Using Case Survey Methodology to Extract Variables and Causal Links: An Example from Studying Business Process Change

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Abstract

Business process change (BPC) projects are complex initiatives with many interrelated factors that still cause unforeseen delays and even cancellations. While research on BPC provides useful insights into successes and failures of BPC projects, we argue that these insights remain rather fragmented. We present a multi-method approach to create a coherent picture by extracting variables and causal links within BPC projects. We do so by adopting case survey methodology and causal loop diagrams. We show the usefulness of this approach by analyzing and consolidating insights of 130 BPC case studies. We make two main contributions: (1) we show the potential of system dynamics in BPC research by integrating the fragmented research on BPC to achieve more coherent picture, and (2) we contribute to the literature on qualitative methods used in system dynamics, as we propose to use case survey methodology for developing causal loop diagrams.

Keywords: Causal loop diagrams (CLDs), case survey methodology, business process change

1. Introduction

Organizations are confronted with rapidly changing environment, such as high market pressure and fast technological development. To remain competitive and profitable at the same time, many organizations strive to change their business processes to improve their efficiency and effectiveness, service quality, or reduce costs. However, a number of business process change (BPC) practitioners and researchers agree that BPC projects present complex and challenging endeavors, which are shaped by a number of different organizational and economic factors, such as organizational performance, leadership, and management practice, which interrelate together (e.g. Ashayeri et al. 1998, Hill & McCoy 2011). Given this complexity, it is not surprising that between 60% and 80% of all BPC initiatives fail (Jurisch et al., 2012a). Thus, various researchers have addressed the topic of BPC projects success. However, their research outcomes produced to some extent conflicting results and only few reliable generalizations (Jurisch et al., 2012b). Furthermore, empirical BPC studies are mainly focusing on one or few specific causal relations, e.g. impact of IT or change management on BPC success (i.e., Grover et al., 1998; Huizing et al., 1997), which somewhat stand isolated in the overall context of BPC success. Thereby, these studies tend to overlook the emergent and complex interactions that are fundamental to any BPC initiatives (Karimi et al., 2007).

Causal loop diagrams (CLD) might be helpful in such complex initiatives, as they provide insights into feedback processes and lead to a better understanding of the dynamic behavior of studied phenomena (Flood & Jackson, 1991). Nonetheless, the application of system dynamics (SD) respectively CLDs has not been a major focus in BPC research over the last two decades. Only few SD models for BPC have been reported in the literature (e.g. Ashayeri et al., 1998; Baguma & Ssewanyana, 2008; Burges, 1998; Kristekova et al., 2012; Van Ackere et al., 1993). The first reason might be, as Flood and Jackson (1991) reported is the fact that SD may not be suitable for such complex systems to begin with. Therefore, they suggest starting with other systems thinking tools such as soft systems methodology, or the viable system methodology. The second reason might be that many CLDs are created in close cooperation with clients, with the purpose to elicit and capture the knowledge in their mental models. However, the difficulty arises when to handle phenomena such as BPC projects that involves several stakeholders and duration of such BPC projects last over several years (Harrington et al. 1998). These might have the consequence that the important people and information, which are needed for the developing of CLD, are not available in the organization anymore. The third reason might be that the majority of BPC research is based on a single case study in specific domain (Caron et al., 1994), which limits its generalizability.

Despite these challenges, BPC research field builds on a wealth knowledge derived from a large number of case studies (Jurisch et al., 2013a). Each of them provides valuable insights of past failures and successes of BPC projects (Kettinger & Grover 1995; Huizing et al. 1997; Guha et al. 1997; Grover et al. 1998; Grover & Markus 2008; Trkman 2010). However, these insights remain rather fragmented and a coherent picture is missing (Jurisch et al. 2013a).

Given this background, the goal of our research is to integrate the fragmented research on BPC projects to achieve a coherent picture. To achieve our goal, we applied a multi-method approach for extracting variables and relationships using a case survey methodology as a qualitative approach for developing causal loop diagrams. The recent study of Jurisch et al. (2013b) shows the potential of applying case survey methodology in information systems (IS) research. They argue that case survey methodology is a powerful approach for identifying main factors of studied phenomena and getting deep insights into the importance of the identified factors. Furthermore, they argue that the generalizability power of such research results increases, as the results are based not only on one or few case studies. Larsson (1993) emphasize that the advantage of the case survey method is the application of a coding scheme of variables on the case studies and the possibility of many researchers using the coding scheme and comparing their results. This method is also helpful if the “unit of analysis is the organization” (Larsson, 1993) as it is often “used in the business policy area” (Jauch et al. 1980) and if there exists a great number of case studies (Jauch et al. 1980).

We make two main contributions: (1) we show the potential of SD in BPC research by integrating the fragmented research on BPC to achieve more coherent picture, and (2) we contribute to the literature on qualitative methods used in system dynamics (SD), as we propose to use case survey methodology for developing causal loop diagrams.

The remainder of the paper is organized as follows. In chapter 2 we provide an overview of methods that might be used for developing CLD and give an overview of BPC. In section 3, we outline our research approach and demonstrate the use of the proposed method by presenting our results. In chapter 4 we discuss our results and limitations, and conclude the paper in chapter 5.

2. Theoretical background

2.1 Data collection techniques for CLD building

System dynamics (SD) literature proposes several qualitative and quantitative methods for collecting data that support the process of modeling CLDs.

Quantitative data collection methods

Quantitative methods can be categorized into four major types: (1) traditional control theory, (2) pathway participation metrics (e.g., Mojtahedzadeh et al., 2004), (3) eigenvalue elasticity analysis (e.g., Kampmann, 1996), (4) and eigenvectors and dynamic decomposition weights (e.g., Guneralp, 2005). However, according to Hayward (2012) these approaches cope with the complexity of their application and therefore are not yet in widespread use in the SD community. From this background, we focus more on qualitative methods for data collecting that support the modeling process of CLDs.

Qualitative data collection methods

(Forrester, 1994) identified qualitative data as a main source of information in the modeling process, which is residing in the mental models of the actors’ heads. The basic qualitative methods used in SD are: interviews, oral history, focus groups, Delphi groups, observation, participation observation, and experimental approaches that lead to qualitative data. These methods have been approached from a multitude of perspectives. It is beyond the scope of this paper to provide an in-depth account of literature concerning these methods. The focus lies only on a brief overview of these methods. For further reading on qualitative methods, we refer to (Bernard, 1999).

Interviews

A large portion of CLDs relies on interview data. Interviews are conducted either in person or over telephone, where the interviewer and interviewees draw on their interactional competencies. The main role of the interviewer is to guide the interview, clearing up any confusion, as well as remain neutral so that the respondent's remarks are not biased by the behavior of the researcher (cf. Luna-Reyes & Andersen, 2003).

Oral history

Oral history in contrast to interviews tries to elicit a particular data in the history that might not be represented in the written record. Oral histories are interviews of individuals in which researcher is looking for stories rich in detail and explanation (Luna-Reyes & Andersen, 2003).

Observation and participant observation

The modeler observes some aspects of reality, referred to as the "universe of discourse" and tries to distinguish a set of entities that compose the universe of discourse and the relationships between them (Richardson & Pugh 1981). Conceptualizations are in effect, a lens through which the modeler observes phenomena of interest in a universe of discourse. However, observation and participant observation copes with several issues, such as permission for observation, whether the observer should announce his/her presence in the social situation, or how the awareness of observation could affect the results of the study.

Focus groups

Focus groups represents a method, where data collection is elicited from a group of respondents who interact with each other in the research environment (Luna-Reyes & Andersen, 2003). Focus groups are similar to group model building. The group is managed by a facilitator, who is responsible for the elucidation of knowledge within the group and thus, help the group to design one or more models (Rouwette et al. 2002). The research on focus groups has highlighted the value of directly involving many clients (groups) in the modeling process, as through them more shared perspective on the problem and on potential solutions is created (Richardson & Andersen 1995; Vennix et al. 1997). Andersen et al. (1997) and Vennix (1996) identified two main structural components necessary in focus groups: (1) the group structure, which takes the participants, the group and sub-group composition involved in each session, and the facilitation aspects into account; (2) the logistic component, which includes all the aspects related to the location, fitting and equipment of the room.

Delphi groups

Delphi groups are an extension of focus groups (Luna-Reyes & Andersen, 2003), where the group might be geographically dispersed. The facilitator asks the clients and stakeholders to elaborate a list of issues on the given problem situation. There exist several approaches to collect the data from the geographically dispersed groups, such as asynchronously through listservers and online discussion lists (Rohrbaugh, 2000). After collation, the groups send the material back to the facilitator individually or in a second Delphi group. The next task of the facilitator is to rank the results according to some standards.

A number of hybrid approaches that involve the client participation, have evolved over the years. For example: (1) Problem Structuring Method (PSM) (Mingers & Rosenhead, 2004), (2) the reference group approach (Stenberg, 1980). (3) the strategic forum (Richmond, 1997), (4) the stepwise approach (Wolstenholme, 1992), (5) modeling as learning (Lane, 1992), (6) the "standard method" of Hines (Otto & Struben, 2004); or (7) Holon Dynamics (Lane & Oliva, 1998).

2.2 Methods for qualitative data analysis

Once, we obtain the text data gathered through interviews, observation, or focus groups, a question arises how to translate these relevant data into a causal loop model. We present two methods for qualitative data analysis, which were successfully used by SD researchers. Other methods such as hermeneutics or discourse analysis might be used as well, however, we did not identify any article in the literature that uses these method for developing CLD.

Grounded theory

Grounded theory is according to Strauss & Corbin (1998) a theory, which is derived from data, systematically gathered and analyzed through the research process. The texts used in grounded theory might come from transcripts of interviews, meeting minutes, or other kind of textual data. Yearworth and White (2013) in their current work presented a multi-methodology that combines the qualitative data analysis process of coding with that of developing CLDs. They described the creation of CLDs from the coding threes, which were developed through a grounded theory approach and through using computer aided qualitative data analysis software. With their work, they try to highlight the need within SD community to ground models in a formal qualitative data analysis to enhance its formality and rigor.

Content analysis

Content analysis is a powerful approach for identifying main factors of studied phenomena and getting deep insights into the importance of the identified factors of (Jurisch et al. 2013b). The researcher starts by defining the set of codes, which are systematically applied to a set of texts from written documents, or transcripts of interviews or focus groups. The coding results are mainly organized into a matrix of codes. Critical issue in content analysis is the reliability of the coding process, as the results are based on subjective judgments of the coder. Therefore, an inter-coder reliability (such as Krippendorfer's alpha) should be established at the outset of the coding process. Deegan (2011) in his work presented a multi-methodology for analyzing policy complexity and intergovernmental relationships using content analysis and causal maps, as a way to analyze arguments identified in two unique reports. In these reports, he coded relationships, which resulted in 97 causal loop diagrams. He further used causal maps to deconstruct arguments into individual components (i.e. causal links) and used these components to identify the size and scope of a recommendation.

2.3 Business process change

BPC is an elusive term that is frequently confounded with a number of terms with similar, though not necessarily identical, meanings (e.g., business process reengineering (BPR) or business process transformation (BPT)) (Sarker et al., 2006). The term BPC was coined by Grover and colleagues (Grover & Kettinger, 1997, 2000; Grover et al., 2000a; Kettinger et al., 1997) in an attempt to shift the focus on the importance of process instead of the radicalness of the change. In the 1990s, radical change (such as BPR) was the dominant tenor. However, the focus of reengineering processes on the account of people and performing major work force reductions frequently did not yield the anticipated results (Grover et al., 2000). Today, BPC reflects a management concept that involves any type of process change (radical and continuous). As such the term BPC "is more inclusive, and avoids the negative connotations of some of the earlier-used terms such as BPR" (Sarker et al., 2006). In the following, we define and differentiate the major terms connected to the realms of BPC (see Table 1 for a summary).

Table 1: Overview of terms in the context of BPC

Name	Definition	Scope of change	Sources
BPM	Corporate management philosophy and discipline		(Brocke & Rosemann, 2009; Van Der Aalst et al., 2003)
BPC	Management concept that involves any type of process change	Radical & continuous	(Grover et al., 2000a; Niehaves et al., 2011a; Sarker et al., 2006)

TQM	Management concept	Continuous	(Tan & Yap, 1994; Zink, 2004)
BPR/BPT/BPI	Method	Radical	(Davenport, 1993; Grover & Markus, 2008; Hammer & Champy, 1993)
Six Sigma	Method (statistical)	Continuous	(Nave, 2002; Revere et al., 2004; Sidorova & Isik, 2010)
Kaizen/CPI	Method	Continuous	(Brunner, 2008; Suárez-Barraza & Lingham, 2008)

The idea of viewing work-related activities as processes and improving them is not new. In fact, these concepts date back to the beginning of the twentieth century and probably even before (Grover & Markus, 2008). The emergence of the term “BPM” is hard to pin down in terms of time and space. Nonetheless, BPM, like BPC, has its origin in the works of Frederick Taylor.

Modern BPM is not a monolithic principle, but rather a wide umbrella of activities, concepts, approaches, methods, techniques and tools for designing, controlling, analyzing and changing processes in organizations (Mathiesen et al., 2011). Van Der Aalst et al. (2003), define BPM as “supporting business processes using methods, techniques and software to design, enact, control and analyze operational processes involving humans, organizations, applications, documents and other sources of information.” Based on this definition, BPM is best understood as a process-oriented management discipline (Hill et al., 2008).

BPC refers to a management concept that involves any type of process change – revolutionary/radical or evolutionary/continuous (Grover et al., 2000; Grover & Markus, 2008) as well as quality programs, enterprise resource planning (ERP) implementation or the retooling of business processes for e-commerce (Sarker et al., 2006). While both approaches, radical (e.g., BPR, BPT, BPI) and continuous (e.g., TQM, CPI, six sigma), share the common goal of improving processes, they are also frequently used complementary (Grover and Markus, 2008). Margherita and Petti (2010) posit that many projects are only labeled as BPR while they are in fact “normal improvement activities which are unlikely to bring radical innovation within the organization”.

Total Quality Management (TQM) is an integrative management concept (Zink, 2004). TQM is considered to be a more evolutionary and continuous concept to constantly optimize and change business processes (Bucher & Winter, 2007). Furthermore, it aims at improving the quality of products and services in all departments and functions (Koch, 2011). TQM consists of different concepts for continuous process change (e.g., Kaizen, Six Sigma).

Hammer and Champy (1993) define BPR as the fundamental rethinking and radical redesign of business processes. Research shows that the implementation of BPR often results in fundamental changes of the organization’s structure, culture and processes (Al-Mashari & Zairi, 2000; Cao et al., 2001). The successful implementation of BPR can result in dramatic improvements in critical efficiency and effectiveness measures such as cost, quality, service and time (Sharafi et al., 2011; Jurisch et al., 2012b). Past experiences also show that all BPR implementations are effectively change management programs (Cao et al., 2001; Sinclair & Zairi, 1995). Hence, BPR not only necessitates top management support, but also bottom-up employee empowerment (Paper et al., 2001).

BPR, business process innovation (BPI) or business process transformation (BPT) are frequently used synonymously for the same phenomenon. According to Grover and Markus (2008) these variations in name of essentially the same concept were part of a bandwagon effect. All BPR, BPI and BPT projects are radical, revolutionary, and one-time undertakings (Davenport, 1993; Grover et al., 2000; Grover & Markus, 2008; Hammer, 1990).

Kaizen originated in Japan and is a continuous process improvement method. In the West, Kaizen can be translated into Kai = Change + Zen = Good (Autorenteam, 1994). It refers to many minor changes in an organization that are applied to existing products and services. More so, Kaizen is a bottom-up approach, which is frequently pursued by employees at lower levels within the organization. Suárez-Barraza & Lingham (2008) summarize Kaizen as a method that involves all the employees of the firm, implements small and incremental improvements, and uses teams as the vehicle for achieving incremental changes.

Six Sigma has been promoted as a more continuous organizational change and improvement method (Sidorova & Isik, 2010). Six sigma projects rely on statistical methods to identify problems. Six sigma projects include the designing, improving, and monitoring of business processes with the goal of reducing costs and enhancing throughput times (Nave, 2002; Revere et al., 2004).

3. Extracting BPC variables and causal links

3.1 Case survey methodology

To extract variables and causal links, we applied case survey methodology, also referred to as structured content analysis of cases (Jauch et al. 1980) or case survey (Larsson, 1993; Lucas, 1974; Yin & Heald, 1975). The case survey methodology turned out to be particularly useful for our research due to the following criteria proposed by Larsson (1993): (1) the research area comprises a huge number of case studies (i.e., cases of BPC projects) (Yin & Heald, 1975); (2) the unit of analysis is the organization (i.e., the organization conducting the BPC project) (Jauch et al. 1980); (3) a broad range of impact factors is of interest (Jauch et al. 1980); and (4) it is difficult to do structured primary research across cases in this research domain.

3.2 Sample collection

We performed a detailed screening of literature. We start our search in traditional channels (e.g., libraries), conference proceedings, online database services (e.g., Emerald, EBSCO, Science Direct and Google Scholar), consulting journals, and other web search tools. We searched for following key words: “business process”, “business process change”, “business process reengineering”, and “business process transformation”, each with the combination the term “case study”. The selected key words resulted in more than 5,000 references. In the next step, we explored titles, abstracts, and keywords, and reduced the sample to 217 case studies. In our last step, we excluded case studies that (1) have none or very little information about the case; (2) none or very little information about the impact factors; and (3) focused on the technology and not on the BPC initiative. Our final sample consisted of 130 case studies, consisting of 86 journal articles, 22 book sections, 16 conference articles, 4 theses, 1 working paper, and 1 magazine article. The final sample spans the years 1993 to 2012 and have an average length of 14 pages.

3.3 Identification of variables

The coding scheme “documents and guides the conversion of qualitative case study data into quantified variables” (Larsson, 1993) and thus stands as the core element of a case survey methodology. In line with Larsson (1993), our coding scheme comprises variables that represent the aspects of the study design (e.g., employee expertise, IT infrastructure employment, or BPC tools and techniques), and the publication status (e.g., ranging from journal article to book section). As a result, a master list of the variables evolved, which we employed for the frequency coding, i.e. for aggregating the findings across the studies.

3.4 Data coding

For the frequency coding of the variables and their relationships, we applied a methodology proposed by Lacity et al. (2010). Following this methodology, we analyzed how often variables from our master list occurred in a case study. We counted the frequency of the words and their synonyms, as some words may have multiple meanings, we always counted the word-frequency in the whole sentence context. Afterwards, we empirically examined the relationships between the variables. To determine the direction of any causality, we set column variables as our starting variables and use a simple one-way causality notation. We assigned two possible values: '+1', '-1'. We coded '+1' for positive relationships, '-1' for negative relationships. We treat all coded variables and relationships as significant, as also variables and relationships that are coded only one time, might have a significant impact on the overall BPC project success.

To ensure consistent coding at the outset, we established inter-coder reliability. For each case study, two authors independently filled the coding sheets of our master list. Afterwards, we meet in person to compare codes and discussed the difference until we reached a consensus. At the outset, the results indicate a Krippendorf's Alpha of 0.68, which is an acceptable inter-coder reliability (Krippendorf, 1980).

3.5 Data analysis

Based on our master list, which consists of 64 variables, we achieved a total frequency coding number of 2.079 in our set of case studies. Generally, the variables of the master list are divided into 11 broader categories, such as BPC project scope and outcome, change management, human and other resources, or project management. Table 2 summarizes the results of our frequency coding for these variables, which are sorted by frequency of use. Each broad category is briefly discussed below.

Table 2: Coding results on variables used in BPC projects

BPC variables	Freq.	BPC variables	Freq.
BPC Project Scope and Outcome		**BPM Capabilities**	
1. Process Efficiency	70	1. Business Process Measurement	60
2. Cycle Time	60	2. BPM Methods and Tools	37
3. Reduction of Costs	57	3. Past Change Projects	13
4. Process Effectiveness	53	∑	**110**
5. Customer Satisfaction	42	**Human Resources**	
6. Employee Satisfaction and Morale	41	1. Consulting Support	69
7. Integration	40	2. Employee Expertise/Capabilities	38
8. Productivity	37	3. Business Process Know-How	21
9. Quality of Products/Services	32	4. Project Manager Expertise	20
10. Complexity	22	∑	**148**
11. Price/Performance Ratio	4	**IT Resources and Capabilities**	
∑	**458**	1. IT	50
Top Management Support		2. IT Infrastructure Employment	38
1. Top Management Vision/ Understanding	66	3. IT Accessibility	37
2. Top Management Resource Support	36	4. IT Flexibility	21
3. Senior Management Commitment	34	5. IT Infrastructure Configuration	14
∑	**136**	6. IT Know-How	13
Project Management		7. IT Reliability	5
1. Governance Structure	70	∑	**178**
2. Process Improvement Goals	49	**Other Resources**	

3. Structure		40	1. Adequate Budget Size		10
4. PM Methods and Tools		38	2. Other Resources		8
5. Project Manager Practices		33		∑	**18**
6. Managing Scope/Goal		30	**Volatility in …**		
7. Managing Stakeholder Interests		29	1. Competitive Environment		20
8. Managing Project Risk		25	2. Scope		17
9. Goal Appropriateness		23	3. Regulatory/ Governmental		13
10. HM/Resource forecasting		14	4. Schedule		9
	∑	**351**	5. Business Strategy		8
Change Management			6. Executive Sponsor		7
1. Training		75	7. Budget		5
2. Communication		69	8. Supplier/ Vendor		3
3. Change Understanding		49	9. Project Manager		1
4. Change Management Methods		45		∑	**83**
5. Formal Process		43	**Learning Capacity**		
6. Information Policy		41	1. Individual Learning		41
7. Capacity for Change		23	2. Organizational Learning		27
8. Perceived Capacity to Change		14		∑	**68**
9. Information Quality		14	**Process Management**		
10. Information Amount		12	1. As-Is Analysis		62
	∑	**385**		∑	**62**
			Interdepartmental Integration		
			1. Cooperation		57
			2. Exchange of Ideas		25
				∑	**82**
				Grand Total ∑ ∑	**2.079**

BPC project scope and outcome

BPC researchers have studied a number of BPC outcomes. One of the most frequently studied variable is Process efficiency, examined 70 times. The improvements in process efficiency were especially achieved by reduction of Cycle times, which were in turn achieved by reducing non-productive time (Kennedy & Sidwell, 2001), and by the identification and elimination of delays (Buchanan, 1997). Reducing cost was the third most frequently used variable, as shown in the example of Xerox Group, which stated that their BPC project was only done because of the proposed cost savings (Harvey, 1994). Another case, the Chase Manhattan Bank reported a reduction of $790 million in their expenses after BPC project (Shin & Jemella, 2002). Another most frequently used variable captures Process effectiveness, which was coded 53 times and is closely connected to customer orientation (Martin & Cheung, 2002). According to Harrington (1991), the effectiveness of a business process is defined as the extent to which the output of a process meets the needs and requirements of its customers. Thus, the fifth most frequently studied variable in this broad category was Customer satisfaction, which was studied 42 times. For example, the Contributions Agency introduced the goal "Ensuring People are Valued", which helped staff to esteem themselves and their customers (Harrington et al. 1998). The Co-operative Bank established monthly reports with the intent that staff "can concentrate on improving what is important to the customers and not on what they think is important" (Dignan, 1995). Researchers also studied Employee morale, and considered it as a pivotal variable determining the success of BPC projects (Grover, 1999; McAdam & Donaghy, 1999). Other change projects tried to improve employee morale by "changing responsibilities from routine transaction processing to value-added accountability" (Ballou, 1995). Another important variable is Integration, which was studied 40 times. For example, an Indian refinery "estimated that the implementation of the integrated materials management system (…) helped them to reduce the inventory carrying costs by more than 30 percent" (Dey, 2001). The next variable "productivity" was examined 37 times. Pilkington Optronics stated "In ten years' time, the best would have a productivity gain of 10:1, and we want to be one of those" (Harvey, 1994). The effects of Quality of products and services, like the improvement of service levels (Currie & Willcocks, 1996; El Sawy & Bowles, 1997), were examined 32 times. For example, a major bank invested £100 million in its IT, which helped to achieve higher service quality (Newman et al. 1998). The last variable in this broad category is the outcome Reduction of complexity, which was studied 22 times. For example, during the reengineering at ITT Sheraton the workforce was dramatically reduced, which lead to reduced complexity (Chand et al. 1997).

Top management support

BPC researchers have long understood the importance of Top management support for the success of the change project (Jurisch et al., 2012b). The first most frequently examined variable in this category is Top management vision/understanding (examined 66 times), which considers the degree to which the project objectives pursued by the top management were clear (Harvey, 1994). The other most frequently studied variables in this broad category were Top management resource support (examined 36 times) and Top management commitment (examined 34 times).

Project management

Project management includes 11 variables, which examine a rich array of factors. One of the most frequently studied one was Governance structure (examined 70 times), which implies that a formalized governance structure was used for the project that is opposed to the existing one of the organization (Huizing et al. 1997). Process improvement goals (examined 49 times) are need to gain clear understanding of the direction the project is moving to (MacIntosh, 2003). The third most frequently studied variable was Team structure (40 times). For example, Capital Holding structured their BPC project according to a customer information system and pulled several cross-functional teams together (Hammer & Champy 1993).

Change management

Change management represents category, whose variables were one of the most frequently studied ones by BPC researchers (385 times). One of the most frequently examined variable was Training (examined 75 times), which considers the education of the employees, affected by the change, to develop new skills for their new position, new role, or both (Gadd & Oakland, 1995; Harvey, 1994). Communication (examined 69 times) was the second most frequently studied variable in this category (e.g., Grover 1999; Lee & Chuah 2001). The third most frequently studied variable was Change understanding (49 times), which considers the degree to which employees understood the need for change (Francis & Alley, 1996), followed by Change management methods and tools (examined 45 times), formal process (examined 43 times), and information policy (Huizing et al. 1997; Guha et al. 1997).

Process management

This broad category examines three variables: (1) as-is-analysis (examined 62 times), which reflects the current state of the organization (Grover & Kettinger, 1995); (2) process management methods and tools (examined 52 times), which ranges from process maps (Shin & Jemella, 2002) to quality management tools (Francis & Alley, 1996); and (3) as-should-be-analysis, which was examined 25 times.

Interdepartmental integration

One of the most studied variable in this broad category was Cooperation (examined 57 times), which considers the degree to which members of different business units collaborate together throughout the change project (Guha et al., 1997). Followed by Formal integration (examined 29 times) and Exchange of ideas (examined 25 times).

Learning capacity

This category has been studied 68 times with two variables. Individual learning (examined 41 times) is characterized by individual experiences during change project (Martin & Cheung, 2002) and Organizational learning (examined 27 times). Collyer (2000) stated Learning is seen as essential key factor to successful project completion.

BPC capability

BPC capability, studied a total of 110 times, include three variables that consider Business process measurement (examined 60 times) to monitor the success of the business processes (Mathiesen et al. 2011), BPC methods and tools (examined 21 times), an organization applied by the change project, and Past change projects (examined 13 times), which considers the degree to which an organization already successfully completed one or several change project(s).

Human and other resources

This broad category studied four variables. One of the most studied variable is Consulting support (examined 69 times), mainly used for an external objective viewpoint (Larsen & Myers, 1997) and methodology (Jackson, 1995). Followed by Employee expertise (38 times), Business process know-how (examined 21 times), and Project manager expertise (examined 20 times). Other resources comprise financial, organizational and physical resources (examined 18 times) (Melville et al. 2004).

IT resources and capabilities

This broad category IT resources and capabilities refer to the necessary hardware, software and other technologies and tools, which were in place and played a significant role in the change project (Grover et al., 1998), and refer to the practices of an organization employed to mobilize and deploy IT-based resources (Bharadwaj, 2000; Kim et al., 2011). BPC researchers agreed among themselves that IT resources and capabilities are critical factors of process change (e.g., Grover et al. 1998; Davenport & Short 1990; Venkatraman 1994). IT capabilities refer to IT infrastructure employment (examined 38 times), IT know-how (examined 13 times), IT (re)configuration (examined 10 times), and flexible IT infrastructure (examined 4 times) whereas IT resources refer to IT (examined 50 times) or tools and methods (examined 21 times).

Volatility

This broad category examines variables concerning the Volatility throughout BPC projects, for example Competitive environment volatility (examined 20 times), Scope volatility (examined 17 times), Government volatility (examined 13 times), or Schedule volatility (examined13 times).

3.6 Analysis of causal links between BPC variables

In this section, we summarize some of the major findings about the 852 relationships, we coded between the BPC variables. The elaborated relationships are presented with the help of CLD, which captures the interactions and relationships between the identified variables. Causally related variables indicate how the dependent variable behaves when the independent variable changes (Sterman, 2000). In CLD this behavior is represented with the help of positive or negative signs. We treat all coded relationship-frequency as significant, as also relationships coded only once may have a significant impact on the overall BPC project success.

Relationships between BPC scope and outcome variables

To keep the readability of the CLD, we partitioned it into five parts. Figure 1 summarizes the relationships between variables from the broad category BPC scope and outcome. The CLD model has 11 variables and nine variables (marked grey in “< >”) from other CLD parts.

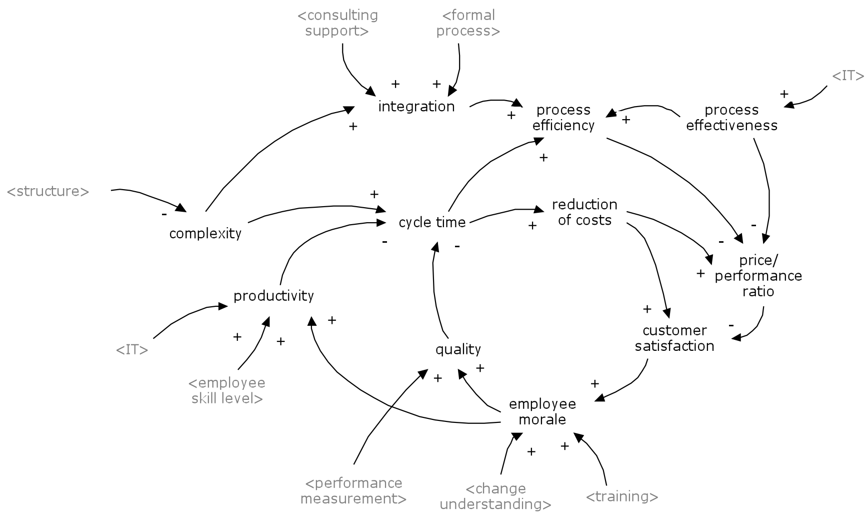

Figure 1: Causal loop model between BPC variables (part 1)

Starting with quality, which is positively influenced by employee morale, as highly motivated employee generate fewer errors. Expecting higher quality and high employee morale, in turn decrease the amount of cycle times (Proctor & Gray, 2006). Researchers found that the introduction of business performance measurement has underpinned the improvements in quality (Newman et al. 1998; Geier 1997). Productivity along with quality and reduced cycle times positively influences the overall process efficiency (Hesson 2007; Thong et al. 2000; Albizu et al. 2004). Furthermore, IT represents another most significant factor that positively influences process effectiveness and productivity and thus has an indirect positive impact on reduction of cycle times and process efficiency (Geier 1997; Newman et al. 1998; Harvey 1994). Other researchers (e.g., Davenport 1993; Harrington 1991) reported that process efficiency is positively influenced by integration and process effectiveness. Organizations strive to improve price/performance ratio to achieve the maximum of output with a minimum of input (Thommen & Achleitner, 2006), which is measured by efficiency and effectiveness (Jurisch et al., 2012b). Low efficiency/effectiveness indicates high price/performance ratio and vice versa. Hesson (2007) found in his study that the result of increased process efficiency is an increase in satisfied customers. Moreover, the reduction of cost as well as low price/performance ratio play an important role by influencing customer satisfaction and employee morale (Weise, 1996), i.e. if employees drive the costs down, e.g., through reduction of cycle times, then employee morale and customer satisfaction increase. Newman et al. (1998) observed that training positively influences employee morale and thus have an indirect effect on the overall quality. Furthermore, Wilckens & Pasquale (1995) reported that reduced complexity positively influence integration. In turn, formal process and consulting support are both enabler of integration (Harvey, 1994).

Relationships between BPC variables (part 2)

Figure 2 summarizes the relationships between variables from the broad category change management, top management support and volatility. However, for top management support and volatility, we used the broad category, as according to Forrester (1976) phenomena with similar structures may be aggregated together. The interfaces, i.e. variables from other CLD parts, are marked grey in “< >”.

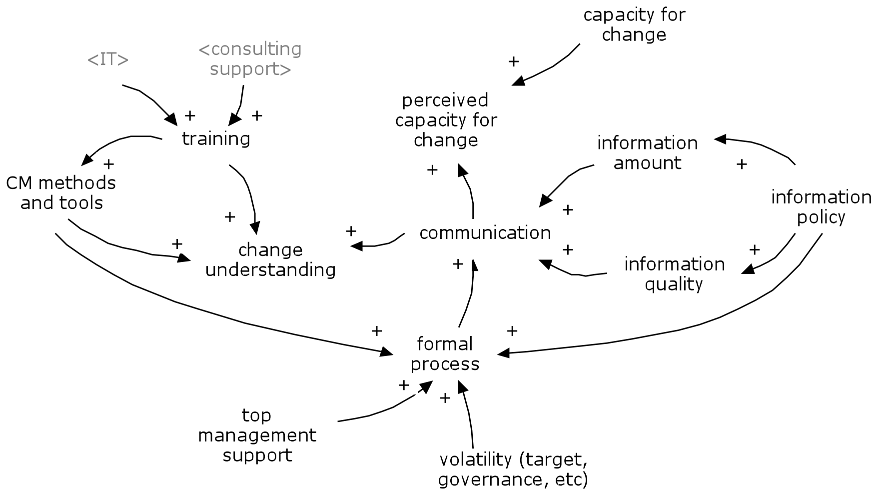

Figure 2: Causal loop model between BPC variables (part 2)

As seen in Figure 2 training positively influences change understanding. This relationship was observed by several researchers (e.g., Thong et al. 2000; Kennedy & Sidwell 2001; Huq & Martin 2006). They all found that employees should be retrained to get an adequate knowledge they need for their new jobs in order to understand the new facets of the change project itself. Thus, several organizations offered training programs to those who needed it for their new roles. Consulting support played a significant role in training, as they provide the skills, methodology, and transferred the knowledge to the employees (Martin & Cheung, 2002; Paper, 1997). As found by Geier (1997) IT has a supporting function in training and can be used for the support of all the process management functions. Training positively influences the use of change management (CM) methods and tools (Huizing et al. 1997). Hammer & Champy (1993) reported that communication is an important factor in reengineering projects due to their complexity and all the employees have to understand the change before reengineering can work. Additionally, an open information policy was established and necessary information where provided and communicated to the employees to understand the purpose of the reengineering project. Another example of how communication influences change understanding was observed by Huq & Martin (2006), where Midwestern hospital first reduced the resistance to change with an effective communication. To establish an effective communication they introduced an information policy in form of an ERP solution, which provided information for the employees via a single point of access to the corporate's intranet. However, information policy influences information quality and amount, as it provides a way how the changes will be communicated to the rest of the company (Harvey, 1994). We also identify that communication and capacity for change both influence perceived capacity for change (Congram et al. 1999), so it is of great importance to change the ratio of capacity for change early on. Another factor, that has an effect on communication, is formal process, which considers at least the formal definition of the activities, scopes and roles, and should be communicated to the affected stuff in order to be accepted (Guha et al., 1997). Another factors influencing formal process are top management support and volatility.

Relationships between BPC variables (part 3)

Figure 3 summarizes the identified relationships between the variables from the broad categories Human and other resources, learning capacity and interdepartmental integration. It consists of ten variables and four variables from other CLD parts, which are marked grey in "< >".

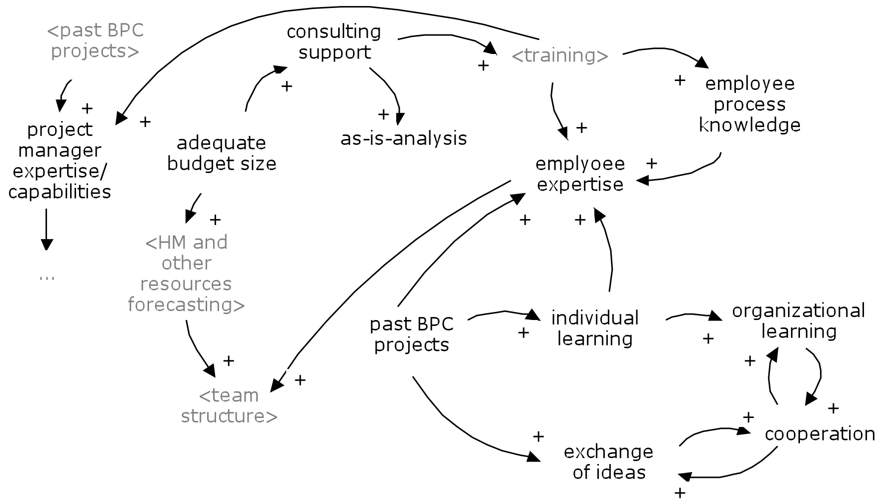

Figure 3: Causal loop model between BPC variables (part 3)

The current people capabilities, including project manager expertise and employee expertise are both influenced by past BPC projects and might be enhanced by training (Harvey 1994; Albizu et al. 2004; Huq & Martin 2006; Lee & Chuah 2001). Consulting support as discussed earlier plays an important role in transferring the knowledge to the people that are affected by the change project. Albizu et al. (2004) further observed that one of the first steps done in BPC project an organization done, was to hire consulting firms for an analysis of the current situation. Consulting support is directly affected by adequate budget size, as found by Albizu et al. (2004). Training enhances the employee process knowledge, which in turn enhances employee skills and capabilities. Employee expertise is further influenced by individual learning, which is characterized by individual experiences from past and current change projects (Martin & Cheung, 2002). Individual learning positively influences organizational learning, which can be further created through shared experiences (Martin & Cheung, 2002).

Relationships between BPC variables (part 4)

Figure 4 summarizes the identified relationships between the variables from the broad categories Project management and BPM capabilities. It consists of twelve variables and six variables from other CLD parts, which are marked grey in “< >”.

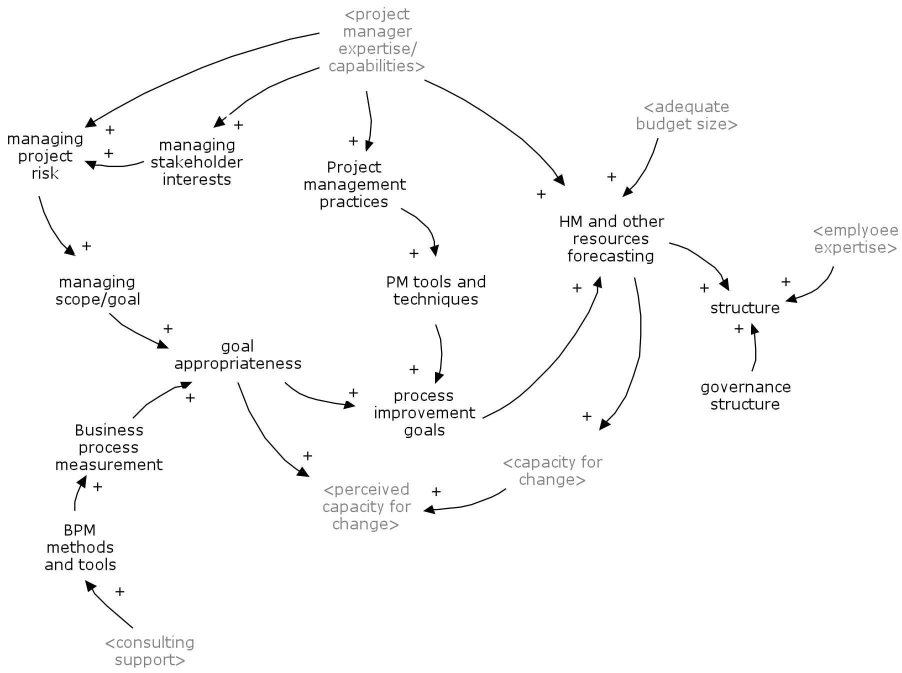

Figure 4. Causal loop model between BPC variables (part 4)

Both, managing project risk and stakeholder interest are positively influenced by the project manager's capabilities. The project manager should establish a consistent and disciplined process for managing BPC projects risks; otherwise the consequences might be harmful to the organization. However, the impact of unfortunate events or the realization of potential threats into opportunities, elaborated from assessing risks, is mainly dependent by project manager capabilities (Congram et al. 1999). Managing stakeholder interest influences project risk, as their interests and concerns might affect the evolution of the whole project. Thus, meeting the expectations of stakeholders reduces the risk and mitigates the potentially negative influence on the overall change project (Newman et al. 1998). Rigorous and proactive management of risks and stakeholder interests enable to manage project scope without problems (Al-Mashari & Irani, 2000). To ensure, whether the goal is still appropriate, measurement criteria should be established and used. Goal appropriateness positively influences the process improvement goals, which are more detailed than the general intended improvements (Grover, 1999). These improvement goals are influenced by project management tools and methods used in the project. According to (Huq & Martin, 2006), the use of methods and tools is dependent on project manager practices. Since each process improvement goal has its unique characteristics a structure must be designed carefully (Huizing et al. 1997). One of the main objectives of the structure is to define relationships among members of the project and the relationships with external environment. Thus, it is of great importance to consider the right resources, which will operate in the given change project. Structure can be further supported with new governance structure, which defines new roles and responsibilities of the employees (Hammer & Champy, 1993; Harvey, 1994).

Relationships between BPC variables (part 5)

Figure 5 summarizes the identified relationships between the variables from the broad categories IT resources and capabilities. It consists of seven variables and four variables from other CLD parts, which are marked grey in "< >".

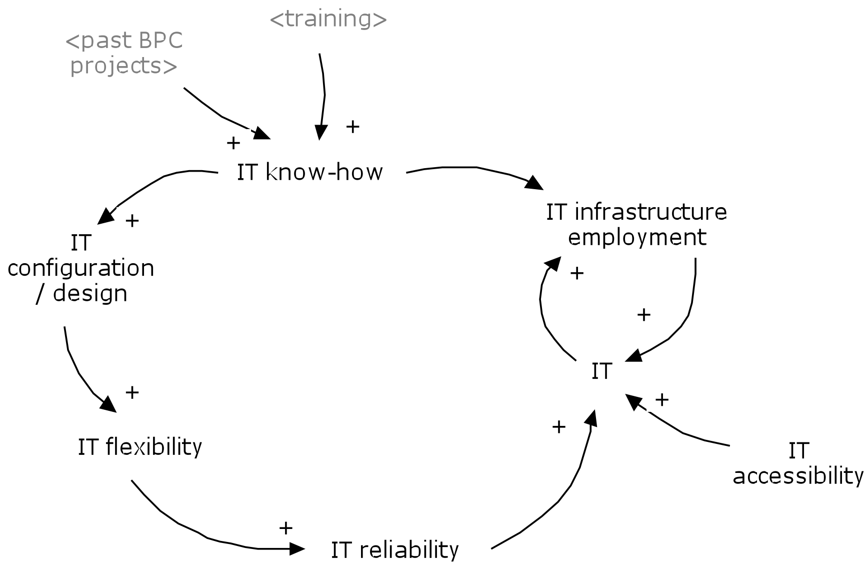

Figure 5: Causal loop model between BPC variables (part 5)

A number of researchers agree that the role of IT is a crucial factor in reengineering projects (e.g., Grover 1999; Venkatraman 1994; Ahmad et al. 2007). Generally IT enables and supports BPC in order to achieve dramatic enhancements in overall performance (Hammer, 1990; Venkatraman, 1994). IT and BPC are interdependent, in the way that the requirements for the new business processes determine the IT resources and capabilities (Venkatraman, 1994). IT capabilities such as flexible IT infrastructure have an impact on IT reliability, which together with IT accessibility impact the overall IT. The successful IT employment and its configuration are achieved by skilled employees with a corresponding IT know-how, which can be enhanced by training and by experiences from past change projects.

4. Discussion

With this research, we presented a multi-method approach for analyzing and integrating the fragmented research on BPC using a qualitative system dynamics methodology. This empirical study has methodological contributions as well as implications for BPC research.

From a methodological perspective, this research contributes to the literature on qualitative methods used in SD, by using case survey methodology as a way to analyze and consolidate variables and their relationships. Since, relationships may be of one or more conditions, such as causal, circumstantial, or contextual, it is the causal that is of interest as the primary building block of causal loop diagram (cf. Yearworth & White 2013). We argue that the application of SD, as a system approach, is suitable method for complex systems such as BPC to start with. Since, SD is capable of creating graspable and remarkably detailed models of influence factors and their relationships. Especially when visualized by means of a causal loop model this makes for a comprehensible representation of BPC project environments. With the empirical CLD presented in this paper, it become apparent that case survey methodology with causal loop model produces results that may not be possible using other methods. We argue that by adopting this multi-approach; SD modelers that are continuously challenged to deliver models grounded in data can enhance the generalizability and rigor of their models. Even though, we did not explicitly address rigor in our paper, the qualitative data analysis used in this paper, apparently meets both generalizability and rigor needs. We further, argue that more empirical system dynamics models would improve the acceptance of SD modeling as a discipline, which would be of enormous benefit. Also the current lack of system dynamics models in BPC research should make for a fertile ground in the SD community with many practitioners eager to obtain empirically supported SD models as a means of experimentation.

BPC researchers have stated the need for a more holistic understanding of "the context of process change and how process change influences and is influenced by the context" (Grover & Kettinger, 1997). Even though, BPC research field builds on a wealth knowledge derived from a large number of case studies, the insights remained rather fragmented (Jurisch et al., 2013a). By adopting case survey methodology with causal loop diagram, as a representation method, we successfully showed how to integrate the fragmented research on BPC to get a more coherent picture. We identify BPC impact variables and elaborate causal links between them by making the abundance of 130 case studies. One of the most frequently coded variable was process efficiency, i.e. that almost 54 percent of all BPC projects resulted in increased efficiency in the organization's processes. By integrating the results of impact variables and their relationships in causal loop diagram, BPC researchers and practitioners will obtain a better understanding of all the factors in the problem. Given these positive implications of SD in BPC research, we expect potential future use of SD in BPC community.

Our findings establish various needs and possibilities regarding future research. The next step in our research is to develop a simulation model. With the help of the simulation model, we want to analyze and understand the consequences of different policy changes in different BPC strategies as well as develop and test different hypotheses, which might enhance the theory of BPC projects.

However, our study shows also few limitations. The first limitation is that the coding process of such a large number of cases is time and resource consuming and requires skilled personnel. It took a couple of months till we reached results. Second limitation refers to a degree of subjectivity, as the coding process, i.e. the identification of impact factors and the elicitation of relationships is bound to a certain degree of personal interpretation. So, to reduce this issue, we first discuss the discrepancies till we reached a consensus. According to Bullock & Tubbs (1990) this helps by reducing individual disparities. Afterwards, we established inter-coder reliability, in order to determine the agreement between the coder. The third limitation is that we cannot guarantee that we found every BPC article published in a literature.

5. Conclusion

The focus of this research was to integrate the fragmented research on BPC to identify the impact variables and their causal links. As a means of demonstration and exploration, we designed a causal loop model that captures many relationships gathered through a set of 130 case studies. We successfully showed that case survey methodology is an appropriate method for developing causal loop models. Further, with this research, on the one side, we showed that SD is an appropriate method for complex systems to start with. We thus want to encourage SD researchers to test our approach also in different areas. On the other side, we showed BPC researchers the benefits of system dynamics in BPC area. They can use the proposed CLD model as a starting point for analyzing and understanding BPC factors and their causal links.

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