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**Introduction to Process-Chain-Network Analysis**

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The purpose of this document is to introduce the PCN Analysis tool that will help us visualize service operations processes, networks, and managerial issues. Figure 3 shows a simple example of a PCN Diagram involving a “full-service” sit-down pizza restaurant. On the subsequent pages we will review key concepts and elements of the PCN framework as depicted in that example.

Figure 3: PCN Diagram example – pizza restaurant
We define a **process** as a sequence of steps. The base grammatical identifier of a process step is a verb. Processes are performed by entities and act on resources, often multiple resources from multiple sources. Resources and entities are identified by nouns. In the PCN framework we use the term **resource** in a general sense, including physical items, knowledge, energy, and so forth. Even entities such as people or machines can be resources.

A **process chain** is simply a sequence of process steps with an identifiable purpose. Figure 3 shows a process chain with the purpose of serving pizza. In general, the purpose of process chains is ultimately to improve the state of well-being of some entity or set of entities, which is the concept of **value** (see, e.g., Grönroos 2008, p. 303). In usual flowchart manner, the sequence of a process chain is indicated by arrows that connect one process step to another. The arrows generally represent a state dependency, meaning that one process step depends on some resource being in a state provided by another process step. This is different from the way arrows in supply-chain diagrams represent the flow of materials or information, although movement of materials and information is an example of a state change. The dashed line between “negotiate supply contract” and “order supplies online” suggests a loose temporal dependency, meaning the supply contract could have been negotiated a long time before an instance of ordering supplies.

A **process entity** is any entity that participates in a process. Examples include firms, departments within firms, customers, agents of customers, and so forth. The key feature of a process entity is the ability to make **decisions** about the initiation or progress of some portion of a process chain. Figure 3 considers only one process entity, which is illustrative but not very interesting. Subsequent examples will be more useful by describing how process chains span multiple process entities.

There are some useful ways of characterizing process entities. Some process entities control certain process steps—functioning as “operand resources” that act on other resources (Constantin and Lusch 1994), such as a surgeon, who acts on a patient. Other process entities function as “operant resources,” meaning they are acted upon, such as the surgery patient. It is common for an entity to be an operant resource during some parts of a process chain and an operand resource in other parts of the same process chain.

All entities participating in a process chain—producers and consumers—are beneficiaries of the process chain, meaning that they participate with the expectation of value (see Sampson 2001, p. 330). We do not advocate eliminating the distinction between consumers and producers as others have done (Vargo and Lusch 2008a, p. 257; Vargo and Lusch 2010, p. 146), but instead recognize that entities engage in interaction with two distinct types of value (i.e., benefit) motivations. Process chains tend to be configured to accomplish one or more specialized purposes. Entities that stand to benefit from a specific purpose of the process chain are specific beneficiaries of the process chain, and are generally called **customers** or **consumers**.

Other process entities participate in a given process chain in order to be able to subsequently meet well-being-improvement needs by other process chains. Usually, these process entities benefit from the given process chain by receiving a generic resource—money—that can be subsequently deployed to meet specific needs from other process chains. Firms such as “manufacturers” and “service providers” often fall into this category. They participate in a process chain not so much for specialized benefits of the process, but for the generic resource that can be used in other process chains, and as such are considered to be **generic beneficiaries** of the process.

Of course, hybrid entities exist—being both a specific beneficiary and a generic beneficiary. For example, consultants are paid to engage in consulting projects (thus being
generic beneficiaries), but also may desire to gain expertise in the business of a given client (thus also a specific beneficiary), and may therefore be willing to reduce the consulting fee charged that client.

Each process entity has a **process domain**, which is the set of process steps that are initiated, led, performed, and, to some degree, controlled by the process entity. In other words, an entity is an operant resource for process steps that fall within its process domain. A driving construct of a process domain is control, as symbolically noted by the triangle at the top of Figure 3. Entities can and do influence process steps outside of their process domains, but do not lead or directly control those process steps.

### Three Regions of a Process Domain

We will use Figure 3 to define the three process regions, and subsequent figures will demonstrate important managerial and strategic issues. At the extreme edges of the process domain in Figure 3 are process steps that involve **direct interaction** with other entities, such as suppliers and customers. This direct interaction means that people are interacting with people in some way, negotiating contracts, taking orders, and so forth. An example of a direct-interaction step in manufacturing is a salesperson negotiating the sale of a manufactured resource. An example from a hospital is drawing blood from a patient or consulting with the patient about the need to draw blood.

Adjacent to the direct interaction regions are areas of **surrogate interaction**, meaning that an entity is performing process steps that involve a non-human resource of another entity (see Chase 1978, p. 139). Examples are ordering supplies via a supplier website and assembling a pizza according to a customer order. The website is not the supplier and the order is not the customer, but are surrogates of those other entities. A manufacturing example is make-to-order production, where the order is a surrogate representation of the customer preferences (Sampson 2001, p. 142-144). A hospital example is analyzing a patient’s blood in a laboratory.

At the center of an entity’s process domain is the region of **independent processing**, which means processing that does not involve either direct or surrogate interaction with other entities. Make-to-stock manufacturing is a common example of independent processing. An independent processing example from a hospital is cleaning the facility, unless the cleaning function has been outsourced to an external firm (that would have surrogate interaction with the hospital).

In Figure 3 it just so happens that the supplier-facing processes are shown on the left and the customer-facing processes are on the right, but it does not have to be that way. PCN Diagrams differentiate suppliers from customers according to beneficial relationships, not by relative positioning in and between process domains. In barter arrangements (see Normann 2001, p. 36), for example, both entities may be suppliers and/or customers, and either can be on either side of the diagram.

As suggested previously, the triangle at the top of the entity’s process domain symbolically represents the **degree of process control**, with less control occurring with more direct interaction (Morris and Johnston 1987). Thompson (1998) explained this concept by distinguishing between “uncontrollable work” such as “when customers and employees interact,” and “controllable work”, which “does not require the presence of customers” and therefore “management has some degree of temporal control” (p. 23). He described how service processes (i.e., process chains with interactive elements) contain both types of work, and managers can
leverage the characteristics of each in order to improve labor utilization while meeting customer needs.

A single-entity service process diagram like Figure 3 is not much more than an entity’s process flowchart (with categories). It is much more interesting to study process chains that involve multiple entities, as shown in Figure 4 and subsequent figures. The essence of PCN Diagrams is documenting the interactions between steps within the process domains of multiple entities in a service system, and considering the roles of various entities in the unfolding of the process.

Figure 4: Interactions between process entities (pizza restaurant and customer)

Notice in Figure 4 how some steps occur between the direct-interaction regions of the entities. Seating customers involves direct interaction, but the step is executed primarily by the restaurant employee, and is therefore more within the restaurant’s process domain. In this
example, creating the order is led jointly by the employee and the customer. Serving the pizza and presenting the check are led by the employee, and the customer leads the step of providing payment. Each of these direct interaction steps are, by our definition, “service” steps. Further, all surrogate interaction steps are considered “service” steps. Note that both entities in Figure 4 are also engaged in some independent processing steps, which are “non-service” steps by our reckoning. Were one to ask, “Is a restaurant a service?” the answer would be, “No, a restaurant is an organization that is engaged in both service (i.e., interactive) and non-service (i.e., independent) processes.” This emphasizes that the focus of analysis is the process segment, not the firm and certainly not the industry (Sampson and Froehle 2006, p. 333-334). Firms are aggregations of resources and processes, including some service (i.e., interactive) process segments and some segments that are independent processing.

It is important to understand the use of grammatical constructs in a PCN Diagram. The subject, or predicated noun, of any step is always assumed to be the entity or a representative of the entity whose process domain the step falls under. In Figure 4, “develop recipes” is under the restaurant’s process domain, implying that “restaurant employees develop recipes.” If the recipes are developed by customers, then the box should be under the customer’s process domain. If an outside entity like a cookbook publisher develops the recipes, then the process step should be under the publisher’s process domain.

Since the subject of each process step is implied by the position on the diagram, the process steps can and should always start with verbs, reminding us that we are studying chains of process steps. The action verbs are followed by one or more object nouns, which are the resources being acted upon. Note that, by definition, object nouns under independent processing are always resources owned and controlled by the given process entity.¹

Research literature refers to service concepts of co-production and value co-creation (e.g., Vargo and Lusch 2010, p. 143). The PCN framework considers “production” in a traditional value-adding sense: preparing resources so that they can subsequently be used to meet needs, which means the prepared resources have potential value (Grönroos 2008, p. 299). The prefix “co-” means “one that is associated in an action with another” (Merriam-Webster 2011). Therefore, co-production means two (or more) entities producing value potential together. In common use, co-production is where customers participate in the development of the core offering of the firm, presumably in conjunction with the firm (Vargo and Lusch 2008b, p. 8). Co-production generally means the customer is assuming some responsibility for production, implying that the co-productive steps exist within the customer’s process domain either through direct interaction or surrogate interaction (e.g., using self-service technologies). Subsequent process steps in the customer’s region of independent processing are not co-production in the strictest sense, but may involve value co-creation, a phrase that has been used broadly to describe a realization of value by customers (Grönroos 2008). Although co-production always takes place in regions of interaction, the realization of value can occur in interactive (service) process steps or independently (such as when a customer uses a product that was purchased from a firm to meet his or her own needs).

Figure 5 depicts a simplified PCN Diagram for a medical diagnosis process involving a patient who feels weak and needs a prescription based on a blood test. This example illustrates a

¹ For simplicity, we allow steps that are outside the scope of the current analysis to be considered “independent processing,” even if they are interactive. For example, Figure 4 shows “travel to restaurant” in the customer’s independent processing, even though the travel may have involved a bus or a taxi. In that example, the interaction between the bus or taxi provider is outside of the scope of the pizza restaurant interaction being studied.
process chain network involving four process entities: (1) a health clinic, (2) a patient, (3) an insurance company, and (4) a pharmacy. Standard flowchart connector symbols are used to show process dependencies that might span different pages or parts of the PCN Diagram. (Each connector has a letter followed by a number representing either the page, or in this example the entity number, where the step continues.) These and other flowcharting techniques can be used to depict PCN Diagrams of various levels of complexity.

Figure 5: Healthcare PCN Diagram example

**Identifying the Appropriate Region**

Summarizing, the three regions of a process domain are:

- **Independent processing** steps are performed by a process entity acting on resources owned and controlled by that same entity.
- **Surrogate interaction** steps involve a process entity acting on the belongings or information of another process entity, but not with the person of the other entity.
• **Direct interaction** steps involve a process entity working in conjunction with one or more other process entities—people to people.²

It turns out almost all process steps fit into one of these three process regions. The initiator (operator) of the process step is the entity whose process domain the step falls within, or, in the case of direct interaction, jointly falls within. In the process step, the process entity is acting on, or integrating, resources. If the entity is acting on or with the person of another process entity, then the step falls in the domain of direct interaction. If the process entity is acting on the resources (belongings or information) of another process entity without direct interaction, it is surrogate interaction. If we have neither direct nor surrogate interaction, then process step is independent processing—acting only on resources owned/controlled by the process entity.

Some processes may include composite steps that occur simultaneously in different process regions or domains. For example, an instructor may be giving a lecture as students are listening. Both are part of direct interaction, but the “give lecture to students” step is in the instructor’s process domain and the “listen to instructor’s lecture” step is in the students’ process domain, with the latter being dependent upon the former. Or, an airline may be transporting passengers and their baggage at the same time: the “transport baggage” step is surrogate interaction and the “transport passengers” step is direct interaction, both in the airline’s process domain, while “ride airplane” step is in the passenger’s surrogate interaction region. It is helpful if the level of detail of analysis is fine enough to delineate the categorization of each step.

It is easy to recognize that every interactive process step, direct and surrogate, involves acting on customer-provided information. This is because people and belongings are always information laden. For that matter, every resource is information laden (Normann 2001, p. 29), meaning that every process step is, at some level, an information processing step. Information availability is the universal resource that ties process steps together in dependent relationships.

The functional and managerial distinction of these three elemental process step regions will be discussed in the subsequent sections.

**Using PCN Diagrams for Service Process Analysis**

PCN Analysis begins with visualizing the process in question. The following are basic steps for creating a PCN Diagram:

1. Identify a process to analyze. As suggested above, the appropriate unit of analysis is a process or process segment, not a firm. PCN Analysis takes place at the process level.

2. Identify the process entities that participate in the given process segment. This usually includes a focal firm and an immediate customer or customer segment. In many cases, especially B2B processes, the PCN Diagram should include the immediate customer’s customer, so as to visualize how the focal firm facilitates the immediate customer accomplishing its customer-serving business objectives. The diagram might also include suppliers, partners, and others involved in the value network.

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² Direct interaction occurs in degrees and may involve people using machines to interact with people, such as doctors using MRI machines to scan patients, or customers who are simply passive recipients of processing, such as passengers on an airplane or guests at a concert. In those situations the process step is often depicted on one side or both sides of the direct interaction region, suggesting that instigation of the process step is not mutual.
3. Record the steps that mark the start and end of the chosen process segment. Process segments often start with an identified customer need and end with the fulfillment of that need.

4. Fill in intermediate steps, showing which process domain and region each step occurs in, as discussed in the prior section. This may include steps in the process domains of the focal firm, customers of the focal firm, suppliers of the focal firm, and other entities in the process-chain network. As mentioned, the arrows between process steps indicate state dependencies (which may or may not involve product flows).

PCN Analysis proceeds by identifying the value proposition and elements contributing to that value proposition, which may include the following:

5. Identify steps where the customer receives benefits (i.e., need-filling value that provides motivation to compensate a focal firm) and where the customer incurs non-monetary costs (such as inconvenience). We tag customer benefits with ☺ and non-monetary costs with ☹. These tags identify the process’s value proposition to the customer.

6. Identify steps where the provider firm(s) incurs costs (tagged -$) or receives monetary compensation (tagged +$). Cost steps may include labor costs, component costs, facility capacity costs, and so forth. This gives us an idea of the profit impact of that given process segment as currently configured.

7. Environmental conditions, such as facility resources, can optionally be identified by placing labels next to appropriate steps. For example, in Figure 4 the “wait to be seated” step has the word “décor” next to it, reminding us that waiting room décor provides comfort benefits ☺. This accomplishes the same purpose as a “physical evidence” row that is included in some Service Blueprints (Bitner, Ostrom, and Morgan 2008), except in PCN Diagrams the evidence is noted by the step. For a typology of physical evidence and how it can be used to enhance customer involvement in a service process see Bitner’s (1992) discussion of “servicescapes.”

One aspect of PCN Analysis involves considering how each step contributes to or detracts from the value proposition. Ideally, each step in a process chain should contribute to value, which might include identifying a value opportunity (i.e., a need), increasing potential value of some resource, or facilitating a realization of value (satisfying a need). PCN Analysis also involves considering the implications of the current process configuration, in anticipation of process improvement and innovation (discussed in the next section). The nature of process steps varies depending on the process region in which a step resides. Independent processing is fundamentally different from interactive processes in design and execution. Table 1 summarizes some of the ways the process regions differ.

Table 1: Some design issues related to process regions (see also Chase 1978, p. 138)

<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Independent Processing</th>
<th>Direct Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility layout</td>
<td>Organized to enhance process flow</td>
<td>Accommodate customer needs and expectations</td>
</tr>
<tr>
<td>Worker skills</td>
<td>Focus on efficiency and consistency; Rote training</td>
<td>Focus on interaction skills and responsiveness</td>
</tr>
<tr>
<td><strong>Design Factor</strong></td>
<td><strong>Independent Processing</strong></td>
<td><strong>Direct Interaction</strong></td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Job design</td>
<td>Tightly defined with precise steps and cycle time</td>
<td>Broadly defined</td>
</tr>
<tr>
<td>Sales opportunity</td>
<td>Mass marketing</td>
<td>Personal selling</td>
</tr>
<tr>
<td>Quality control</td>
<td>Based on formal specifications</td>
<td>Based on variable standards from customers</td>
</tr>
<tr>
<td>Asset utilization</td>
<td>Schedule assets for maximum utilization (ROI)</td>
<td>Balance asset utilization with customer responsiveness</td>
</tr>
<tr>
<td>Use of technology</td>
<td>Cost/productivity issues dominate</td>
<td>Customer acceptance issues dominate</td>
</tr>
</tbody>
</table>

The following are some general principles about PCN process design:

**Principle #1: Process inefficiency.** In general, interactive processes are less efficient (from the perspective of the provider firm) than independent processing, with directly-interactive processes being the least efficient. As Chase (1978; 1981) identified, operating efficiency is an inverse function of the degree of customer interaction. This relates to the concept of “customer intensity,” which is defined as “the degree to which variation in customer input components causes variation in the production process” (Sampson 2010b, p. 38; Sampson 2010a, p. 116). Interaction leads to customer intensity, and the resulting variation hinders process efficiency. If efficiency is a goal, effort should be taken to reduce customer intensity by limiting how much of the process chain operates in the region of direct interaction.

**Principle #2: Economies of scale.** High fixed costs favor processing by specialized providers who can spread those fixed costs across more units of production. As will be demonstrated in the next section, customers involved in interactive processes usually have the option of performing certain aspects of the process independently—so-called “do it yourself” (Lusch, Brown, and Brunswick 1992). For example, a customer can hire a carpenter to build an addition onto his house or alternatively can purchase tools and attempt the project himself. Even though customers typically have a customization advantage by being their own providers (Principle #3 below), focused providers typically have a scale advantage. In particular, specialized providers can more easily justify incurring the fixed costs of obtaining skills and competencies.

**Principle #3: Customization.** Customization increases as process steps move closer to the customers’ independent processing region. A firm can provide customization by moving steps from independent processing (e.g., make-to-stock manufacturing) to surrogate or direct interaction (e.g., make-to-order manufacturing). However, firms can increase customization even further by moving steps into the customer’s process domain, allowing the customer to customize their execution of steps and use of resources, as depicted in Figure 6. Indeed, the words “customize” and “customer” share the common root. Assuming they have sufficient skills and resources, customers can get more customized results by doing the task themselves since they are not constrained by practical or legal restrictions of hired service providers.

**Principle #4: Surrogate positioning.** Surrogate interaction is a tremendous tool for balancing the classic tradeoff between process efficiency and customization (Frei 2006). Changing an independent processing step to an interactive step or vice versa can be disruptive; and firms can use the surrogate-process region as a less-disruptive alternative.

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3Customers engaging in self-service surrogate interaction or do-it-yourself independent processing are usually not paid by the provider firm for their efforts; therefore represent efficiency to the firm.
These four principles are depicted in Figure 6 below. An application of these four principles will be discussed in the subsequent section.

**Innovation and Strategic Process Positioning**

The PCN framework unlocks a powerful approach to service innovation based on exploring process configuration alternatives. Innovation can be introduced into process chains by repositioning steps or sets of steps across the regions of a process domain or across the entities of a process-chain network. It should be recognized that there are always process alternatives, with some being more practical than others in terms of costs and benefits. It should also be recognized that in many cases, service (or interactive processing) is one option, and independent processing is another. **Service is a strategic choice!**

For example, consider a process chain involving financial investment management. Figure 6 depicts positioning options for a process step to analyze investment alternatives, with the provider being a firm with investment expertise. In option 1, the firm performs the investment analysis independently from any client investor. In option 2, the firm analyzes a client investor’s investments portfolio in a back office operation that does not require direct interaction with the client. Option 3 accomplishes the investment analysis through direct interaction. Option 4 switches over to the customer’s process domain, meaning that the customer executes the analysis, using the provider’s resources. Finally, option 5 represents the customer doing the analysis independently from the firm.

![Figure 6: Investment analysis process options and principles](image-url)
Which is the best process positioning option? That depends on the needs, expectations, interests, and skills of the investor customer segment, in conjunction with the capabilities of the investment firm. The principles from the prior section provide guidance. The interactive options (especially option 3) are the least efficient, possibly requiring the customer to visit the provider’s location and provide information inputs for the investment analysis, with the location and interaction being important parts of the value proposition. If the customer desires extensive customization and control of the analysis process, positioning the step closer to the customer’s central region (option 5) has advantages. However, that comes with a cost of economies of scale, and it may require that the customer have the type of specialized investment analysis knowledge that one would expect an investment firm to have. Option 1 can have tremendous economies of scale, allowing the provider’s expertise to easily be shared with an unlimited number of investors who receive the newsletter, assuming the investors do not need customized investment advice from the firm. The surrogate options (2 and 4) provide balance between these operational factors.

In general, the best process positioning depends on the desired value proposition of a given process, as depicted by realization of costs and benefits in the process. For example, moving a process step from direct interaction to surrogate interaction will cause a decrease in cost ($), but may also have some impact on customer value (☹). One reason we mark value and cost steps is to observe where and how changes are likely to impact value and costs. We will now consider two common types of process-configuration changes.

**Enabling and Relieving Innovations**

Normann (2001, p. 73-74) discussed two major categories of process innovations, or what he called “value-space reconfigurations”: enabling innovations, which enable customers to do things that were previously provided by others, and relieving innovations, in which a firm takes over activities that previously were done by customers. In the PCN framework, enabling innovations are visualized by moving process steps from the provider’s process domain to the customer’s process domain. Relieving innovations are visualized by moving steps the other direction (toward the provider).

Normann cites the Swedish retailer IKEA as an example of a firm that successfully executed an enabling innovation for strategic advantage (Normann and Ramírez 1993; Normann 2001). A traditional stock furniture retailer such as Ethan Allen assembles furniture (or outsources assembly) and ships assembled items to its retail stores (see Figure 7a). IKEA differentiates by repositioning the “assemble furniture” step from IKEA’s process domain to the customers’ process domain, as depicted in Figure 7b. (It is often helpful to highlight steps involved in an innovation with double-border boxes.) This shift reduces the cost structure of the firm, allowing the sale of higher quality furniture at a lower monetary price.

Another differentiating feature of IKEA is the decreased customer intensity from having less of the process chain in regions of direct interaction (see Figure 7). The interactive firm in 7a provides product advice that is valued by customers (☹) by employing experienced and costly (-$) labor. (We sometimes place steps requiring judgment in rounded boxes.) Avoiding this interaction further helps IKEA’s efficiency and cost competitiveness.

Campbell, Maglio, and Davis (2011) describe relieving innovations in what they term super service, defined as providers performing tasks previously done by customers. They discuss home-delivery of groceries as a B2C example and vendor-managed inventories as a B2B example.
Figure 7: PCN Analysis for furniture retail

Provider  

e.g., Ethan Allen  

<table>
<thead>
<tr>
<th>Independent processing</th>
<th>Surrogate interaction</th>
<th>Direct interaction</th>
<th>Direct interaction</th>
<th>Surrogate interaction</th>
<th>Independent processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>design furniture offerings</td>
<td>assembl e furniture</td>
<td>give advice</td>
<td>ask questions</td>
<td>browse showroom</td>
<td>trash old furniture</td>
</tr>
<tr>
<td>$</td>
<td>no</td>
<td>yes</td>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ship to retail stores</td>
<td>deliver item</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Customer  

furniture purchaser  

use item  

---

Provider  

IKEA  

<table>
<thead>
<tr>
<th>Independent processing</th>
<th>Surrogate interaction</th>
<th>Direct interaction</th>
<th>Direct interaction</th>
<th>Surrogate interaction</th>
<th>Independent processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>design furniture offerings</td>
<td>create furniture kits</td>
<td>browse store</td>
<td>make selection</td>
<td>assemble item</td>
<td>use item</td>
</tr>
<tr>
<td>$</td>
<td>ship to retail stores</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$</td>
<td>purchase item</td>
<td>transport item to register</td>
<td>transport home</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Other examples of relieving innovations fall under the heading of *servitization*, which is when manufacturing firms (largely engrossed in independent processing) make a strategic process shift into related services (i.e., interactive processes). Neely (2008) provides some examples. One example is a jet engine manufacturer, Rolls-Royce Aerospace, shifting from selling engines to leasing engines by the hour of use, and in the process relieving customers of engine maintenance and repair processes. Another example is IBM, a firm that previously focused on designing and producing computer hardware that customers would use to meet their computing needs, but now provides managed hosting services, relieving customers of having to manage their own IT. In each of these examples of relieving innovation, process steps shift from the customers’ process domains to the providers’ process domains.

**Putting PCN Analysis to use**

In this final section, we discuss how service and Service Operations Management can be more clearly conceptualized through the PCN framework, and how the framework can help guide the efforts of professionals from Service Operations Management and related disciplines.

**Foundational principles of PCN Analysis**

The following are three important insights coming from the PCN framework.

1. **The diversity of business operations are built upon three fundamental process regions.**
   
   Some have suggested that the diversity of service businesses may require “developing separate paradigms for different categories of services” (Lovelock and Gummesson 2004, p. 37). For example, Edvardsson, et al. reviewed 57 research articles on defining service and surveyed 11 top service researchers, and concluded that “on lower abstraction levels a general service definition does not exist. It has to be determined at a specific time, in a specific company, for a specific service, from a specific perspective” (2005, p. 119). Conversely, we propose that processes that possess similar sequences of independent, surrogate interactive, and direct interactive steps will have similar operating characteristics, even if they are in seemingly disparate businesses. For example, auto repair involves independent processing to prepare skills and technology, direct interaction to review symptoms, surrogate interaction to diagnose, direct interaction to confirm a repair plan, surrogate interaction to perform the actual repair, and direct interaction to handle payment. That process chain is surprisingly similar to process chains found in management consulting, kitchen remodeling, healthcare, and estate planning. Indeed, the basic structural elements of PCN Diagrams can reveal commonality among seemingly disparate lines of business.

2. **Every business has a mix of interactive processes and independent processing.**
   
   As mentioned, some researchers have suggested that all businesses are service businesses. That may imply that all process chains ultimately involve value-laden interactions with customers, which may be true, but it provides little in the way of strategic direction (Sampson, Menor, and Bone 2010). All businesses also involve essential aspects of independent processing, which does not imply that all businesses are make-to-stock manufacturing (the quintessential non-service process). The PCN framework shows how process chains contain both independent and interactive process elements—and we will not likely find any businesses that involve only interactive service processes or only independent processing.

3. **The nature of the process mix makes a difference in how the process should be managed.**
   
   Some processes are conducive to interaction, and others are not. Table 1 listed some examples of significant managerial distinctions between independent processing and direct
interaction, and others are described by Sampson (2001) and Sampson and Froehle (2006). Service interaction requires some degree of integration of processes across multiple entities, and can, therefore, be more difficult to design and execute than independent processes.

**Using PCN Analysis in various functional areas**

Service Operations Management is primarily the management of process chains that have steps involving interaction among process entities. From this perspective, a “service system” can be defined as a network of process entities that have one or more process chains in common (e.g., Figure 5), and the emerging field of “Service Science” can be defined as the science of multi-entity interactive processes. The purpose of PCN Diagrams is to help Service Operations Management researchers and practitioners in documenting, designing, analyzing, and reconfiguring processes of all types. Other functional areas can also find value in their use.

Service Marketers can use PCN Diagrams in New Service Development (NSD) to prototype (on paper) potential service offerings and assess opportunities for increased customer value. This may include exploring the implications of increased customer engagement, such as by moving process steps from a firm’s process domain to the customer’s process domain. PCN Diagrams can help communicate new service configurations to potential customers, and, using methodologies such as conjoint analysis, assess customer value resulting from changes in process configuration.

Human Resource Managers can use PCN Diagrams to help employees understand their roles in service delivery processes, and how their roles relate to customer roles. The nature of job design is very much influenced by the process region the job spans, which has implications for employee selection criteria. Also, work measurement and compensation can vary dramatically depending on the process configuration.

Strategic planners can use the PCN framework in considering the strategic implications of various process configuration alternatives. PCN Diagrams can be constructed to depict process design alternatives, which can be used to show how each alternative may provide a different value proposition. Further, current and proposed processes can be assessed as to whether they are consistent with the process strategy and skill set of the firm.

Service Operations Management professionals are (or should be) service system integrators, or what Normann referred to as “Prime Movers” (2001, pp. 26-36). This means they need to have a broad understanding of the firm’s interactive and independent processes as well as of the related processes along the process chains with which the firm is involved. This requires understanding traditional operations, customer interfaces, and supply chains that extend outside of the firm. This can also mean understanding the processes of suppliers, suppliers of suppliers, and so forth. Integration requires identifying what information needs to be shared across the process chain, and how the integration should best be implemented, measured, and controlled.

**Summary**

Service systems have been characterized as complex, which can be attributed to the intertwining processes that span networks of entities with bidirectional interactions (Sampson 2000). The PCN framework facilitates the analysis of interactive service processes as they exist within multi-entity systems. PCN Diagrams allow us to depict complex processes, identify value propositions and cost drivers, and consider strategic process alternatives. Practitioners and researchers can use PCN Analysis to visualize, analyze, and solve SOM problems.
References


