred view can be stated as follows:

1   Identify or develop core competences, the fundamental knowledge and skills of an economic entity that represents potential competitive advantage.

2   Identify other entities (potential customers) that could benefit from these competences.

3   Cultivate relationships that involve the customers in developing customised, competitively compelling value propositions to meet specific needs.

4   Gauge marketplace feedback by analysing financial performance from exchange to learn how to improve the firm's offering to customers and improve the firm's performance.

In SD logic, market exchange is the process of parties using their specialised knowledge for each other's benefit – that is, for mutual service provision (Vargo and Akaka, 2009). Vargo and Lusch (2008) have proposed ten foundational premises for SD logic as shown in Table 1.

Table 1   Foundational premises of service-dominant logic

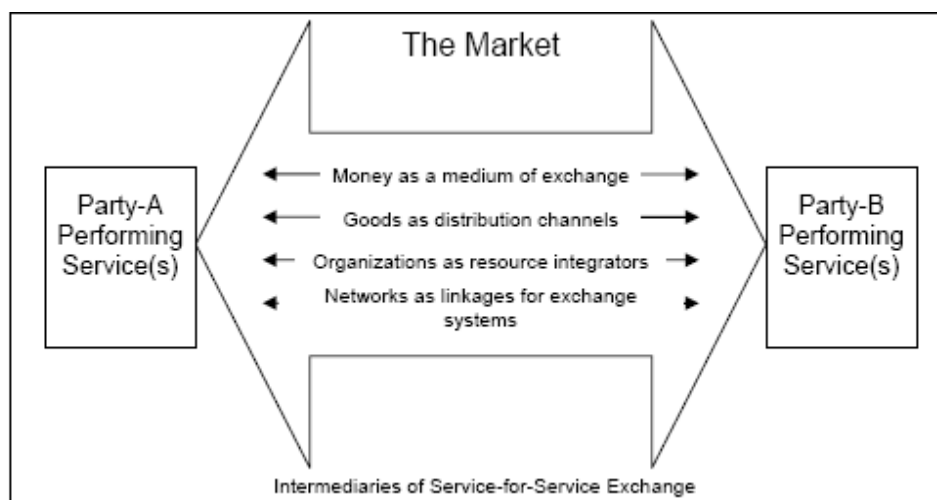| *Premise*		*Explanation/justification*
FP1	Service is the fundamental basis of exchange.	The application of operant resources (knowledge and skills), 'service', is the basis for all exchange. Service is exchanged for service.
FP2	Indirect exchange masks the fundamental basis of exchange.	Goods, money, and institutions mask the service-for-service nature of exchange.
FP3	Goods are distribution mechanisms for service provision.	Goods (both durable and non-durable) derive their value through use – the service they provide.
FP4	Operant resources are the fundamental source of competitive advantage.	The comparative ability to cause desired change drives competition.
FP5	All economies are service economies.	Service (singular) is only now becoming more apparent with increased specialisation and outsourcing.

Source: Adopted from Vargo and Lusch (2008).

Table 1   Foundational premises of service-dominant logic (continued)

Premise		*Explanation/justification*
FP6	The customer is always co-creator of value.	Implies value creation is interactional.
FP7	The enterprise cannot deliver value, but only offer value propositions.	The firm can offer its applied resources and collaboratively (interactively) create value following acceptance, but can not create/deliver value alone.
FP8	A service-centred view is inherently customer oriented and relational.	Service is customer-determined and co-created; thus, it is inherently customer oriented and relational.
FP9	All economic and social actors are resource integrators.	Implies the context of value creation is networks of networks (resource-integrators)
FP10	Value is always uniquely and phenomenological determined by the beneficiary.	Value is idiosyncratic, experiential, contextual, and meaning laden.

Source: Adopted from Vargo and Lusch (2008).

The basic tenet in SD logic is that service (singular, indicating a process versus the plural 'services' indicating intangible unit of output) is the application of competences for the benefit of another. This is the basis for all exchange (FP 1). Service is always exchanged for service; therefore all economies are service economies (FP 5). Although service is the basis for all exchange in SD logic, it also recognises that the direct service for service exchange is often masked by the complexities of the market (FP 2), indicating indirect exchange among service systems. According to Vargo and Akaka (2009), the process of value creation within and between service systems becomes increasingly complex and less apparent as intermediary systems develop, as shown in Figure 1.

Figure 1   Service(s) exchanged for service(s)

Source: Adopted from Vargo and Akaka (2009).

These market-related intermediaries (e.g. goods, money and organisations) maintain important roles in facilitating the process of exchange. They are not the primary purpose or fundamental source of exchange and value creation.

Operant resources are those that act upon other resources to create benefit, such as competences. These are knowledge and skills that are the underlying source of value. On the other hand, operand resources are those resources that must be acted upon to be beneficial (Vargo and Lusch, 2004).

In SD logic, value creating resources are not confined to the firm; customers, suppliers and other stakeholders also constitute operant resources and contribute to value creation. Value is always co-created with the customers and others (FP 6). Firms cannot create and deliver value; they can only propose value (FP 7) and provide service as input to its realisation. Vargo and Akaka (2009) argue that value is phenomenologically and contextually derived (FP 10) by the service beneficiary (i.e. the customer).

This means that value is not created until the beneficiary of the service, often the customer, integrates and applies the resources of the service provider with other resources, in the context of its own, specific, available resources, including those from other service systems. In SD logic language, these service systems are characterised as resource integrators (FP 9). Therefore, the co-creation of value incorporates the integration and application of (integrated) resources from service providers (e.g. the firm and other market-facing, public and private resource integrators), by service beneficiaries (e.g. customers). Because value is always (contextually) beneficiary-specific, it is always determined by the beneficiary (FP10) (Vargo and Akaka, 2009).

Research in service science seeks to find out how to design, build, operate, use, sustain and dispose of service systems for the benefit of multiple stakeholders such as customers, shareholders, employees, partners and society (IBM, 2007). Service science has a front stage and a back stage. The front stage is about providing customer interaction. The back stage is about operating efficiency and beating the competition with better value chain relationships, smarter employees and technology-enabled processes. Research is still too much in its infancy to have a standard methodology for designing service systems based on the SD logic.

In order to be competitive and service our global economy, it is imperative that we focus on growth and innovation through services. There is a need for research and education to support the rapidly growing global service economy. Service innovation is the key to competitiveness and survival in our global economy. In this special issue, we have collected some papers from service research to reflect on the different aspects of SSME.

The first paper is, 'Enhanced service provision through mobile technology utilisation in facility processes' by Tolman, Matinmikko, Möttönen, Siira, Tulla and Vähä. They talk about facility management. According to these authors, facility management (FM) is the integration of processes within an organisation to maintain and develop the agreed services to support and improve the effectiveness of its primary activities. The basic concept of FM is to provide integrated management on a strategic and tactical level to coordinate the provision of the agreed support services. These services include items ranging from real estate and financial management, change and human resource management to building maintenance and domestic services including cleaning and security. Despite the potential benefits of using mobile technologies for facility management, this has not been fully realised. The authors of this paper have conducted

several studies to identify the current benefits and obstacles of mobile technology as perceived by Finnish FM professionals. The main aims of the studies are:

1   to describe the current technological enablers for the utilisation of mobile technology at FM settings

2   to interview the FM professionals on their perceived benefits and obstacles of the utilisation of the currently available technology.

The findings of the empirical part include currently feasible mobile solutions and their perceived limitations. These authors found that the perceived benefits are mostly related to improved resource efficiency and quality control. Better service instruction and guidance, and timely working instructions improve the output. Quality is enhanced with visual aids of cameras and other gadgets integrated to mobile phones. The major hindrance is the isolation of the FM service provider and, in particular, the mobile personnel from the information systems of the companies. This disconnection from the company's main information system has deprived the service providers of real-time assistance possibilities that would be available with real-time connections to enterprise level background knowledge and services. Both e-construction and FM sectors agree that the obstacles to exploitation of mobile technology are related to the lack of modes of operation with the enabling technology rather than to the capacities of the technology itself. The lack of knowledge of mobile solutions, the difficulties of the integration of systems and the lack of routines in procurement and operation are hindrances.

From mobile technology for facility management, we move on to Paper 2 by Uden and Naaranoja on service innovation by SMEs. This paper talks about the importance of service innovation, especially for SMEs, in order to be competitive. Uden and Naaranoja describe a case study on service innovation by an SME in Finland. Central to service innovation is the co-creation of value between the customers and the provider. The authors describe service innovation from the perspective of service science based on the new paradigm of marketing known as service dominant logic. They discuss why it is important to co-create value in order to create value for both parties. The basic building block for co-creation is dialogue, because it encourages knowledge sharing. It is the authors' belief that the emerging discipline of service science can shed light on service innovation by SMEs, based on service dominant logic of value co-creation.

Following Paper 2 on innovation, Paper 3 by Minetaki is 'Analysis of productivity in Japanese information service industries'. According to Minetaki, the aim of his paper is to examine whether the natural selection mechanism (NSM) works in Japanese information service industries. He argues that there are few empirical studies investigating entry and exit in software and information service industries in Japan. The purposes of his studies are:

1   to estimate total factor productivity (TFP) in the information service sector using large-scale firm-level date

2   to investigate entry and exit behaviour to determine whether the information service industries are stagnant

3   to investigate whether NSM works.

From his study, Minetaki found that there are problems in the working of the market mechanism, especially in periods of severe recession. He discovered that, on average, the

productive firms, rather than the un-productive ones, were driven out of the market during severe recessions. This happened in manufacturing and non-manufacturing industries during the banking crisis of 1997. It also occurred in software and other information service industries when the IT bubble burst in 2000. This shows, Minetaki claims, that the natural selection mechanism does not work well in Japanese information service industries.

Paper 4 is by Sawatani and Niwa. Their paper, 'Service systems framework focusing on value creation: case study' is concerned with how best for research organisations to continue IS service business. Sawatani and Niwa studied service projects in which researchers participated as case studies, and developed a conceptual framework of service systems. The conceptual framework was developed based on information processing of service research projects. The framework focuses on the patterns of value co-creation activities in the service systems. Service project types are defined by the service systems framework, such as high intensity x knowledge; high intensity x knowledge embedded service system, and low intensity x knowledge embedded service system. These authors conducted a survey to investigate the outputs created by the researchers working in each pattern of the framework, and studied the linkages between the success of service projects and those outputs. They found that method creation is critical for the success of a service project, beyond technology creation.

From business service, the next paper is about social media services, by Multisilta, entitled 'A service science perspective on the design of social media activities'. In this paper Multisilta describes the design of social media services in terms of service science. This author believes that there is a lack of discussion of social media applications as services. Based on his review of the literature, he used a classification of service and proposed a new type of service, namely a 'shared-with-me' type of service. He also proposed a method for designing these types of services using activity theory. The model he proposed for designing social media service is the shared experience and activity (SEA) framework. It has a strong emphasis on shared felt experience. According to the author, the framework is not a complete design model, but is intended to be used in conjunction with user-centred design and participating design methods.

The final paper is 'Studies on customer service optimisation by using the SCIM – an application of the agent base modelling (ABM) technology to service science' by Kamoshida, Terano, Bin, Elias and Kikuchi. Their paper describes an application methodology of agent base modelling (ABM) technology for service science. A method known as smart customer interaction modelling (SCIM), based on ABM technology has been developed by these authors to optimise a service design for customer interaction. According to these authors, the main aim of SCIM is to maintain the corporate brand loyalty of customers. An actual adaptability of the SCIM for a car sales service is studied. Based on the case studies, these authors confirm that SCIM technology has the capacity to realise a maximum service quality. Some of the key issues found in the case studies are also discussed in the paper.

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