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WMG Service Systems Research Group
Working Paper Series

S-D Logic Research Directions and Opportunities: The Perspective of Systems, Complexity and Engineering

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About WMG Service Systems Group

The Service Systems research group at WMG works in collaboration with large organisations such as GlaxoSmithKline, Rolls-Royce, BAE Systems, IBM, Ministry of Defence as well as with SMEs researching into value constellations, new business models and value-creating service systems of people, product, service and technology.

The group conducts research that is capable of solving real problems in practice (ie. how and what do do), while also understanding theoretical abstractions from research (ie. why) so that the knowledge results in high-level publications necessary for its transfer across sector and industry. This approach ensures that the knowledge we create is relevant, impactful and grounded in research.

In particular, we pursue the knowledge of service systems for value co-creation that is replicable, scalable and transferable so that we can address some of the most difficult challenges faced by businesses, markets and society.

Research Streams

The WMG Service Systems research group conducts research that is capable of solving real problems in practice, and also to create theoretical abstractions from or research that is relevant and applicable across sector and industry, so that the impact of our research is substantial.

The group currently conducts research under six broad themes:

- Contextualisation
- Dematerialisation
- Service Design
- Value and Business Models
- Visualisation
- Viable Service Systems and Transformation

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S-D Logic Research Directions and Opportunities: The Perspective of Systems, Complexity and Engineering

The need for a systems approach to modeling and understanding service is now well established, (Barile 2009; Barile and Polese 2009; Golinelli 2010; Ng et.al., 2011a). Following the construction of Maglio et al (2009) we view a service-system as a network of agents and interactions that integrate resources for value co-creation. The context of value creation is intrinsic to the system design.and the adaptive, interactive actions of agents classifies the network as an ecosystem (Lusch et al, 2010).

To date, several disciplines have broached the systems view of service and the engineering of service systems. Operations research applied to services began with a rather simplistic, macro view of resource integration in the form of Data Envelopment Analysis (DEA), introduced by Charnes, Cooper and Rhodes in 1978 (Charnes, Cooper et al. 1994, Banker, Charnes et al. 1984). Micro models of service systems have tended to study the systems' IT components (Hsu 2009; Qiu 2009). Engineering, which has always been associated with "assembling pieces that work in specific ways" (Ottino, 2004) and "a process of precise composition to achieve a predictable purpose and function" (Fromm, 2010 p. 2) has contributed to greater scalability and purposeful control in service systems. However, the agents of the system usually are people whose activities may not be easily controlled by predictable processes and yet are critical aspects of the value-creating system (Ng et al, 2011b). There is need for a new combinative paradigm, such as third-generation activity theory in which two or more activity systems come into contact, to explore dialogue, exchanging perspectives of multiple actors, resulting in networks or groups of activity systems that are constantly interacting (Nardi 1996, Oliveros et al 2010, Marken 2006).

While various systems approaches such as general systems theory (von Bertalanffy, 1962), open systems theory (Boulding, 1956; Katz and Kahn, 1978) and viable systems approach (Beer, 1972; Golinelli, 2010; Barile 2008) will not be reviewed here (see Ng, et al 2011a for a systems approach to service science), they share common tenets: boundaries, interfaces, hierarchy, feedback and adaptation to which most systems writers would add emergence, input, output and transformation (Kast and Rosenzweig 1972). These terms may be used as a basis for a research agenda for the consideration of a *service* system.

Major Issues Needing Resolution

The design and management of service requires a science of co-creation activities, processes and interactions (Spohrer, Maglio et al. 2007; Maglio et al. 2009). For service systems, the foundational premises of Service Dominant Logic, (Vargo and Akaka 2009) form the core of the postulate base. The implications of this perspective are that service models cannot be simply extensions of the models for

product design, supply-chain management or other legacy approaches developed by different disciplinary communities over the past six decades. New approaches must be defined and validated. We identify five essential elements of models of service systems, which need substantial development and validation in order to advance the knowledge of service systems for the construction of useful decision support in the design and management of service:

Boundaries
Establishing the boundaries of a service system in terms of value-in-context is a key starting point towards the understanding of a service system. While this might seem intuitive, individuals' value-in-context serve goals and purposes in individual lives which are different and temporally open-ended. This may imply that service systems are far more open than many system designers would like them to be.

Contextual Hypervariety
Given that the value being co-created by service is dynamic and the benefits of the system are contextual, changes in contexts and conditions may introduce hypervariety into a system (Ng et. al. 2011b; Hsu 2009), threatening the system's viability and its original design purpose. A system that is scalable and predictable may not be flexible or agile to absorb customer contextual variety of value-in-use, implying different resource usage. Conversely, a system that is agile and flexible may not be scalable. Adaptation (autopoeisis or homeostasis) may not be so easily achieved and researchers may need to model variety in stochastic terms (Badinelli, 2010) or with fuzzy model elements.

Resource Integration
A service system co-creates value through integration of resources, with knowledge resources becoming increasingly important. Models of resource integration must define the dynamic and context-specific configurations of form, time, place and possession of resources that achieve the "density" that is necessary for optimal value creation (Lusch et al 2010).

Agent decisions and autonomy
Each agent's decision process at different points of the service system invokes abductive, inductive and deductive forms of the agent's descriptive model of the world and the formulation of decision rules (optimal, heuristic, intuitive, irrational) that can be used for determining a decision (Barile 2009). The system may exhibit outputs that could be both deterministic and emergent due to the nature of the interactions between decisions made and the level of autonomy between the agents.

Valuation of service outcomes and Risk
Perceived value can be extrinsic, intrinsic, dynamic, non-stationary, state-dependent, irrational or a misunderstood self-assessment by the agent. With the uncertainty in valuation and the risk that it produces, agents adapt to unpredictable outcomes through learning processes that range from simplistic to elegant. Agent epistemology is therefore a core element of models of service systems.

Major Research Opportunities

The understanding of service systems for value co-creation is to be worked on collaboratively by researchers, and not in isolation. Current academic community, borne out of a production economy and used to breaking down problems into reductionist disciplines such as engineering, management, marketing, strategy, operations, OBHRM, has to consider alternative approaches towards understanding, analysing and drawing insights from service systems.

Marketing now has a significant role in representing the customer as an agent within the service system. However, supported by an ever-increasing liquification of information and intelligent IT from a wide and changing variety of sources, the customer-agent could assume a greater responsibility for its role as co-creator of value in the system. Any valid approach to engineering service systems requires re-structured models of service systems that place customer-agent in an active co-creating role instead of being passively 'served' by provider firms.

Conclusion and a Grand Challenge

In reality, service systems are all complex phenomena. Their analysis ought to be accomplished both by deepening the observation of a single entity (reductionism) as well as casting a system view of the whole (holism). The synthesis of these two approaches is crucial towards understanding both the single element and its relationships with other elements without missing the whole picture and its systemic interpretations (Golinelli, 2010; Ng et. al., 2011a).

Service research needs to advance an agenda that is trans-disciplinary and capable of solving real problems. As researchers, we could come together to render our perspectives to a complex problem, such as the *design of service for value-creating, viable, sustainable, adaptive global urbanization*. Just as particle physicists have come together across the world through CERN, we propose the establishment of such a 'wicked' problem that supports inter-theoretical and cross disciplinary perspectives, allowing for boundaries, units of analysis, methods, perspectives; resource integration, markets and practices, value, structuration, framing, effectuation. Such an establishment could rally the global community to volunteer real data, with different research centres and researchers around the world cooperating to provide perspectives and insights. It would serve to locate disparate research contributions into a system of knowledge for understanding and transferability, and it would serve as a major call to action for all researchers to join in the effort to direct our world to a more sustainable future – the grand challenge in service.

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