A Systems Model of a Service Organization

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Abstract

This paper develops a service systems model which is then used to discuss a number of important implications for service design. We begin by outlining the existing service design literature which is either too abstract or too low level for design. Thus, we develop the requirement for a service systems model which enables the consideration of a number of different ‘levels’. The main contribution of this paper is the development of the service systems model from data collected in a single case study of a large international Telco. We conclude by considering three implications for service design of developing a systems model. Firstly, we challenge the level or unit of analysis of service systems design research. Secondly, we propose an alternative contingency variable based on the input type and finally we suggest the model may be used within service improvement to identify the appropriate approach to mathematical modeling.

1. Introduction

The motivation for this paper stems from widespread discontent exhibited by industry colleagues on the nature of research into service design. Practitioners frequently comment that the general principles of service design appear to be well developed what is problematic is the level of the analysis. Much academic research takes place at the detailed level of individual processes or specific products. Consider for example all these examples from the banking sector. Safizadah et al. [22] considers the business processes as selling insurance, handling complaints and claims management. Zomerdijk and De Vries [29] consider processes across 3 product types, mortgages, loans and mass products such as current savings and current accounts. Frei and Harker [6] measure the efficiency of a single service delivery process in a retail bank. Huee and Roth’s [10] work addresses only the front-office portion of the service delivery system in retail banks. The challenge for the executive management of a large bank is that they have to manage at the level of the organization, with multiple products and multiple processes. Products and processes cannot be considered in isolation there are shared resources of people, technology and facilities. What is required is a model that can be used to inform the level at which service design takes place and to help identify the appropriate level and to help practicing managers make design decisions such that they do not optimize one part of the business to the detriment of another.

The objective of this paper is therefore to develop a systems model of the organization which focuses on the interrelationship between the parts [5]. The purpose of such a model is to inform the theory of service design.

2. Literature

2.1. Service Design

Many authors have developed important insights into service design. For example Heskett [9] identifies the components of operations design as, the role of people, technology, facilities, equipment, layout, service processes and procedures. Ramaswamy [20] summarizes this as the location where the services are provided and the process through which the services are delivered. Roth and Menor [21] consider that the design decisions include:

- structure, facilities, layout and equipment
- infrastructure, job design, policies and skills
- integration, coordination issues, service supply chains and adaptive mechanisms.

There are also a wide number of service classification schemes which are then linked to design characteristics for the different types of service system: for example Lovelock [14] in a wide ranging paper proposes five alternative classification schemes. Perhaps the most widely used classification for service organizations has been developed by Schmenner [24]. His work is based on a classification scheme developed
by Maister and Lovelock [15]. His model integrates the axes of client contact and customization, into a single axis, the degree of interaction, with a second axis as labor intensity, which is defined as the ratio of labor cost to capital (table 1).

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<tr>
<th>Degree of interaction</th>
<th>1 Service factory</th>
<th>2 Service shop</th>
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<td>L</td>
<td>Back office of large banks</td>
<td>Hospitals</td>
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<td>Airlines</td>
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One of major implications of Schmenner’s work for process design relates to labor intensity where high equates to relatively high levels of labor to capital. Where labor intensity is high then the emphasis is on the HR processes of recruitment, staff development, etc. Where customer interaction and labor intensity are high is high eg professional services, staff might form individual relationships with customers that transcend their work organization and can lead to clients leaving the company if a particular member of staff leaves.

The literature on components of process design has been usefully summarized in Ponsignon et al (2011) into six components;
1. The level of people skills
2. Degree of employee discretion
3. Degree of routineness of technology and equipment
4. Degree of automation
5. Location
6. Front office-back-office configurations

What is more contentious in the literature on process design principles is to what they refer. For example, Safizadeh [22] conducts an analysis of process design across a wide range of banking processes. These include developing new business, enrolling new customers, processing new accounts, opening client account, selling insurance and securities, calculating commissions, managing insurance claims, handling complaints, developing Information Systems, in total they consider 52 processes. This list is quite fragmented and reductionist. For example, any organization redesigning its processes around enrolling new customers would also affect processing new accounts and opening client accounts. The selling of insurance and securities would impact on calculating commissions and quite possibly on how insurance claims are managed which in turn may well have an impact on complaints handling. From the customer’s perspective they are also likely to see the organization as one process: I want an insurance policy or I want you to process my claim.

In a similar vein Zomerdijk and De Vries [29] considered the design principles for front office and back-office work across mortgages, mass customer products such as savings accounts and credit cards and business loans. They focus on the service delivery system which comprises the following processes; a customer intake to schedule an appointment; preparing for meeting the customer; a sales meeting to identify the customer’s needs and potential for additional sales; registration of the new products in the sales support system; arranging consent for providing credit facilities to the customer; printing the sales contract to be signed; and archiving the contract.”[29, p.117]. There is no consideration here of the implications of designing the whole sales process nor the implications of these sales processes for subsequent fulfillment or support.

Optimizing the design of each of these processes in isolation may be subject to the general theory of the second best [13] which demonstrated that if one optimality condition is not satisfied the next-best solution will involve changing other variables away from their positions of optimality. Using similar conceptual foundations based around constraints, Goldratt [8] highlights the ramifications of optimizing one part of a whole process that is not the limiting step. In his theory of constraints he points out that optimizing the performance of a process step upstream of the bottleneck will only increase work in progress and working harder downstream is limited by the output of the bottleneck [8]. Sprague [26] sums this up neatly proposing that “Optimizing the supply chain” means convincing elements within that system to accept local sub optiumms for the good of the whole [26, p. 221]. In this case supply chain means any combination of operational activities.

This call for consideration of the broader service system has also been reflected in the service science literature. Notably Glushko and Tabas [7] suggested that the existing literature has focused on the service experience in the front stage and discounted the contribution of the back stage or fulfillment. They call
for a consideration of the entire network of services that contribute the parts of the service system

In responding to that call this paper develops a systems model which will enable designers to consider the implications of changing one part of the organization on other parts of the organization such that the design is considered at the level of the whole organization. In the tradition of systems thinking it focuses on the relationships between the parts rather than optimizing parts in isolation.

2.2. Systems Modeling

Checkland [2] considers a system to be an entity which is a coherent whole, that is the elements show some level of organization beyond that of the random or weakly related. The coherence enables a boundary to be drawn around the entity which then distinguish the elements which are inside from the outside; the environment. The existence of a boundary enables the identification of inputs and outputs which cross the boundary. There is some mechanism of control which enables the entity to preserve its identity. Finally, an entity considered a whole has sub-systems and is part of a wider whole. This is shown diagrammatically in Figure 1.

![Figure 1. Features of a System](image)

A number of authors have developed organizational systems models. Miller [18] in his comprehensive treatment of primary tasks identified three classes of activity;

1. Operating activities, these define the nature of the enterprise and are the main transformation process. For example, in an airline this would be moving passengers from location A to location B.

2. Maintenance Activities, these obtain and develop the resources that produce the operating activities.

3. Regulatory activities, these are the activities that set standards and plans and control the actions of the operating activities.

Katz and Kahn [11] describe organizations as having five subsystems:

1. Production/Technical: (“the major type of work that gets done”)
2. Maintenance: socialization of new members, training, preserving the system, rewards
3. Supportive: transactions with external agencies
4. Adaptive: the research and planning activities eg market research, long-range planning, etc.
5. Managerial: these are the activities associated with control, coordinate and direct subsystems, and the development of policies.

Perhaps the most comprehensive (and also the most abstract) systems model is that proposed by Checkland, Warmington and Wilson [3] in their general systems framework (Figure 2) for viewing the enterprises as a system. In the model shown below, T is the primary task and transforms inputs into outputs, P is the planning system, S is the support system, C is the enterprise-wide control system and L is a linkage system to the external world and includes such activities as marketing, R&D etc. Each of the subsystems has its own local control system, depicted inside a smaller circle, also labeled C.

![Figure 2. Enterprise Model (Adapted from Checkland)](image)
2.3. Frameworks

There are considerable similarities between the systems models of Miller, Katz and Kahn and Checkland et al and the CIM-OSA standard [1] for business processes. CIM-OSA identifies three main categories of processes,

1. Manage Processes, these are essentially about design; designing what the organization is to do. The time frame they work on is typically months or years and govern the overall behavior of the organization. These are analogous to Miller’s regulatory activities, Katz and Kahn’s adaptive and managerial sub-systems and Checkland et al’s planning system (P) and control system (C).

2. Support Processes, the support processes are typically resource driven eg the provision and development of people, technology and assets. They also include financial management activities associated with financial reporting and legal and regulatory aspects of the business. These are analogous to Miller’s maintenance activities, Katz and Kahn’s supportive and maintenance sub-systems and Checkland’s support system (S).

3. Operate processes are those which are directly related to satisfying the requirements of the external customer, for example the logistics supply chain from order to delivery and are often referred to as core processes. These are analogous to Miller’s operating activities, Katz and Kahn’s production/technical sub-system and Checkland’s primary task and transformation (T).

3. Research Method

The objective of this research is to develop a systems model of a service organization so as to inform the practice of service design. Clearly, this task is a considerable undertaking and we began with a detailed analysis of a single case example. It is recognized (eg Lewis and Brown [12]) that single case studies can be particularly useful in the early stages of theory building and that they are ”particularly appropriate for completely new exploratory investigations” Meredith [16] and Voss et al [28] recognizes the advantages provided by single cases in that they provide greater opportunities “for depth of observation”.

Siggellow [25] identified 3 main reasons for using a single case; falsifying or identifying weaknesses in existing theory, inspiration for new ideas or as illustrations of a conceptual contribution. The case that follows is illustrative of a systems model the service organization. The case has also provided inspiration for new ideas and considerations of existing theory. These will be considered in the discussion section.

3.1. Case Study

Talkphone\(^1\) is a large European organization that provides a mobile phone network in all of the developed economies and most of the developing world. It is currently amongst the world’s 100 largest companies. It is split into two major business units focusing on different markets:

- Personal customers which was a B2C business, Consumer Business Unit, (CBU)
- Business customers, which was a B2B business (BBU).

Most of the support activities are shared across the two Business Units (BU), eg finance, personnel, IT etc are shared, the network is common to the two business units, there is central procurement and warehousing etc. However, there are two major differences, marketing and sales are specific to the business unit and there are also dedicated call centers serving different customer types.

3.2. Systems Model

Using the guidance provided by the three systems models described above we began by developing a control model for the whole enterprise Figure 3. The control model relates to the manage processes described in the CIM-OSA [1] standard and is informed by Miller’s [18] regulatory activities, Katz and Kahn’s [11] adaptive and managerial sub-systems and Checkland et al’s [3] planning system (P) and control system (C).

The basic logic depicted in the model is that develop vision and strategy produces a strategic direction, which then guides the planning process. Business plans are produced, which guide day to day actions in the operate processes. These business plans are sets of decisions on how resources; people and technology, will be combined to execute strategy. Performance is regularly evaluated in the review part of strategy execution. Deviations from the plan trigger a number of potential courses of action. Initially, they may cause a revision of the plan, which may then lead to activities to improve the business eg they may trigger a strategic action in developing (and subsequently implementing) new business opportunities or if the improvement required is more localized, it may kick-off a request for technology optimization or improving the various processes.

\(^1\) Name changed because of confidentiality
3.3. Operate Model

The data for the development of the operate model was collected using a protocol developed with senior operational managers. The initial overview phase consisted of 18 interviews and a second phase of 21 interviews after we had identified gaps where we had no maps. This gave a total of 39 interviews. There were two people present at all interviews, one to take notes the second to develop the process model. Subsequent to the interview a model was produced in Visio and sent back to the interviewee for validation. There were a small number of cases where a subsequent second interview was required to clarify the process models.

An example of the type of map produced after this first round of map building is provided below in Figure 4. The map illustrates the sales process of the Government sales channel. In addition to these maps there were also a number of ‘in-house’ maps previously developed, in total we had around 30 maps. The models were then integrated using the systems modeling method IDEF0 [4].

Figure 3. Control model

Figure 4. Sample process model

The principal features of IDEF0 are
1. It uses as its basic syntax, input–output, see Figure 5. IDEF0 terminology below. Usefully IDEF0 distinguishes between those that are being transformed (inputs) and those carrying out the transformation (resources). This latter group are called mechanisms. There is also a final arrow the control that governs the way that the activity takes place.
2. It limits the number of diagrams to a page to between 3 and 6 (explicitly conforming to Miller’s [18] rule of 7 ± 2).
3. It enforces a strict hierarchy of models so that inputs and outputs on sub-systems must be shown on higher level models.
4. It shows the interconnectedness of the input-output diagrams by labeling arrows as nouns (ie things to be transformed).
Each ICOM has a definition...

Controls
... regulate and sequence the conversion from inputs to output

... are converted into...

Mechanisms
... are the means used in the process or activity to produce the output.

Output
... data or materials produced or resulting from the activity

Inputs
... data and materials used to produce the output of an activity

Figure 5. IDEF0 terminology

Figure 6 is an IDEF0 model of Talkphone’s operate processes. The boxes are the main operational activities and the lines are the flows of material or information between the activities. The red bold lines indicate main flows, sometimes these are from outside the model (e.g., queries, credit information), others are main internal flows (e.g., sales prospects or equipment orders. At the bottom of the box are the mechanisms, who or what carries out the transformation: these include various teams (e.g., marketing) or software systems.

The ‘operate model’ describes what is happening in the core activities of the system. The first activity is ‘develop the business’ this includes the development of the tariffs, the design of all new bundles of products and services, including relationships with strategic partners and the activities involved in marketing, including developing organizational capabilities and partner management. To reflect the broad nature of these activities Talkphone described this as ‘develop the business’. The second activity, ‘Sell and Change Product and Service’ reflects the activities involved in new sales but also the sale of additional subscription based services, the sale of additional devices (e.g., headsets, datacards) and the upgrading of tariffs. The third process was termed ‘deliver product and service’ and included three key elements: the delivery of devices, the delivery of network access and the delivery of a network transaction for example phone call, SMS, MMS, data etc. The final process was termed ‘manage customer service’ to reflect all the
activities associated with the post sales customer experience. These included both proactive features (monitoring of the network) and reactive features including addressing customer queries, returns repairs and exchanges.

Using the abstraction associated with the IDEF0 modeling method, each of the high level activities eg A1 ‘develop the business’ was then decomposed to lower levels.

One of the key features of IDEF0 modeling is the focus on what links and what triggers (controls) activities. Take for example ‘prospect’ which flows between ‘develop the business’ and ‘sell and change product and service’. The prospect is an output from A1 and without it being produced the telesales team cannot do their sales activity. This type of modeling focuses attention on the relationships between the activities and how one activity is dependent on another activity. This is a particularly important consideration in service design.

4. Contribution

The development of the service systems model provides three insights for academic research and the development of a number of important questions and identifies some potential alternative literatures.

Firstly, the model directly challenges the level or unit of analysis of service design theory and raises a number of important questions for research in service systems design.

In this research we have set out to draw the boundary around the organization as an entity and to consider the organization as a system. Currently, different academic disciplines speak to different aspects of the model. For example, developing the business and sell and change is associated with marketing, delivering the product and service and managing customer service is more typically associated with IT and operations management. The HR discipline is associated with the provision of resources and accounting with collecting the management information around the process. Process design at the level of the organization involves all the disciplines and any attempt to privilege or prioritize one discipline will inevitably lead to a sub-optimal whole. The model provides a basis for the consideration of all the major disciplines when developing service system. Previously, it has been extremely difficult if not impossible to identify the implications of changing one part of the business on another part of the business and in practice has frequently led to unintended consequences. One of the key principles of systems thinking is that optimizing the performance of one part of the business does not necessarily optimize the whole. The research question that emerges from this discussion is at what level systems design can take place and whether the existing theories of systems design (discussed in the literature section) apply at the level of the whole organization?

This raises the obvious question; do all design decisions have to be made at the organizational level? Or what are the appropriate system boundaries? This will depend on the extent of the interrelationship of the parts. Where the parts are tightly connected then design decisions in one part will impact other parts of the organization. Where parts are relatively unconnected then the implications for other functions and processes are limited. The crucial question is what are the conditions under which design theory can be localized and optimized to a specific organizational function or process? Information Systems theory using the concepts of modularity, coupling and cohesion may provide important theoretical insights.

The systems model also provides a basis for a consideration of how the system behaves and performs. Sousa and Voss [30] in their comprehensive review of the management practices literature identified four categories of contingency variables: national context and culture, firm size, strategic context and a final general category for example industry type [p703]. An alternative classification would be by type of organizational system, through the identification of a series of system archetypes. Further insight may be provided by using other theories from the systems literature. Ashby’s [31] Law of Requisite Variety (LRV) focuses attention on the disturbance and the response in control systems model. Classifying different types of disturbance/input might enable us to move beyond the rather simplistic classifications identified by Sousa and Voss.

Finally, the model also can provide insights into service process improvement. At lower levels in the model, the boundary can be tightly drawn, the system can be ‘closed’ and the objective function specified in such a way that deterministic and probabilistic modeling can provide insights. See for example Little's Law [32] in queuing theory. However, once the boundary is drawn around the wider organizational unit and the system becomes more 'open' then optimization, for example through the methods of operations research, is less applicable and may lead to sub-optimized wholes. The characterization of the problem type such that researchers and managers can identify appropriate techniques and methods is still under researched and much further research is needed.

This research also has implications for practice. We contend that it is only by understanding the organizational structure through a systems model...
which identifies the relationships between the entities that we can consider process design at the level of the whole organization. Only at that level can we inform practicing managers as to what process design principles should be applied. Inevitably products and services and their associated processes share resources of people, facilities and technology. Some of these may need to be sub-optimized (2nd best) in order for the whole to optimized.

We recognize the limitation of our own unit of analysis. The drawing of the systems boundary around the organization is itself somewhat reductionist. Supply chain management research would propose a boundary around the chain or network and consider trade-offs across that systems. Alternatively, recent development in marketing e.g. SD logic [27] would suggest including the customer within the boundary. Similarly, Sampson’s [23] work on the process of service as the interaction between customer and provide draws a more extended boundary. Both Vargo and Lusch [27] and Sampson would extend the system boundary and make the system more ‘open’. This necessarily extends the design space to include the customer, there are implications here for other aspects of systems thinking including complexity theory and variety.

5. Conclusion

At the centre of our argument for the development of a systems model is the contention that academic research in service design is highly reductionist and prone to assert ceteris paribus as a justification. This clearly limits its practical applicability.

This paper challenges an assumption of existing service design literature relating to the level of the unit of analysis that design takes place. That literature can be summarized as high level taxonomical classifications and detailed low level analysis of specific processes. The taxonomical classification is too general for service design and the consideration at the level of specific products or processes does not consider the issue of shared resources and competing performance measures and is too low a level for design. We use an approach based on systems thinking to develop a systems model of Talkphone. The model considers all the processes of the organization in one high level framework based on manage, operate and support processes. We have focused on the operate processes and developed an IDEF0 model of the 4 core processes. We conclude by considering the implications for service design of developing a systems model, these include a recognition that the academic disciplines informing organizational design (marketing, finance, operations etc) need to recognize that the principle of second best may apply. That is the design of any one process may need to be sub-optimal to produce an overall optimum design. The systems model is therefore a guide to the overcoming the issues of the theory of second best. Secondly, systems models may be the basis for the developments of archetypes which are alternative contingency variables. Thirdly, we call for more understanding of problem types as a basis for the identification of appropriate improvement techniques and methods. Finally, we recognize our limitation in drawing a simple organizational boundary around the systems model and call for further models to be developed that extend the system model through the supply chain and into the domain of the customer.

6. References


