AN EXPLICATION OF THREE SERVICE BUSINESS PROCESS MODELING APPROACHES

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ABSTRACT

Business process modeling is an important aspect of analyzing the needs of a modern firm. The models produced are used in diverse ways including understanding services delivered to customers, underpinning enterprise architecture, explaining future changes and the automation of processes, and in defining information technology to support processes. However, there is also a diversity of modeling techniques used. This paper is an explication of three of the most popular: service blueprinting, business process modeling notation (BPMN), and a new approach called process chain network (PCN). The paper concludes with future works to better understand how these approaches can be used in conjunction.

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INTRODUCTION

Managers in service businesses are particularly interested in service design as this has a major impact on service delivery costs as well as customer satisfaction and loyalty (Ostrom et al., 2010). Service process visualization techniques are useful tools that can be used to analyze various aspects of a service delivery process. Most service managers are familiar with service blueprinting, which has been around for over 30 years (Shostack 1982). Blueprinting essentially takes the viewpoint of the customer in mapping out the service delivery process. But there are two other service process visualization techniques that have been developed more recently that can also be useful in service delivery design. Business Process Modeling Notation (BPMN) is about ten years old and as a more technical approach it takes the viewpoint of the service provider (Milton and Johnson, 2012). Even more recent, is a visualization method called Process-Chain-Network (PCN) analysis developed by Sampson (2011), claimed to be superior to service blueprinting.

Since the latter two service process visualization techniques are not as familiar to service managers, this paper provides a fairly detailed, yet concise, explication of all three techniques. To this end, the next section describes service blueprinting, followed by a section on PCN, and then a section on BPMN. Each section describes the core concepts for each technique; summarized in a table for each. The paper then concludes with some suggestions for future research on comparing the three service process visualization techniques.

SERVICE BLUEPRINTING

Service blueprinting is the most well-known and popular service process modeling technique, which was developed especially for service marketing and innovation in the 1980s by Shostack (1982, 1984, 1987). Kingman-Brundage (1989, 1991, 1993, 1995) further developed service blueprinting and called it service mapping. Service blueprinting can be used for mapping and revising an existing service or for designing new services. A service blueprint is based on the customer view, not the organizational view. This means that customer interactions with individuals or
technologies (e.g., websites) are the major features of a service blueprint. According to Bitner et al. (2008), in an ideal blueprinting process, cross-functional teams and possibly customers will be involved in visualizing an entire service. This includes all of the customer contact points, underlying support processes, physical evidence and other process functions involving customer experience. Customer experience is important as it can distinguish a company from other providers in the market (Alonzo-Helton et al. 2013). Indeed, a service blueprint is a holistic snapshot of all relevant resources, actors, and activities that represent the steps and tasks in the process of service delivery (Ojasalo 2012). Service blueprinting can be used to document the process steps, checking the logical order of process steps and spotting failure points in a service system (Berkley 1996).

Service processes do not include just technologies and objects alone, they are customer induced. Therefore, service blueprinting is a powerful method in the service context (Zeithaml et al. 2006). Employing service blueprinting is beneficial especially in the phase of concept development when designing a new service. Specifically, it can be used to understand what the service involves and the roles of front-line employees, customers, and support personnel, in the process of service production and delivery (Bitner et al. 2008). Service blueprinting provides an organized development process for customer experience management which results in achieving customer outcomes and organizational goals (Bitner et al. 2008). Figure 1 presents a basic blueprint for a hotel stay (booking on phone).

FIGURE 1. SERVICE BLUEPRINT EXAMPLE – HOTEL STAY (BOOKING ON PHONE)

According to Fließ and Kleinaltenkamp (2004, p.396) a service blueprint has two dimensions: “the horizontal axis represents the chronology of actions conducted by the service customer and service provider. The vertical axis distinguishes between different areas of actions. These areas of actions are separated by different “lines”. All the works done by different actors in a service blueprint are called ‘actions’. Props and physical evidence are the things that are seen by the customer and affect the customer’s perception of service quality (Bitner et al. 2008). The hotel stay example indicates that the actions and physical evidences in a service blueprint are represented by boxes. An action flow presents the sequence of actions performed by an actor. A communication flow connects the actions of different actors (Milton and Johnson 2012). The areas of actions represent different actors in a service blueprint. The actors are customer, onstage employees, backstage employees (or systems), support and management. There are four lines in a traditional service blueprint (Bitner et al. 2008):

- **Line of interaction**: separates customer actions from frontline employees and systems (frontline consists of onstage and backstage and includes all contact employees and systems);
- **Line of visibility**: separates onstage actions from backstage actions;
• **Line of internal interaction**: separates backstage actions from support actions;
• **Line of implementation**: separates support actions from management actions.
In addition to these lines, Fließ and Kleinaltenkamp (2004) added another line:
• **Line of order penetration**: separates customer induced actions from customer independent actions.

**FIGURE 2. SERVICE BLUEPRINTING LINES**

<table>
<thead>
<tr>
<th>The Lines of a Service Blueprint</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Map of Internal Process</strong></td>
</tr>
<tr>
<td><strong>Customer Actions</strong></td>
</tr>
<tr>
<td>Line of Interaction</td>
</tr>
<tr>
<td><strong>Concealed/Visible Employee Acts</strong></td>
</tr>
<tr>
<td>Line of Visibility</td>
</tr>
<tr>
<td><strong>Backstage/Hidden Employee Acts</strong></td>
</tr>
<tr>
<td>Line of Internal Interaction</td>
</tr>
<tr>
<td><strong>Support Processes (Unseen Drivers)</strong></td>
</tr>
<tr>
<td>Line of Order Penetration</td>
</tr>
<tr>
<td><strong>Support Processes (Unseen Highways)</strong></td>
</tr>
<tr>
<td>Line of Implementation</td>
</tr>
<tr>
<td><strong>Management Processes</strong></td>
</tr>
</tbody>
</table>

Figure 2 illustrates all service blueprinting lines. Fließ and Kleinaltenkamp (2004, p.396) define customer induced actions as the actions that “can be carried out after having been started by the customer or his/her external factors”. The external factors can be customer’s goods and information. The customer independent actions are “independent from a specific customer and only rely on the service company’s internal production factors” (Fließ and Kleinaltenkamp 2004, p.397). The internal production factors can be assets, commodity factors, semi-finished goods and finished goods. In fact, internal production factors are under the control of the service company while external factors are under the control of the customer. The line of order penetration is between the lines of internal interaction and the line of implementation. Fließ and Kleinaltenkamp (2004) explain that customer induced actions and customer independent actions have different impact on process efficiency; customer induced activities entail production risks and customer independent activities entail market risks. Production risk involves external factors, which are very hard to control by the service provider. On the other hand, market risks include the capacity and commodity factors in management, and are under the control of the service provider. Therefore, process efficiency is higher in customer independent actions that in customer induced actions. The steps involved in building a blueprint are as follows (Zeithaml et al. 2006):

1. Identify the target service process for blueprinting;
2. Identify the customer segment;
3. Map or design the customer interactions with service provider;
4. Map or design contact employee actions or technology actions related to the customer;
5. Link support and management actions to contact employees’ actions;
6. Add physical evidence for customer actions.

A service blueprint can be at various levels of detail depending on which department of the organization is shown and what purpose they depict. Service blueprinting can be used to depict the interaction of a customer with a service provider’s employees, or a company’s self-service technologies and websites. Figure 3 presents a service blueprint for a pizza takeaway (online ordering).
The core concepts of service blueprinting as shown in Table 1, which were defined earlier, with their precise definitions. The following section is dedicated to an introduction of the process-chain-network (PCN) analysis method.
PCN was introduced by Sampson (2011) upon which we base the discussion in this section. He claims that “PCN diagrams build on the strengths of other flowcharting techniques, while emphasizing the unique conditions and design opportunities for interactive service processes” (Sampson 2012, p.17). The aim of the PCN framework is to illustrate a balanced perspective of the provider-customer relationship and describe the interaction between provider and customer, considering service as a type of resource / process configuration. The involvement of the customer in service production processes increases the complexity of service operations in comparison with non-service operations (Frei 2006). The PCN framework enables service designers and service analysts to analyze service operations in a systematic way.

Figure 4 shows a PCN representation of the hotel stay blueprint introduced in the previous section. The diagram shows a sequence of process steps (boxes) with an identifiable goal that is called a process chain. In some PCN diagrams such as this one, a diamond shaped symbol is used to present the branching of arrows based on a decision, but it is not defined in PCN. The purpose of the process steps in this diagram is to show the serving of a hotel customer. The process steps are connected with arrows to indicate process dependency. Sampson (2012a) refers to the defined value concept discussed by Grönroos (2008) to explain, in general, that the goal of a process chain is to improve the wellbeing of process entities.

**FIGURE 4. PCN DIAGRAM EXAMPLE – HOTEL STAY (BOOKING ON PHONE)**

A process entity is a participant entity in a process. Examples of process entities are organizations, departments of organizations, customers, agents of customers, and so forth. In the hotel stay example, the customer and the hotel are process entities. A key feature of PCN diagrams is that they can show one entity or span multiple entities. Entities that act on some other resources and control certain process steps are called operand resources (Constantin and Lusch 1994). In comparison, process entities that are acted upon by other entities function as operant resources (Sampson 2012a; Sampson 2012b). It is possible that an entity, at some parts of a process chain functions as an operant resource, and at some other parts of a process chain functions as operand resource. For example, in the above example the customer functions as an operant resource when he/she arrives at the hotel, and functions as an operant resource when the bell person takes his/her bags to the room.

All entities participate in a process chain to receive a value (Sampson 2001). Process entities are grouped into two categories based on their received value type: specific beneficiaries (called also customers or consumers) and generic beneficiaries. Specific beneficiary entities participate in a process chain to benefit from the specific purpose of the process chain. Generic beneficiaries mainly participate in a process chain to receive general resources (such as money) to use in other process chain activities that satisfy their specific needs. It is common for an entity to
receive both generic benefits and specific benefits. These entities are called hybrid entities. For example, a bank that offers financial services to businesses can request feedback from them to use in its future strategy design processes.

Every process entity has a process domain, which includes all the process steps for which that entity is an operand resource. This means that an entity controls the process steps in its process domain to some degree. The degree of control is shown using a half triangle on top of each process entity. An entity can be an operand resource for certain steps outside of its process domain, but it cannot control or lead those process steps directly.

Sampson (2012b) refers to Wemmerlöv (1990) to explain that there are three types of contacts between a service system and a client/customer: direct contact, indirect contact, and no contact. Based on this, Sampson (2012a, 2012b) divides a process domain into three process regions: direct interaction, surrogate interaction, and independent processing. He defines the direct interaction region as the areas of a process domain for process steps “involving person-to-person interaction” (2012a, p.28); the surrogate interaction region as the areas of a process domain for process steps “involving interaction with non-human resources of another entity (e.g., technology or information)” (2012a, p.28); and the independent processing region as the areas of a process domain for process steps “that are performed independent from other entities in the process chain network” (2012a, p.28). Considering the hotel stay example, Figure 3 illustrates that the hotel has direct contact with its customers at the check-in desk, has only indirect contact with them when the hotel staff take bags to the room, and has no direct contact with customers when the hotel supplies hardware and software.

The basic steps in creating a PCN diagram are (Sampson 2012b, p.190 & 191):

1. Identify the target service process;
2. Identify participant entities in the service process;
3. Identify the first and the last process steps;
4. Identify intermediate process steps and their position in both process domains and regions of a specific process domain, connecting them with arrows to show the state dependency between the process steps.
5. Tagging the process steps that in which the specific beneficiary receives nonmonetary benefits (tagged ⊙) and incurs nonmonetary costs (tagged ⊙⊙);
6. Tagging the steps in which the generic beneficiary receives monetary compensation (tagged +$) and incurs monetary costs (tagged -$);
7. Use labels to represent environmental conditions that are seen by the customer during the service process and affect the perception of customer service. Sampson (2012b) argues that these labels accomplish the same job as “props and physical evidence” do in service blueprinting.

Each step in a service process must contribute to the realization of value, value opportunities (i.e., a need), or (co)production of value potential. In step 5, the process steps contributing to value opportunities and value realization are identified. If a process step does not contribute to one of these three conditions, it must be eliminated. Figure 5 shows a PCN diagram of the pizza takeaway (online ordering) blueprint represented in the previous section. The diagram represents the value propositions and environmental conditions.

A PCN diagram can help PCN designers to apply three service operations management principles through the use of process regions:

1. Process Efficiency: process efficiency is lowest in the direct interaction region in a process domain, but it will increase towards the independent processing region. Chase (1978, 1981) highlights that the degree of customer interaction has an adverse impact on process efficiency. This is what Sampson (2010a, p.116; 2010b, p.38) calls “customer intensity” and identifies as “the degree to which variation in customer input components cause variation in production process”.
2. Economies of scale: fixed costs can be divided across units of production; therefore, the cost of producing each unit is less in the independent processing region, whilst increasing towards direct interaction with the customer and the customer’s process regions.
3. Customization: customization is highest in the customer independent processing region, as the customer can control everything when he/she performs each process step. It will decrease towards direct interaction with a provider and it is the lowest in the provider independent processing region. In the provider independent processing region, the customer does not get involved in any kind of decision making regarding each process step.

Providers can use the surrogate interaction region to balance between process efficiency and customization (Frei 2006). PCN analysts can reconfigure and reposition process steps between different process regions in provider and customer process domains for the purpose of process improvement and innovation. Based on the decision of the provider, they can choose process alternatives to increase process efficiency and customization, or decrease
(co)production costs. Identifying value propositions can help during this process. Figure 6 shows the process options for a pizza firm.

Figure 6 indicates that two process steps of Assemble pizza and Cook pizza can be repositioned across the pizza firm’s and pizza consumer’s process regions. The diagram also shows that this repositioning affects process efficiency, economies of scale, and customization of service process. For example, a pizza restaurant can choose to assemble pizza in a direct interaction with a customer and then the restaurant would cook the pizza, so that the restaurant increases its customization (and probably customer satisfaction, which is an important indicator for a successful business). However, process efficiency is reduced. There are twenty five different repositioning options for these two process steps. Pizza firms can choose a repositioning option based on their business strategy.

**FIGURE 5. PCN DIAGRAM EXAMPLE – PIZZA TAKEAWAY (ONLINE ORDERING)**

![PCN Diagram Example – Pizza Takeaway (Online Ordering)](image)

Table 2, represents the key concepts of PCN and their precise definitions. The next section explains BPMN in detail.

**BUSINESS PROCESS MODELING NOTATION (BPMN)**

BPMN is an important process modeling technique and it has absorbed the attention of both the practical and academic community in a short period of time since its release date (Muehlen and Recker 2008). BPMN was published publicly for the first time in May 2004 by a consortium of tool vendors (BPMI Notation working Group) (BPMI.org 2004). The consortium later granted rights to Object Management Group (OMG) to publish version 1.0 of BPMN standard in February 2006 (BPMI.org and OMG 2006). This paper explains BPMN version 2.0 (OMG 2011).

BPMN has a core set of constructs and an extended set of constructs. The core set is defined for business analysts and non-technical users to depict typical business modeling processes and activities that are understandable by all stakeholders (Ko et al. 2009; Recker 2011). The extended set of constructs targets technical users who want to draw more complex technical diagrams. The extended set can be used for “workflow engineering, simulation, or web service composition” (Recker 2010, p.183). Current research considers the core set of BPMN constructs for the purpose of conceptual comparison. Figure 7 shows a BPMN diagram of the hotel stay example.
FIGURE 6. PROCESS OPTIONS FOR A PIZZA FRIM

BPMN basic constructs are grouped into four categories: flow objects, connecting objects, swimlanes and artefacts. Flow objects are: event, activity, and gateway. Connecting objects are: sequence flow, message flow, and association. Swimlanes are: pool and lane. Artefacts are: data object, group, and text annotation.

An event represents an occurrence during a process. Events are depicted in a BPMN diagram by circles; however, internal markers can be different depending on the type of represented event. There are three types of events: start event (when a participant begins a process), intermediate event (happens at the middle of a process) and end event (when a participant finishes a process). Empirical research indicates that ‘start event’ and ‘end event’ are used in more than 50% of BPMN diagrams (Muehlen and Recker 2008). The current study defines a super type event that can happen anytime during a process and affects the flow of a model.

Activity is a generic term for the work that a participant does in a process. An activity can be atomic (task) or compound (sub-process). An atomic activity cannot be broken down into more activities. A compound activity can be broken down into several activities. Activities are shown with rounded rectangles. Sub-processes are distinguished from tasks by a plus sign in the bottom center of the rectangle.

A gateway determines divergence and convergence of paths in a process. Object Management Group (2011) defines six basic types of event based on the splitting and joining of sequence flows. A gateway is shown by a diamond shape; internal markers differentiate between different types of event. This study defines a super type gateway that determines branching, forking, merging, or joining of paths. A super type event shows “whether exactly one (exclusive “or”), more than one (“or”), or all (“and”) of the activities entering or leaving the join or split, respectively, are required prior to (join) or must follow (split)” (Milton and Johnson 2012, p.612). In the hotel stay example, the gateway determines branching of sequence flows: if the customer has bags then he gives the bags to the bell person, otherwise he/she goes for check-in.

A sequence flow shows the order of activities in a process. A sequence flow is represented by a solid line with a solid arrow indicating the sequence of activities in a process. A message flow shows the flow of messages between two activities. Message flows are shown with dashed lines with a solid arrow indicating the direction of communication. The labels on message flows are called message and represent the content of communication.
<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Step</td>
<td>A Process Step represents a step of process chain.</td>
</tr>
<tr>
<td>Arrow</td>
<td>An Arrow represents state dependency and connects process steps to each other.</td>
</tr>
<tr>
<td>Process Entity</td>
<td>A Process Entity is an entity that participates in and makes decisions about steps of a process chain.</td>
</tr>
<tr>
<td>Value</td>
<td>Value refers to the satisfaction of process entity needs.</td>
</tr>
<tr>
<td>Specific Beneficiary</td>
<td>A Specific Beneficiary is a process entity that participates in a process chain to have needs met by the specific competencies in the process chain.</td>
</tr>
<tr>
<td>Generic Beneficiary</td>
<td>A Generic Beneficiary is a process entity that participates in a process chain to acquire generic resources (money) to meet needs from other process chains.</td>
</tr>
<tr>
<td>Process Domain</td>
<td>A Process Domain is a portion of process chain that falls under a process entity’s control and responsibility.</td>
</tr>
<tr>
<td>Direct Interaction Region</td>
<td>A Direct Interaction Region is the area of a process domain used for process steps involving person to person interaction between process entities.</td>
</tr>
<tr>
<td>Surrogate Interaction Region</td>
<td>A Surrogate Interaction Region is the area of a process domain for process steps involving interaction with non-human resources of another process entity (e.g. technology or information).</td>
</tr>
<tr>
<td>Independent Processing Region</td>
<td>An Independent Processing Region is the area of a process domain for process steps that are performed independently from other process entities in the process chain networks.</td>
</tr>
<tr>
<td>Nonmonetary Benefits Tag</td>
<td>A Nonmonetary Benefits Tag identifies the process steps where the customer receives benefit.</td>
</tr>
<tr>
<td>Nonmonetary Costs Tag</td>
<td>A Nonmonetary Costs Tag identifies the process steps where the customer incurs nonmonetary costs.</td>
</tr>
<tr>
<td>Monetary Compensation Tag</td>
<td>A Monetary Compensation Tag identifies the process steps where the provider receives monetary compensation.</td>
</tr>
<tr>
<td>Monetary Costs Tag</td>
<td>A Monetary Costs Tag identifies the process steps where the provider incurs costs.</td>
</tr>
<tr>
<td>Environmental Conditions Label</td>
<td>An Environmental Conditions Label is used to label the process steps where there is physical evidence seen by the customer.</td>
</tr>
</tbody>
</table>

BPMN defines two constructs to categorize activities in a process: pool and lane. Pool represents a participant in a process. Object Management Group (OMG 2011) defines a participant as a partner entity (e.g., a company) or a partner role (e.g., a buyer, seller, or manufacturer). In the hotel stay example, partner entities are hotel and customer, hotel, bell person and reception staffs are internal roles and hotel system is an internal system. However, the hotel stay diagram uses pool constructs to represent all of these and the customer. The reason is that a pool construct is not only capable of representing a partner entity or role; it can also present all internal departments, roles, and systems as well. Therefore, a participant that is represented by a pool can be a partner entity, a partner role, an internal department, an internal system, or an internal role. Based on the decision of BPMN designers it is possible to present a diagram such as this one in many different ways, using both pool and lane constructs. In addition, it is critical to know that sequence flows connect activities within a pool and message flows connect activities from different pools. Figure 8 presents a BPMN diagram for the pizza takeaway example.

Source: E. Sampson, Essentials of Service Design.
In figure 8, the customer and restaurant are considered as two different pools. The activities of the restaurant are categorized by different lanes within a pool. The lanes divide the restaurant pool into Cashier, Waiter, Chef, and Ordering System. As the example indicates, all restaurant activities are connected with sequence flows, and connections between different parts of the restaurant with the customer are presented using message flows.

An association can be used to connect BPMN artefacts with flow objects. Associations are shown with dotted lines. An arrow can be used to present the direction of an association. A Data Object presents required data for an activity or produced data by an activity. Associations link data objects to activities. Reservation details are usually shown by a letter symbol. In the hotel stay example, ‘reservation details’ is a data object; it is connected by associations to process reservation activity as an output, and to process registration activity as an input.

A group specifies a number of logically related activities and does not affect sequence flows. Groups can be used for process analysis and documentation purposes; they are shown by dashed-dotted boxes around a number of activities. BPMN designers group a set of activities to show a logical relationship between those activities. In the hotel stay example, two sets of activities are grouped: reservation sub-processes and registration sub-processes. Figure 9 presents the detailed tasks of registration group.

Text annotation adds additional information to a diagram for BPMN readers. An association can be employed to associate an annotation to flow objects. In the hotel stay example, annotations demonstrate different representational symbols for tasks, sub-processes, start events, and end events. Table 3, over the page, presents the core concepts of BPMN and their definitions.
FIGURE 8. BPMN DIAGRAM EXAMPLE – PIZZA TAKEAWAY (ONLINE ORDERING)

Customer
- Place online order
- Travel to restaurant
- Collect pizza
- Pay pizza

Ordering System
- Process order

Pizza Restaurant
- Prep
- Assemble pizza
- Cook pizza
- Deliver pizza

Waiter
- Receive
- Serve

Chef
- Collect payment

FIGURE 9. REGISTRATION PROCESS FOR HOTEL STAY EXAMPLE

Customer
- Tell personal details
- Hand out ID
- Receive room keys

Reception Staff
- Check details
- Ask for ID
- Confirm guest identity

Hotel System
- Retrieve reservation details
- Allocate room
TABLE 3. CONCEPTS IN BPMN

<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>An Activity is a generic term for work that an organization performs in a process. An activity can be atomic or compound. An atomic activity (task) is used when the work in the process is not broken down to a finer level of detail. A compound activity (sub-process) comprises of more than one compound activities or tasks.</td>
</tr>
<tr>
<td>Event</td>
<td>An Event is something that “happens” during the course of a process. These events affect the flow of the model and usually have a cause (trigger) or an impact (result). An event can happen at the start of a process (start event), during a process (intermediate event), or at the end of a process (end event).</td>
</tr>
<tr>
<td>Pool</td>
<td>A Pool represents a participant in a process. A pool is a graphical container used to partition a set of activities from other pools/participants.</td>
</tr>
<tr>
<td>Lane</td>
<td>A Lane is a sub-partition within a Pool. Lanes are often used for things such as internal roles (e.g., Manager, Associate), systems (e.g., an enterprise application), or an internal department (e.g., shipping, finance).</td>
</tr>
<tr>
<td>Sequence Flow</td>
<td>A Sequence Flow is used to show the order that activities will be performed in a process by a participant. Sequence flows connect and order activities within a pool.</td>
</tr>
<tr>
<td>Message Flow</td>
<td>A Message Flow is used to show the flow of messages between two participants that are prepared to send and receive them. In BPMN, two separate pools in a Diagram represent two participants.</td>
</tr>
<tr>
<td>Message</td>
<td>A Message is used to depict the contents of communication between two participants.</td>
</tr>
<tr>
<td>Gateway</td>
<td>A Gateway is used to control the divergence and convergence of sequence flows in process. Thus, it will determine traditional decisions, as well as the forking, merging, and joining of paths.</td>
</tr>
<tr>
<td>Data Object</td>
<td>Data Objects provide information about the conditions required for activities to be performed and/or what they produce.</td>
</tr>
<tr>
<td>Text Annotation</td>
<td>Text Annotations are a mechanism for a modeler to provide additional information for the reader of a BPMN diagram.</td>
</tr>
<tr>
<td>Association</td>
<td>An Association is used to link artefacts (data objects and annotations) to flow objects (activities, events and gateways).</td>
</tr>
<tr>
<td>Group</td>
<td>A Group identifies logically related activities and does not affect the sequence flow. This grouping can be used for documentation or analysis purposes. Source: OMG, Business Process Model and Notation (BPMN)</td>
</tr>
</tbody>
</table>

CONCLUSIONS AND FUTURE WORK


These concepts clearly have some overlap (e.g., action, process step, and activity are clearly related) whilst others are likely to be quite distinct (e.g., only PCN has specific beneficiary and generic beneficiary). Many contemporary businesses require a deep understanding of how customers are serviced. All contemporary businesses operate in supply chains, and all also face the need for greater process efficiency and efficacy including the need for more automation. All these pressures require different modelling approaches, sometimes in combination with each other.
Therefore, future research could include deeply understanding the relative strengths and weaknesses of service blueprinting, PCN, and BPMN. This research would include a pairwise conceptual comparison (Milton and Kazmierczak, 2004) of the techniques. The results of that research would help guide practitioners to use the most appropriate modeling technique, alone or in combination with others, for different purposes and in different situations.

ENDNOTES
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REFERENCES


Sampson, Scott E., “Introduction to PCN Analysis 1”, 2011, Provo, Utah, USA.


