ABSTRACT

Traditional technologies for service design have largely focused on dyadic relationships between service providers and customers. This research advances service design by describing how the processes that underlie the interactions in service networks can be modeled through a methodology known as Process-Chain-Network (PCN) Analysis. We provide examples of the applications of PCN Analysis to common network configurations found in the delivery of healthcare services. We demonstrate the value of PCN Analysis by first modeling process interactions within networks in multiple service encounters in a case study of a regional healthcare system, then showing how to diagnose and improve service delivery.

KEYWORDS: service operations, service networks, service design, healthcare operations

1. INTRODUCTION

Traditional operations management focuses on processes within firms. Supply chain management extends that focus outside the firm, considering relationships between entities such as firms and their suppliers and customers. Supply chain management is thus considered a more comprehensive view of production. However, the study and discussion of supply chain management has had three deficiencies. First, supply chain management in research literature has focused on dyads, whereas real world supply chains are composed of triads and networks (Choi & Wu, 2009). Second, supply chain management literature is fixated on the study of manufactured product supply chains, with sparse reference to the omnipresent service supply chains (Sampson & Spring, 2012). Third, the supply chain management literature focuses on relationships between firms or entities within firms, with little attention to the specific processes that define those relationships (van der Valk & Wynstra, 2012).

This research report will help fill the gap of these three research deficiencies. We will describe how the processes that underlie service networks can be modeled through a methodology known as Process-Chain-Network (PCN) Analysis. We will specifically apply PCN Analysis to service networks manifest in healthcare. We analyze process interactions in the...
case of a regional healthcare system to demonstrate how PCN Analysis can represent and diagnose process deficiencies in those networks.

The healthcare environment provides a dynamic case setting that is characterized by significant complexity in patient conditions, fragmented care processes that often rely on uncoordinated work by specialists, payment systems that create incentive misalignment between patient wellness and provider financial performance, and expanding systems of providers (Christensen, Grossman, & Hwang, 2008). Healthcare services are experienced by the vast majority of individuals living in developed nations and represent an astonishing percentage of GDP.

The next section explores the application of various service relationship models in healthcare settings. We provide a brief introduction to PCN Analysis as a superior methodology. Finally, we demonstrate the use of PCN Analysis in healthcare service networks and show how this analysis tool can be utilized to diagnose and improve service design.

2. SERVICE RELATIONSHIP MODELS

Services have been described in various ways in the research literature. Archaic perspectives consider services to be intangible products. However, the intangible product idea has come under severe scrutiny in recent years (Grove, Fisk, & John, 2003; Lovelock & Gummesson, 2004; Vargo & Lusch, 2004; Sampson & Snow, 2011).

A more enlightened perspective considers services to be process relationships between entities. Li and Choi (2009, p. 28) cite the “one enduring characteristic” of service relationships, namely that, “the customer interacts with the service provider during the process of delivery.” This is embodied in the Unified Service Theory (UST), which states that “with services the customer provides significant inputs into the production process” (Sampson & Froehle, 2006, p. 331). Examples include passengers providing themselves and their luggage as inputs to airline processes, homeowners providing their homes as inputs to plumbing repair processes, taxpayers providing their financial records to tax accounting processes, and patients providing their physical and/or mental conditions as inputs to healthcare processes.

2.1. Service Supply Chains

The UST perspective characterizes services as bidirectional supply chains, meaning that the customer provides a production resource to the service provider, and the service provider provides a resource back to the customer, perhaps the same resource modified. A simple example from healthcare is depicted in Figure 1. The customer (a patient) provides the physical or mental condition of his or her body including symptom information to the service provider (the physician), and the physician provides a treatment to the patient as customer.

![Figure 1: Dyadic healthcare service supply chain](image)

Figure 1 also depicts an element of a traditional unidirectional supply chain, namely the relationship between the equipment supplier and the physician. In that relationship the
physician is the customer and the equipment manufacturer is the supplier. The physician does not provide any resources to be used in the production of the equipment, but simply pays for the equipment after it is produced (and possibly provides feedback). That payment is used by the equipment manufacturer to fund subsequent production of equipment, but not for the production of the paying physician’s equipment. Conversely, we recognize that custom manufacturing, based on customer specifications, is not unidirectional, but is a bidirectional service supply chain (Sampson, 2001, p. 142).

In a service supply chain the customer is both a supplier of input resources and recipient of outputs, which is the concept of “customer-supplier duality” (Sampson, 2000). The example shown in Figure 1 only represents a service dyad between the patient and the physician. Our interest in this research report is service networks, such as the simple triadic example depicted in Figure 2. There the physician outsources the analysis of patient fluids to a lab, which is also a service provider. The physician uses the resulting analysis report in the delivery of his or her diagnostic services.

![Service Supply Chain Diagram](image)

**Figure 2: Triadic healthcare service supply chain**

Sampson (2000) referred to relationships like that in Figure 2 as two-level bidirectional supply chains. van der Valk, Wynstra, and Axelsson (2009) refer to these relationship as “semi-manufactured services,” wherein the resources received from the second-tier supplier (the lab in this case) are transformed (by the physician) before they become part of the first tier-supplier’s (the physician’s) offering to the end customer (the patient).

### 2.2. Service Triads and Networks

We called the diagram in Figure 2 “triadic,” van der Valk and van Iwaarden (2011) suggested that relationships like Figure 2 are not service triads in the purest sense, since they only consist of two dyadic relationships. Those authors focus our attention on a more interesting triadic relationship wherein “the subcontractor interacts directly with and receives inputs from the end customer” (van der Valk & van Iwaarden, 2011, p. 199). This is closer to the traditional buyer-supplier-customer triads discussed in the literature (Li & Choi, 2009).

This type of triad is seen in healthcare when a patient visits a primary care physician (PCP) about an ailment and is referred to a specialist, as depicted in Figure 3. In this configuration, the primary care physician makes a decision about which specialist the patient will see, and thus acts as a buyer. The specialist is the supplier of specialized treatments.
These types of buyer-supplier-customer relationships present many interesting issues (Niranjan & Metri, 2008; Holma, 2012). One issue is how the relationship between the patient and the PCP influences the relationship between the patient and the specialist supplier. The patient may have expectations for the specialized healthcare supplier based on interactions with the PCP.

Another interesting issue is how the relationship between the PCP and the specialist influences the service provided by each to the patient. This is particularly relevant in the case of comorbidities—when a patient has a number of related maladies. For example, a PCP may treat a patient for diabetes, but suspect the patient may also have mental health issues such as depression. The treatment of diabetes could be tremendously assisted by the treatment of the depression, suggesting there should be some coordination between the PCP and the mental health specialist. Further, the primary care and specialist physicians may have overlapping capabilities for serving the patient. These types of issues will be discussed in a later section.

In reality, the service system of healthcare is much more complex than even the triad depicted in Figure 3 would have us believe. Figure 4 illustrates how individual patients can require the services of numerous specialized providers. Our diabetes patient needs to deal with insurance companies, pharmacies, and possibly nutritionists. If exercise is prescribed then interaction with physical therapists, fitness trainers, and gyms may be required, and may also induce interactions between the provider entities in the network (examples given by thin connectors).
The arrows in these type of relationship diagrams represent interactive relationships (Holma, 2012), but do not provide detail about the actual nature of the relationships and the processes that underlie those relationships. van der Valk and Wynstra (2012) emphasize the importance of understanding the nature of these relationships, stating that “for success to occur, a specific interaction pattern always has to be in place.” They refer to Roth and Menor (Roth & Menor, 2003, p. 151) who assert “in the design of service encounters both the locus and nature of the interactions between the service providers and customer must be specified.”

This research report explores the nature of service interactions, specifically network interactions that involve more than two entities (for example, triads). Relationship diagrams like those shown above leave the nature of interactions in the abstract. They address what Holma (2012) calls the relational dimension of interpersonal interaction, but neglect the structural dimension.

What researchers and analysts really need is the ability to document and understand the interactive processes that compose relationships in service networks, so that opportunities for operational improvement might be explored. The tool we will use is PCN Analysis. In the next section we will review basic elements of PCN Analysis. For more details about PCN Analysis, including a review of alternate process modeling techniques, see Sampson (2012; 2014).

3. BASIC PCN ANALYSIS

Process-Chain-Network (PCN) Analysis begins with the concept of a process entity that has a process domain. The process domain comprises all of the process steps that are performed, directed, and controlled by the given entity. A process entity could be an individual, a department, a beneficiary, or any unit of process execution and control.
Figure 5 shows how a process domain is drawn as a triangle over three process regions. The outermost region (right and left sides) holds steps involving direct interaction, or person-to-person interaction, between that entity and some other entity. Airline examples are shown, and other examples will be given below. Just inside the regions of direct interaction are regions of surrogate interaction, meaning that the entity is interacting with resources coming from another entity, but not interacting with the other entity in a person-to-person manner. Finally, the central region of the process domain depicts steps of independent processing, wherein the entity is acting on resources that are owned and controlled by that same entity.

The concept of surrogate interaction has been alluded to in prior literature. Chase (1978) referred to work being performed on customer surrogates, such as completed forms. More recently, Balakrishnan, et al, (2008) delineated a difference between in-person contact and symbolic contact. Other authors have discussed the concept of indirect interaction that is mediated through some resource (Wemmerlöv, 1990; Vargo & Lusch, 2008; Holma, 2012). The point is that there is a fundamental difference between interaction with people and interaction with inanimate resources, even resources provided and owned by other entities.

The sloped roof of the process entity represents the degree of process control, and symbolically reminds us that interaction with other entities typically requires some ceding of process control. Traditional manufacturing operations that occur within a factory may be in regions of independent processing, which allows for maximum process control. Custom manufacturing that acts on customer specifications (i.e., surrogate interaction) gives some control to the customer entity. True co-production, where providers and customers operate together, further reduces the provider’s process control.

PCN stands for Process-Chain-Network, which captures the idea that we are analyzing networks of entities that are tied together by process chains. A process chain is a sequence of interdependent steps with an identifiable purpose, which purpose is always to contribute some value through the satisfaction of needs of the various entities. A PCN Diagram is a depiction of
process steps that span entities, and PCN Analysis includes identifying the relationships between entities and how value is delivered so that needs might be satisfied.

Figure 6 shows an example of a PCN Diagram for a healthcare situation. That figure is taken from Sampson (2012), which provides readers who are unfamiliar with PCN Analysis with a more detailed explanation. For now, we emphasize that PCN Analysis can depict process interactions at various levels of analysis, including individual-individual, organization-organization, and individual-organization interactions as shown in Figure 8. That example considers four process entities: a health clinic, a patient, an insurance company, and a pharmacy. In this scenario, the patient feels weak, drives to the clinic, and checks in at a kiosk. After waiting the patient discusses symptoms with the physician, who takes a blood sample. (In this example, we group the physician with the health clinic. Alternately we might have depicted the physician as a separate entity from the clinic, particularly if the physician has different process decision objectives from the clinic.)

Figure 6: Healthcare PCN Diagram (from Sampson, 2012)

The clinic analyzes the patient’s blood (surrogate interaction, since the clinic is acting on the patients’ blood resource). Subsequently, the physician prescribes medication and calls in a prescription to the pharmacy. (The B/4 connector uses standard flowcharting notation,
indicating that the process continues at connector node B accompanying entity 4.) The patient drives to the pharmacy, shows ID, and fills the prescription. The pharmacist checks insurance coverage, and indicates the patient’s co-payment amount. Previously, the insurance company developed a payment schedule and established a coverage agreement with the pharmacy. This allows for efficient processing of payments.

This simple example describes a process that is susceptible to failure. For example, an author went through this process, only to have the pharmacist complain that the prescription was not prepared properly by the physician. As a result, the author had to wait over a weekend to have the prescription verified and corrected. Subsequently, the insurance company contacted the author to receive verification that the prescription was justified by the physician, requiring the author to provide the clinic with additional paperwork for submission to the insurance company.

A PCN Diagram depicts interactive processes, and PCN Analysis includes identifying opportunities for process improvement. One of the primary functions of PCN Analysis is “strategic process positioning” which involves shifting process steps across the regions of process domains to achieve improved operating characteristics (Sampson, 2012). For example, as shown in Figure 6, the patient checks in at the clinic via surrogate interaction with the clinic’s kiosk. Alternately, the patient could check in through direct interaction by talking with a receptionist. Or, the clinic could check in the patient by simply observing that the patient arrived.

To facilitate reposition of process steps across a PCN Diagram, the steps begin with a verb followed by various resource nouns. The subject, or executor, of the process step is implied by the positioning of the process step within a process domain. Shifting a process step to a different process domain implies that the step is to be performed by the entity of that domain.

Again, this is intended to be a brief introduction to PCN Analysis, and the reader is referred to Sampson (2012; 2014) for a more detailed description. The focus in the present research report is using PCN Analysis to document and analyze processes of service networks, with specific application in healthcare, as discussed in the next section.

4. PCN ANALYSIS OF HEALTHCARE SERVICE NETWORKS

We will demonstrate the application of PCN Analysis through an actual healthcare service process network situation. The subject of study is a large regional healthcare organization located in the United States. The organization operates more than twenty hospitals and more than 100 clinics, and involves thousands of physicians and hospital beds. Admittedly, our application of PCN Analysis to this organization was performed post hoc, since PCN Analysis was developed (by the lead author) just at the time the empirical study was being completed. Regardless, the healthcare study provides a rich basis for demonstrating the use of PCN Analysis in service process network analysis.

The specific problem of interest is how to deal with patient comorbidities, wherein patients have multiple health problems that are often related to one another. For example, Hertzlinger (2007) reports that nearly half of the more than 20 million diabetics in the U.S. also suffer from high blood pressure, and up to a tenth suffer from other diseases such as asthma, heart disease, and behavioral issues or other type of mental illness. For purpose of illustration, in this paper we focus on patients that suffer from a comorbidity of diabetes and a form of mental illness. Patients with diabetes may be treated by a primary care physician (PCP), who is often a general practitioner or, in some cases, may be a diabetes specialist. Although the PCP may be able to recognize the symptoms of a given mental illness, it is unlikely that he or she has advanced training in psychiatry, and therefore would need to refer the patient to a
psychiatric specialist. (In this basic scenario we assume the PCP can treat the patients’ diabetes—otherwise a diabetes specialist may also be needed.)

Figure 7 depicts this triadic network relationship. Note that this is similar to what we saw in Figure 3, but we now provide more details of the production flows between entities in the triad. This base-case example describes what might traditionally happen in a healthcare organization prior to attempted process redesign, that is, prior to making attempts to integrate its healthcare processes (Herzlinger, 2007).

As depicted in Figure 7, the patient provides his or her symptoms to the PCP. If the PCP determines that specialized care is needed, the PCP provides the patient with a referral to an appropriate specialist. That referral is basically a prescription to see a particular specialist. The PCP may simultaneously or subsequently forward the patient’s medical records to the specialist so that the specialist will have needed information about prior and current health conditions and treatments.

Then, the patient visits the healthcare specialist and provides symptoms and other relevant information, which may include participating in tests of various types. The healthcare specialist then provides a treatment to the patient, which may include prescribed medicine or other interventions. (In this example we are not considering the pharmacy or insurance provider, as was done in Figure 6.)

4.1. PCN Representation

As with all relationship or information flow diagrams, Figure 7 does not provide the interactive process details that are needed to more clearly understand what is happening within the service triad. In fact, the healthcare organization hypothesized that the healthcare provided by the triadic relationship depicted in Figure 7 could be further improved. To understand how it might be improved, we will represent this triad in a PCN Diagram.

As depicted in Figure 8, we begin by considering the process relationship between the patient and the PCP. The patient has a health problem independent from the physician. The patient travels to the PCP’s health clinic, which is depicted as surrogate interaction because it involves the patient acting on an address coming from the clinic. For simplicity we have omitted the steps of calling to make an appointment, which will be discussed below.
The patient meets with the PCP in direct interaction. (Again, for simplicity we have omitted all of the steps of checking in at the clinic, although that detail is easily incorporated in a PCN Diagram.) The patient discusses the symptoms with the PCP through direct interaction. Note that this is only one process configuration alternative for the “discuss symptoms” step, another alternative being for the patient to log the symptoms and email them to the PCP, which would be surrogate interaction.

If the diagnosis does not require a specialist, the PCP provides whatever treatment is necessary, such as processing a prescription. However, that is not the focus of this study, so details of PCP treatment are omitted. What we study here is the situation where a specialist is required, implying that the PCP provides the patient with a referral, and then prepares the referral information that is sent to the specialist. The “send records” step of Figure 8 is annotated with “(to specialist)”, which indicates that the surrogate interaction involves another process entity (the specialist) that is on a different part (or page) of the PCN Diagram. Likewise for the patient calling the specialist and scheduling an appointment, shown on the right side of Figure 8.

The next part of the PCN Diagram is depicted in Figure 9. Note that Figure 8 and Figure 9 could have been combined into one figure, as was done in Figure 6. However, we want to illustrate how a PCN Diagram can easily be created to span multiple pages. One method for connecting steps was described in conjunction with Figure 6. Alternately, steps on one PCN Diagram that interact with an entity on another PCN Diagram are noted with a parenthetical indication of the other entity, as with the “(to specialist)” indication shown on Figure 8.
In Figure 9, the healthcare specialist receives the patient’s records (from the PCP) and waits to hear from the patient. The patient hopefully calls the specialist to schedule an appointment. At the appointed time, the patient travels to the clinic. The dashed line between “schedule appointment” and “travel to clinic” indicate a loose temporal dependency, i.e., that some amount of time will pass between the two steps.

At the appointment the patient discusses symptoms and provides test data. In the case of psychiatric evaluation this may include completing psychiatric tests. The test data is analyzed by the specialist (as shown) or some other entity (not shown), and the specialist provides treatment. In some cases, the patient is expected to subsequently follow up with the PCP.

4.2. Diagnosing process failure

The organization we studied observed an unfortunately high failure of patients to follow up with psychiatrists, healthcare specialists or other providers as prescribed or recommended by PCPs. Figure 9 highlights two process failure points that are each identified with a circled (F). The first failure point occurs when patients do not call and schedule the necessary appointment with the specialist. Note that it may be difficult for a patient diagnosed with mental illness to make the effort and competently follow up as prescribed by the PCP. As a result, appropriate treatment may not always be established, further contributing to one of the original ailments (such as diabetes or mental illness).

The second failure point marked in Figure 9 has to do with keeping the appointment even if made. A nontrivial percentage of comorbid patients may not have personal transportation, therefore requiring the patient to use public transportation. The process of using public transportation is depicted in Figure 10. This may seem like a relatively straightforward process, but the organization of this case study found that the process of securing transportation and actually making the effort to follow through was a deterrent for some patients.

These two failures can be attributed to the fact that this triadic configuration—shown in Figure 7 and detailed in these PCN Diagram pieces—requires the patient to be the network coordinator. In other words, the patient is responsible for providing key coordination links between the entities. Unfortunately, some patients may lack knowledge and/or motivation for this coordination responsibility. The mental illness morbidity, possibly in combination with other illnesses, may exacerbate the issue.
The healthcare organization took steps to address this problem by collocating psychiatric specialists in the clinics housing the PCPs. The psychiatrists would spend perhaps one day per week at the clinic meeting with patients referred by the PCPs of the clinic. This could help accomplish two objectives. First, it would reduce the transportation concerns, since it was assumed that patients were already capable and accustomed to visiting that clinic. Second, it was expected to facilitate better coordination between the PCPs and the psychiatric specialists.

The model involving physician coordination is shown in Figure 11, which is essentially the same as Figure 7 except for having a bidirectional link between the PCP and the specialist. This is the model of healthcare delivery that has been adopted at the famed Mayo Clinic, where physicians meet weekly to discuss patients with comorbidities that span areas of responsibility (Christensen et al., 2008).

Figure 10: Patient-transportation provider interactive process

Figure 11: Healthcare process network - physician as coordinator
The colocation of specialists with PCPs provided improvements in healthcare results but by itself was not deemed sufficient to resolve all the issues. Physicians are notorious for acting as independent contractors (perhaps rivaled in their independence only by university faculty). Just having colocation does not guarantee coordination between physicians, and productivity expectations may actually discourage coordination. Further, collocating specialists with PCPs will not fully solve the scheduling and transportation issues. Patients who are expected to execute their own follow up with specialists and make the necessary appointments and transportation arrangements may still have difficulty in doing so.

4.3. Coordination via a Care Coordinator

Thus as an added cornerstone of improved coordination, the organization implemented a “new” role of Care Coordinator (CC). A CC is typically a registered nurse with a general understanding of the healthcare process. In particular, the CC would know the resources of the healthcare organization, and also know the needs of specific patients. This revised model is depicted in Figure 12. The CC is responsible for coordinating the services between the disparate providers. For example, the CC will help perform tasks such as informing the patient about the efficacy of the drugs, offering information regarding community resources available to the patient outside of formal treatment, helping organize appointment schedules, tracking whether the patient has picked up the prescribed medications, and checking in on the patient's progress outside of the formal appointment visits.

![Figure 12: Healthcare process network – CC as coordinator](image)

Earlier we suggested that the CC role was “new”, but we put “new” in quotes because similar roles existed previously in this and other healthcare organization—sometimes called “Case Manager” or “Care Manager”—that coordinate needs and resources in order to provide quality care to patients at efficient cost to providers. What is somewhat “new” is the way in which the CC’s role is implemented in the organization we studied. Each CC (and each PCP, for that matter) is effectively given training in two areas (each is explained further below): 1) helping determine the process domain for positioning specific steps of care; and 2) helping
determine the process region for specific steps, i.e., whether a given task is best performed via direct interaction or surrogate interaction or independent processing.

With regard to the first point, determining the appropriate process domain, consider the entity of ‘patient.’ Note that some patients will be capable of interacting directly with a pharmacist in getting a prescription filled, while others will rely on the CC to complete the task. To establish the appropriateness of leaving interactive steps in the patient’s process domain, the CC and PCP use a tool called a ‘patient assessment instrument’ (PAI). The PAI assesses the severity of the mental illness along with the level of familial and other support the patient may have access to. This in turn determines which steps should be moved to the CC’s process domain – that is, it determines which process steps the CC will directly manage.

Next consider the second point, that of direct or surrogate interaction or independent processing. If, for example, the patient needs physical therapy, perhaps the patient can perform her own physical therapy (constituting independent processing), but on the other hand perhaps she will recover much faster if she participates in a session with a physical therapist (representing direct interaction). Again, the PAI (along with continual feedback as to the patient’s progress) may help determine the appropriate process configuration.

To reiterate, a limitation of a relationship diagram like Figure 12 is that it provides sparse indication of how the process configuration is actually implemented. For implementation details we turn to a PCN Diagram like that shown in Figure 13. That figure shows a moderate level of detail, sufficient to outline a process spanning five entities on one page. A more detailed PCN Diagram can be constructed that would span multiple pages and include other entities such as insurance companies, pharmacies, and so forth.

Figure 13 again begins with the patient’s health problem. The patient meets with the PCP and is provided with a referral to a specialist. The PCP notifies the CC about the referral. As appropriate, the CC coordinates scheduling an appointment between the patient and the specialist, which is a triadic interaction. That highlighted step exists in the region of direct interaction between the CC and the specialist, and also includes ‘entity 2’ which is the Patient, making it a triadic interaction. Then, the CC separately reviews the patient situation with the specialist, and discusses the arrangement with the patient, including identifying a possible transportation need. If there is a transportation need the CC facilitates scheduling between the transportation provider, such as a taxi company, and the patient. On the appointed day the transportation provider picks up the patient and takes him or her to the specialist. The specialist discusses symptoms, gathers test data, and provides treatment. The specialist also notifies the CC, as depicted via the connector node A/3 (i.e., node A which is located on the diagram for entity 3). The CC follows up with the patient, and if follow-up with the PCP is necessary, schedules a follow-up visit between the patient and the PCP—another triadic interaction.

The value of a PCN Diagram like Figure 13 is seeing the process that defines the interactions between the various entities. This allows us to more easily and clearly communicate expectations and requirements to the various parties, and to diagnose opportunities for process improvement. PCN Analysis is therefore a tool for process visualization, analysis, design, and improvement.
Figure 13: PCN Diagram of CC managed process
4.4. Process Customization and Empirical Effects

The new treatment framework involving Care Coordinators (CCs) and the patient assessment instrument (PAI) was rolled out by the healthcare organization to numerous clinics over a course of several years. What is important to note is that this new paradigm customizes the treatment for each patient, in that the process domain for specific steps may differ for each patient, and in addition, the process region (direct interaction versus surrogate interaction versus independent processing) is customized for each patient (an example for one patient was shown in Figure 13). By effectively customizing the process configuration for each patient, the organization was able to significantly enhance patient care outcomes, particularly for those patients that otherwise had difficulty managing the direct interactions between themselves and another entity. A key result was that for such patients, the frequency of need for emergency intervention was cut in half. In addition, the internal surveys done by the healthcare organization showed increased customer satisfaction. And notably, employee satisfaction increased as well – in particular, the PCPs reportedly felt a heightened sense of accomplishment and satisfaction in being able to provide the enhanced patient care. These represent dramatic and important health care achievements.

4.5. Service process network innovation

PCN Analysis not only facilitates documenting and implementing an appropriate service process, but also can be used to explore process configurations that are departures from the norm, even to the point of being process innovations. This is accomplished by further shifting steps between regions of process domains and observing the impact on process efficiency and effectiveness.

An example of a service process network innovation is shown in Figure 14, where the base configuration is the highlighted step from Figure 13. Process Innovation A has the Care Coordinator identifying times that the patient is available to meet with the specialist, scheduling an appointment using the specialist’s online scheduling system (surrogate interaction), and then notifying the patient via email (also surrogate interaction). Innovation B has the care manager directly notifying the specialist about the need to meet with a patient, and letting the specialist contact the patient to make an appointment.
The appropriateness and value of each process innovation depends on the capabilities and motivations of the various entities, as well as desires for efficiency and effectiveness. For a more detailed discussion of using PCN Analysis for service process innovation, see Sampson (2012; 2014).

5. CONTRIBUTION SUMMARY

We have shown how PCN Analysis provides a process view of service networks and enables analysis of interactions of entities across a service process network. In comparison to existing approaches of modeling service networks, this approach enables better diagnoses of areas for improvement in service processes, a paramount concern in practice and research. PCN Analysis can be used to study common network configurations in services at the process level of analysis. PCN Analysis is therefore a way for the practitioner to better understand how interactive processes can actually be implemented and improved.

The contextual focus of this research report was on network examples commonly found in healthcare services, and exemplified by a case study of a regional healthcare system. We show that PCN Analysis provides more in-depth examination of service relationships in healthcare networks than can network relationship diagrams. A relationship diagram (such as Figure 12) depicts relationships only by arrows between process entities, whereas a PCN Diagram (such as Figure 13) identifies the nature and type of interaction involved in each significant process step. PCN Analysis advances our understanding of the actual processes occurring between interacting entities as well as the nature of those service interactions. We also demonstrated how it can be used to explore process innovations in service networks.

There are many future opportunities for research applying PCN Analysis to service networks. It would be interesting to analyze the processes that occur in and enable coopetition.
between service suppliers such as primary care physicians and specialists (Wu, Choi, & Rungtusanatham, 2010). PCN Analysis can be used as a rich tool for innovation and New Service Development (Menor, Tatikonda, & Sampson, 2002). Or, it can be used to identify process strategies for mitigating coordination risks that are inherent in service networks.

References


