Towards Developing a Framework for Measuring Organizational Impact of IT- Enabled BPR: Case Studies of Three Firms

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Abstract

This article reports on a case study of three firms which examined the organizational-level measures and process-level measures that were used to identify the effects of IT-enabled BPR (Business Process Redesign) projects. Firms in three distinct industry sectors provided the context for document review and semi-structured interview studies to identify those measures used to determine whether the firm's project was considered successful and how the firm had made the determination. A theoretical framework is proposed and provisionally confirmed demonstrating the link between IT-payoffs and BPR payoffs and the creation of intermediate assets that were identifiable and measurable. Lessons learned and opportunities for future research are presented.

ACM Categories: C.5.0, H.3.4, H.4.0, K.4.3, K.6.

Keywords: Business Process Reengineering, Measurement, Organizational Impact, Process Theory, IT, Information Technology Payoff

Introduction

Since the 1990s Process Redesign or Business Process Reengineering (BPR) has been embraced by organizations as a means to cut non-value-added activities and to improve competitiveness (Grover & Malhotra, 1997). A number of studies in the literature present the improvements, radical as well as incremental, resulting from BPR (Hammer, 1990; Huizing et al., 1997). Even as IT implementations have evolved through Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM), the issues of process integration with technology implementation have hampered full-scale acceptance and success (Al-Mashari et al., 2003; Kotorov, 2003; Kumar et al., 2003). Executives have sought big returns to justify the degree of change and organizational stress resulting from such projects. While many studies have reported on the steps or tools in process redesign, few studies have addressed the effectiveness of such initiatives, particularly at the organizational level (Kohli & Hoadley, 1997). This is due in part to the lack of a framework of organizational measures of process redesign (Barua et al., 1996; Teng et al., 1996).

Stiroh (2001), states that not only is there improved productivity in the industries which produce and intensively use IT, but analysis of a wide selection of industries supports the role of IT as "a driving force behind the U.S. productivity revival" (p. 5). The three organizations selected for this project were a non-durable manufacturing firm, a hospital, and a financial services firm. These three represent three broad

industry sectors that experienced accelerated productivity during the time period of our study (Stiroh, 2001). They also are three firms that have undertaken IT-enabled BPR projects. Are these factors connected? The case studies provide a context in which to identify organizational impact measures that these firms used to determine whether their specific IT-enabled BPR projects were successful. Are organizations gaining through their IT-enabled BPR projects? If so, how? And how do they know what their improvements are?

Purpose and Motivation

The purpose of this paper is to examine (i) how organizations determine the overall organizational impact of their IT-enabled BPR projects, (ii) which specific variables organizations use to measure their process-level BPR improvements, and (iii) how these two levels of measurement affect each other. More specifically, we want to confirm the importance of both levels of measurement on the success of the project as espoused by the IT-payoff literature. The case studies reported in this paper reveal the contextual influences on the organizations' choice of variables.

Our impetus for this study was the senior managers' demand for justification of BPR, combined with the mixed results of measuring organizational performance cited in the literature (Bashein et al., 1994; Devaraj & Kohli, 2002; Sarker & Lee, 1999). BPR measurement is a contemporary issue across industries. For instance, in healthcare, declining reimbursement of services by insurance companies has necessitated extensive cost cutting through BPR. Similarly, competition from electronic commerce firms has led to widespread BPR in traditional industries to streamline order taking, payments and delivery of products and services as evidenced in the increase in ERP and CRM implementations. At a time when the relevance of IS academic research to the practice of BPR, ERP, and CRM is being debated among researchers, a rigorous case study can provide much needed guidance to practitioners (Benbasat & Zmud, 1999; Bergeron et al., 2001; Lee, 1999)

Although the ideas of measurement and improvement are not new, the emphasis on process redesign measurement at the organizational level is relatively recent and continues to be discussed periodically (Attaran, 2004; Kumar et al., 2003; O'Neill & Sohal, 1999 ; Tallon et al., 2000). The investment in initiatives to streamline business processes has not gone unnoticed among executive-level managers. They expect to see tangible evidence of BPR effectiveness and the resulting value to the organization. Senior managers have posed such questions as*:*

1. *Is there evidence that the organization as a whole has benefited from the BPR efforts?*
2. *How do we know where and how BPR has benefited the organization?*

This leads researchers to ask the questions –

1. *How do organizations measure organizational impact of BPR?*
2. *What framework(s) should they follow in implementing organizational impact measurements?*

Researchers advise examining practitioners' use of information through industry-academic interaction (Martinez, 1995; Strassman, 1990). Academicians appear to be answering this call (Al-Mashari, 2003; Irani et al., 2002). Case studies, such as those reported in this paper, are well suited to capturing the knowledge of practitioners and eventually developing theories from it (Benbasat et al., 1987). Case studies are a valuable tool for:

(a) examining a contemporary phenomenon, especially one that is not clearly understood,
(b) asking how and why questions (as opposed to how many or how much), and
(c) capturing the context (Benbasat et al., 1987; Yin, 1994).

While BPR is not necessarily a technology endeavor, information technology is a critical enabler of new operational and management processes (Davenport & Short, 1990; Hammer, 1990; Irani et al., 2002; Mooney et al., 1996). The strategic role of IT investments in supporting the BPR effort is often cited in the literature (Bashein et al., 1994; Broadbent et al., 1999; Ray et al., 2004; Tomsho, 1994). BPR and its links to the IT function have been key issues (Gottschalk, 2000), and there is renewed interest in this link and in reexamining the impact of information technology on process redesign (Attaran, 2004). However, there is a need to establish a framework that firms can use to redesign business processes by making use of their IT investment to have a demonstrable impact. We will draw upon prior BPR research, in addition to IT payoff research, to develop a framework of organizational impact and will use these case studies to further our understanding of where the payoffs come from.

The paper is organized as follows. In section II, we present an overview of the pertinent literature on IT-enabled BPR and its organizational impact. Based upon the review of literature, we present a theoretical framework for our case study investigations in section III. Section IV reports the research method that includes a case study framework and the findings from the three case studies. We present the results of cross case conclusions in Section V. Based upon our

findings, in Section VI we present lessons learned, and limitations of the case study. Finally, section VII presents our conclusions and areas for further research.

Literature Review

The waning interest in process design can be traced to the academic and trade literature reports of large investments in BPR but less than successful outcomes from such investments (Altinkemer et al., 1998; Kohli & Hoadley, 1997; Moad, 1994; Roach, 1987; Strassman, 1990; Teng et al., 1996). However, as the new e-commerce technologies begin to mature, there is recognition that process design and IT investment are not necessarily two separate projects. For instance, lessons from customer relationship management (CRM) suggest that CRM implementation is a strategy which can be successful if implemented a cooperative environment (Kotorov, 2003). Such cooperation is dependent upon removing silos, linking disparate information systems, and redesigning organizational incentives and structure to empower those employees closest to the customer (Sviokla & Wong, 2003). Each of the findings expressed in literature is consistent with the fundamental principles of process redesign that espouse integration of functions, data and processes. These findings are also consistent with the role of process redesign as a key to maximizing benefits of enterprise resource planning (ERP) investment (Ho et al., 2004).

While there has been acceleration in productivity levels in industries that use IT, the identification of how this acceleration specifically affects the firm is unclear. In examining the IT investment at the organizational level, Hitt and Brynjolfsson (1996) contend that even though there are relationships among *productivity*, *customer value*, and *profitability*[1], each is a separate issue, and the focus of an IT initiative on one of these three objectives determines which measures are attended to. The project's focus is equally important in understanding the stimulus, the response to which is process reengineering, as it is to understanding how to affect organizational change (Barua et al., 1996). Tallon, Kraemer, and Gurbaxani (2000) propose a process-oriented model in their examination of business activities within the value chain. They identify whether firms use *an operations focus* (to reduce operating costs while improving quality, speed, and time to market), *a market focus* (to create value for their customers and exploit customer segmentation), *a dual focus* (which blends the operations and market focus), or *an unfocused approach* (which doesn't focus on any specific strategy). This study found that executives have different and specific goals for IT-enabled BPR projects which must be taken into account when determining whether the project was successful. Additionally, if the firm had a dual-focused approach, executive perceptions of project success were more favorable than other focus types. The study reinforces that a firm must exercise a project focus in process redesign to achieve corporate goals.

Lee (2004) proposes a four-phase IT evaluation methodology which addresses the question of whether both BPR and IT investment are justifiable. Through a mathematical formula the approach estimates organizational benefits of combining BPR with IT investments into a capital budgeting model. The model and simulation indicates that measuring the impact of reducing cycle time on customers' decisions to repurchase is a key factor in determining the strategic value of the project. Thus, the identification of cycle time underscores the importance of business process performance and its impact on the returns from IT investment.

From an economic perspective, and consistent with Hitt and Brynjolfsson's (1996) argument, although IT investment has increased productivity and customer value, its effect on profitability has been difficult to isolate. In other words, payoff of IT-enabled process design is affected by other complimentary changes such as organizational structure changes (Brynjolfsson, 1993), management of change process (Sherer et al., 2003), and the extent of the effort involved in Business Process Reengineering initiatives (Devaraj & Kohli, 2000). Therefore, given that technology and business processes are complimentary factors, they must be changed in a coordinated manner to improve performance (Barua et al., 1996). However, this points to a complex measurement process in which the constructs and variables of interest are yet to be identified or may be evolving. To identify such constructs, a process approach to measurement may be better suited.

The process view of BPR payoff is used by Mooney, Gurbaxani, and Kraemer (1996) through a framework which proposes that firms derive business value from applying IT to intermediate, operational, and management processes. They classify these processes along *automational, informational, and transformational* dimensions. Other examples of the process perspective in measuring BPR have been in assessing the impact of IT on business value in manufacturing sector (Barua et al., 1995); in assessing executives' perception of business value of IT (Tallon et al., 2000); and in assessing the business value of enterprise systems (Markus & Tanis, 1999).

[1] The metrics used in previous studies are italicized and employed in building a framework in this paper.

Study	Variables	Findings
Mooney, Gurbaxani, & Kraemer (1996)	Automational variables Informational variables Transformational variables	As IT permeates the organization, it has a greater impact on business processes and the organization.
Hitt & Brynjolfsson (1996)	Productivity Customer value Profitability	The study used firm profitability but suggests that the IT investment effort is dependent on which of the three objectives are the focus of the firm.
Barua, Lee, & Whinston (1996)	High-level organizational variables Intermediate variables Low-level design variables	Without understanding the complementary relationships among the variables, organizations may measure the wrong variables, and therefore not find an expected payoff.
Tallon, Kraemer, & Gurbaxani (2000)	Automational variables	Firms that focus on both operational costs and market strategy improve the success of their IT-enabled BPR projects.
Zhu (2004)	Organizational Financial variables Process Variables	Ignoring complementarities in business value measurement can seriously underestimate the impact of IT

Table 1. Relevant literature signifying the importance of intermediate variables and project focus while measuring IT-enabled BPR

The process approach to measurement relates overall measures of performance such as *profitability and return-on-investment* to intermediate variables such as *customer satisfaction, turnaround time, coordination levels, and capacity utilization* which mediate the IT-enabled BPR impact (Barua et al., 1996). Zhu (2004) concluded that ignoring complementarities in business value literature can underestimate the IT payoff assessment. We used overall and process-level measures of BPR to examine three firms for this case study. The review of literature, summarized in Table 1, indicates that IT-enabled BPR payoff to the firm should take into account intermediate variables and project focus on the objective of BPR.

Although past research has highlighted the objective to study the interplay of BPR and IT payoff, the approach taken by researchers has varied. Increasing competition has renewed interest in cost cutting and process quality and hence the attention to process design (McCartney, 2004; Warren, 2004). To deal with the complexity of large data about customers, products and cost, IT's role is once again being emphasized to achieve business objectives (McWilliams, 2004). However, the process through which firms accomplish the measurement of IT-enabled BPR needs to be clearly understood. Hence, we undertake this study to examine how firms establish the link between IT investment and BPR in practice. We will establish a link to the BPR evaluation results of the three firms and view them through the lens of previous findings in IT payoff literature.

From our review of the literature, the context and firm's internal and external environmental dynamics emerge as key co-variables of proper BPR organizational impact. To accomplish the measurement, the literature points to a process theory model which proposes that investment in IT projects, applications and skill base represent creation of IT and process assets in an organization. When assets are used strategically in the organizational processes, only then will we see enhanced organizational effectiveness. It is the organizational effectiveness that our study examines through the above-mentioned measures (in italics). Using components of the literature presented here, we seek to understand the process of measuring organizational impact of BPR by building a theoretical framework.

Theoretical Background

We examined the organizations in our case studies through a framework derived from the literature and involving (i) the organizations' project focus of BPR, and (ii) the process-oriented measurement of BPR organizational impacts. Below we provide grounding and operationalization of *focus* and *process-oriented measurement*.

Project Focus

The crucial link between BPR and project focus has also been proposed by several authors (Benko & McFarlan, 2003; Edwards & Peppard, 1997; Kettinger & Teng, 1998). In the same line of thinking, aligning customer value with process investment has been considered as an antecedent of BPR (Guimaraes, 1997; Kallio et al., 1999; Leidner, 1999; Lockamy & Smith, 1997) and improving cycle time to increase customer repurchasing has shown to be critical in evaluating the business value of an IT-enabled implementation (Lee, 2004). A recent announcement by United Parcel Service (UPS) cut one day out of it delivery for no extra charge (Brooks, 2003). The effort was the result of its focus upon the customer value and led by redesign of its business processes through an extensive use of IT.

Based upon the cited literature on BPR project focus, we use three measures - **customer value, efficiency, or profitability** from Hitt and Brynjolfsson (1996) framework - to assess organizational impact in each of our case studies. These measures generally correlate to the constructs of market focus, operations focus, and dual focus espoused by Tallon et al. (2000). The determination of the project focus can be operationalized by whether its primary objective is to enhance customer value, efficiency, or profitability (Hitt & Brynjolfsson, 1996). Although it is obvious that the three focus measures are interrelated, Hitt and Brynjolfsson suggest that when cost is the central strategic issue in an industry, improving productivity may be the preferred choice. They caution that although it is assumed that increased productivity may lead to greater profitability, it is the pairing of benefits of IT investment with market opportunity and providing customer value that is more likely to lead to higher profitability. We sought confirmation of these pairings in the three case organizations. Irrespective of the focus of BPR project, the fit between the focus and the BPR initiative is critical to the success of the effort and eventual performance of the firm (Huizing et al., 1997).

Process-oriented Measurement

The intermediate variables for measurement of BPR are determined by the focus of the BPR project. These intermediate and process measures may be automational, informational, or transformational (Mooney et al., 1996). The deployment of BPR assets is not a guarantee that the organization will benefit from the BPR initiative (Soh & Markus, 1995). The proper management and utilization of such assets lead to BPR process impacts. Such BPR impacts when channeled appropriately and when measured through control variables are likely to yield measurable organizational BPR impacts (Devaraj & Kohli, 2000).

Figure 1 depicts the linkages of IT/BPR to organizational IT impacts. These linkages include process-oriented measurement in understanding such impact, indicated by the intervening 'Intermediate Assets'. Traditionally, The IT payoff literature has examined the investments and their impact on the organization, as depicted by the arcing arrow. However, recent literature cited in Table 1 had stressed the importance of complementary changes while studying the payoff. This view is also consistent with the process approach to examine intermediate assets, BPR being one such asset. Since many intermediate assets are 'soft' metrics, case study approaches serve as an effective way to examine and validate the effectiveness of measuring IT-enabled BPR. In the cases presented here, we seek to find evidence that identification of process-level success leads to higher organizational impact and higher IT/BPR payoff.

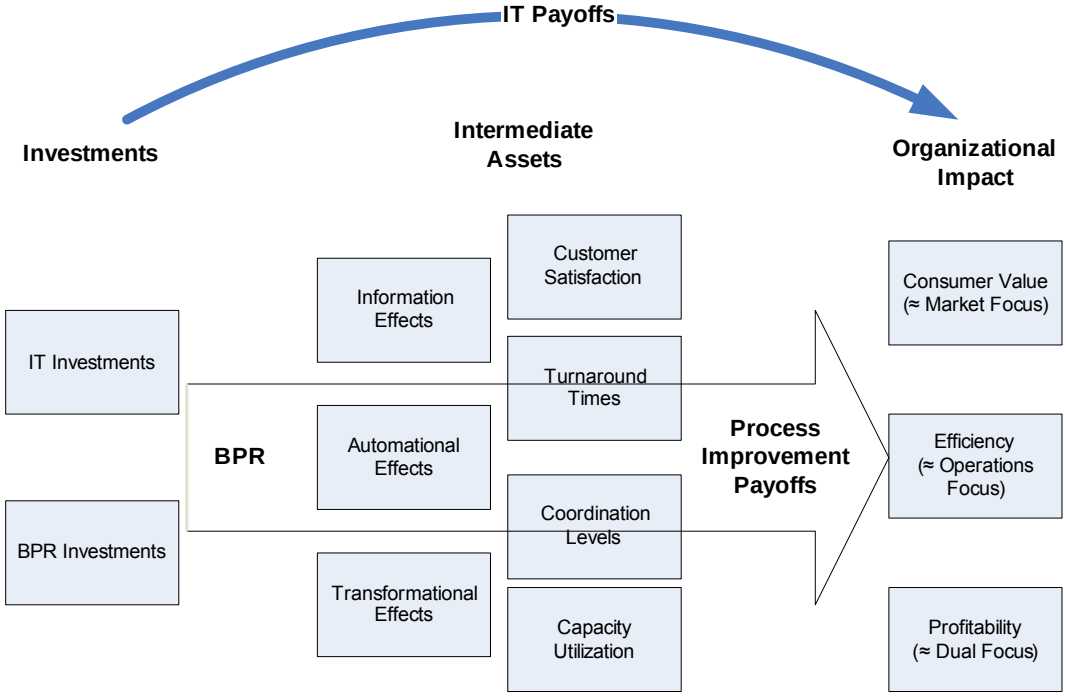

Figure 1. Focus of the IT-enabled BPR project is a contributor to intermediate and organizational impact of IT

Research Method

We conducted a pilot survey to explore the application of metrics among practitioners engaged in BPR projects. Our survey responses supported the suggestion that the term BPR was not used consistently among industries and even organizations within the same industry (Boudreau & Robey, 1996). The responses regarding the measurement of BPR were broadly distributed and therefore lacked aggregate comparison. The accompanying narratives of respondents, combined with the results, suggested that an in-depth study of an organization(s) would be more appropriate. Therefore, we decided to conduct case studies of organizations that were implementing or had recently implemented an IT-enabled BPR project. The organizations we selected represent three different industries where research has shown accelerated productivity with IT usage (Stiroh, 2000). We describe how organizations measured the effectiveness of their IT/BPR projects at the organizational level using the investment – intermediate assets - organizational impact framework as a reference. Specifically, we determine

1. whether there is a primary project focus on profitability, productivity, or customer value,
2. whether the firm sought improvement from redesign or radical transformation,
3. whether intermediate and process-level variables are measured,
4. whether process-level measures are aligned with the organizational level variables, and
5. whether the organization viewed the project as successful.

In order to institute rigor in the case study method, we follow an established case study method proposed by Yin (1994), an adaptation of which is shown in Figure 2. Yin's case study method begins with a framework of BPR organizational measurement. Following the framework, the selection of organizations and the data collection protocols were formulated and completed. At the conclusion of the case studies, the cross-case conclusions are drawn leading to a comparison of the initial framework. This comparison may lead to a modification or enhancement of the framework. The relevance and implications of the findings are reported so as to add to the cumulative research as well as provide guidance to practitioners. Finally, Yin's case study method calls for providing conclusions and recommendations resulting from the case study.

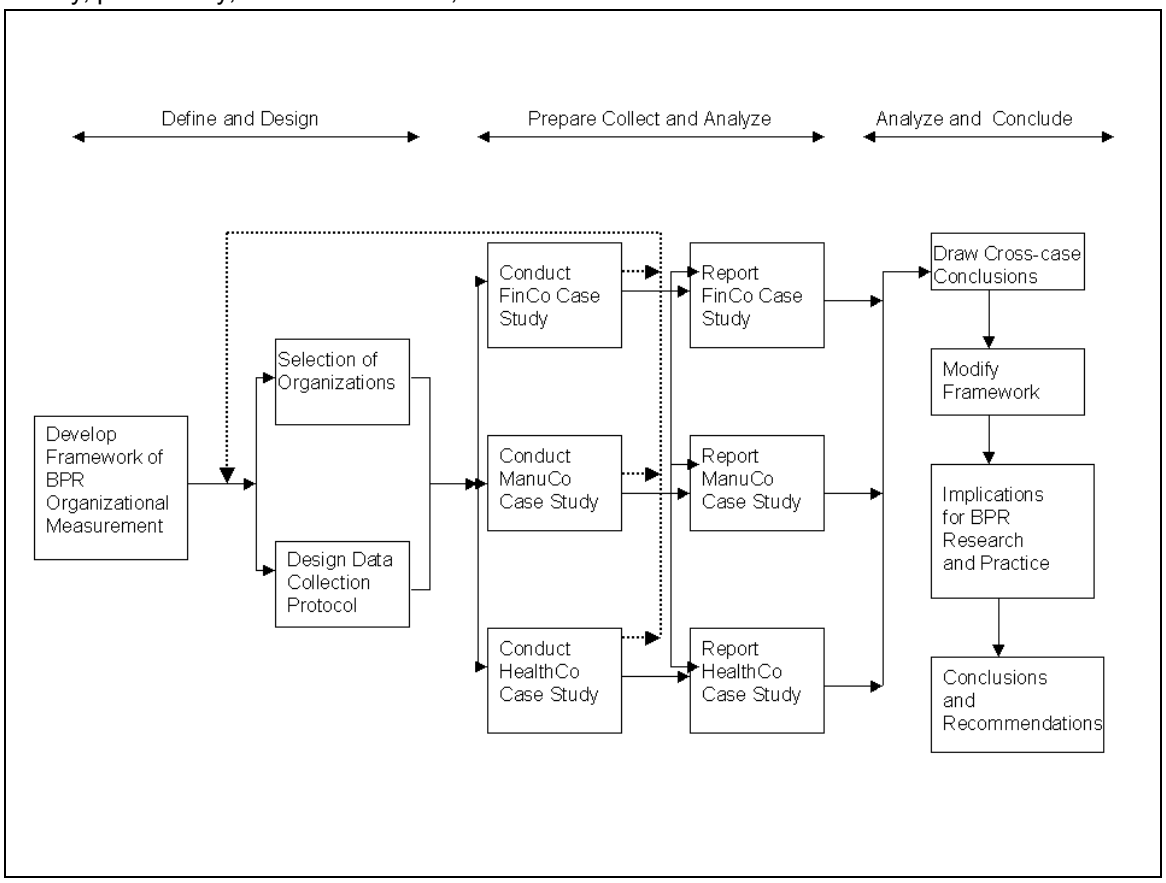

Figure 2. The approach followed in conducting the case studies reported in this paper [Adapted from Yin (1994), p.49.]

	FinCo	ManuCo	HealthCo
Industry	Financial Services	Manufacturing	Health Services
Annual Revenues	$775M	$886M	$1,500M
Number of Employees	3,700	6,500	19,135
Location	International	National (US)	National (US)
Market Strategy	Service Differentiation and Product Customization	Low-cost Commodity Product	Service Differentiation

Table 2: Description of the Three Case Study Organizations

Case Studies

Selection of Organizations

The three selected firms represent three distinct industries. We named them FinCo, ManuCo and HealthCo to reflect this representation. FinCo is in the investments sector of the financial services industry. It employs 3700 employees and 35 brokers with approximately $775 million in revenues annually. ManuCo is a manufacturer of disposable paper products. The strategic business unit examined in this case study is a supplier of packaging and promotional material to the fast-food industry. ManuCo employs approximately 6,500 people with annual revenue of approximately $886 million. HealthCo is a national provider of health care services. It employs over 19,000 people and has annual revenue of approximately $1.5 billion. Table 2 provides a summary of the characteristics of the three organizations.

Data Collection Protocol

Data collection focused on the topics of IT/BPR measurement variables, outcomes, and effectiveness. Data were collected through documentation review and semi-structured interviews. In each case, the organizations provided free access to documentation related to the BPR projects allowing us to specific and open-ended questions. This supports stronger substantiation of measurement constructs through information probing about emerging concepts. Furthermore, supplementing documentation review with interviews tended to eliminate biases of perceived project outcomes, and hindsight. This was particularly the case for projects that spanned a prolonged period of time (up to two years). Working from our preliminary framework, we constructed questions for semi-structured interviews to explore concepts of BPR organizational impact. Appendix A outlines our underlying concepts and the resultant questions.

Conducting and Reporting Case Studies

The documentation review and interviews yielded data about each organization's measurement of IT/BPR projects. Our data collection protocol called for (i) aggregating the information collected per the measurement frameworks summarized in the literature review and (ii) reporting the data collected and findings for each case.

	FinCo	ManuCo	HealthCo
BPR Participants			
Project Leader	1	1	1
Analysts	2	2	3
Non BPR Personnel			
Managers	1	2	2
Staff	2	2	3
Total	6*	7	9

* FinCo designated a manager to coordinate responses

Table 3. Employees interviewed by organization and position

Focus Variables *Hitt & Brynjolfsson (1996)*	FinCo	ManuCo	HealthCo
Productivity	*	*	*
Profitability	*	*	
Customer value	*	*	

Table 4. Focus Measures and Case Study Findings

FinCo: The FinCo is a high-priced, quality-differentiated investment firm. Using a traditional account structure, FinCo strives to build investment relationships with its customers. A comprehensive IT-enabled BPR began by identifying the processes and sub-processes of the firm. FinCo hired consultants who developed cross-functional and cross-hierarchical teams of 20 people each. The process redesign effort was undertaken to support the implementation of a document imaging system. The goal was to measure work hours spent by account managers on each customer account by unobtrusively collecting time data within the document imaging system. This would then result in an overall measure of cycle time for each

project. Continuous improvement would result through reduced cycle time. Preliminary measures of the process redesign were:

- Customer satisfaction
- Competition rating for quality of service
- Elapsed time of the process
- Process cost through elapsed time per department
- Process cost through account personnel time usage
- Accuracy

The overall process measure was profitability. This measure was not reduced to the team level, but rather remained at the business unit level. FinCo is now measuring per unit costs to reduce them below the market level in order to increase market share and number of clients. Intermediate measures of reduced costs and improved service resulted in increased profits. Productivity is important to reduce the operating costs for each unit.

Intermediate Assets *Barua, Lee, Whinston (1996)*	**FinCo**	**ManuCo**	**HealthCo**
Unit Operating Cost	*	*	*
Total Cost of Reengineering			
Capital cost	*	*	
Non-capital cost	*		*
Quality of routine transactions			
Number of tasks per employee	*	*	*
Electronic monitoring	*		*
Transaction simplicity			
Process integration			*
Intra-process information access			*
Quality of exception transactions			*
Access to external information			*
Interface design			
Decision aids			*
Scope of decision authority			*
Contribution identification			

Table 5. Intermediate Assets and Case Study Findings

FinCo Data: In examining the project focus variables, FinCo is attempting to focus on all three: productivity, profitability, and customer value. They recognize that as the high priced firm in the industry, they have to provide the highest customer value through service and customization. They also recognize that only improved productivity through redesigned processes would improve their profitability. Although they are profitable in the marketplace, continued profitability is possible only as long as the cost of gaining and servicing accounts can be kept at a minimum.

Intermediate Assets *Mooney, Gurbaxani, Kraemer (1996)*	**FinCo**	**ManuCo**	**HealthCo**
Operational: Automational			
Labor Costs	*	*	
Reliability		*	
Throughput		*	*
Inventory Costs			*
Efficiency	*	*	*
Operational: Informational			
Utilization			*
Wastage			*
Operational flexibility		*	
Responsiveness		*	
Quality			*
Operational: Transformational			
Product/Service Innovation			
Cycle times	*	*	
Customer relationships	*	*	
Management: Automational			
Administrative expense	*		*
Control	*		*
Reporting			*
Routinization			*
Management: Informational			
Effectiveness	*		*
Decision quality			*
Resource usage	*	*	*
Empowerment			
Creativity			
Management: Transformational			
Competitive flexibility			*
Competitive capability			*
Organizational form			

Table 6. Intermediate Assets and Case Study Findings

FinCo finds it difficult to differentiate among the focus variables. It must get productivity and customer value gains to achieve profitability. However, if profitability is not realized, the project is ultimately deemed not successful. FinCo must keep customers through satisfaction and customer value; but they cannot target customer value if they can't do so profitably. FinCo has

realized little or unknown profitability gains of their BPR project, some productivity gains, and mostly customer value gains.

Without being explict about measuring intermediate variables, FinCo decomposed its IT payoffs into those measures that would be most appropriate for their business context. FinCo is willing to invest in the underlying information technology to support BPR as well as in the labor resources to realize its implementations. FinCo recognizes that its product is an information product and that it has to implement an information technology for customer support.

Finally, FinCo has comprehensively measured the process variables of BPR assets, impacts, and organizational value. Intermediate assets were created through increased technology, infrastructure, training, and organizational knowledge. FinCo realized the impact of the increased assets through improved products, services, and processes. FinCo sought to determine how these impacts are realized in greater organizational value through profits, productivity, and customer value. They value this project as a moderate success – the outcome is positive, but the project completion time was burdensome.

ManuCo: ManuCo is a market-leading commodity-price producer of supplies for the fast-food industry. ManuCo's BPR project began with support from industry consultants. The impetus for change was to meet the frequently changing customer demands through improved process flexibility while maintaining market share. Additionally, ManuCo wanted to evaluate current processes in a holistic way rather than piecemeal evolving processes that resulted in a higher-than-optimal cost structure.

The first step in the process evaluation was to set performance measurements for the manufacturing process. It was believed that if lower level measures were managed, the cumulative results would automatically achieve the overall goals of improved profitability through lower costs. The first iteration of redesign resulted in some of the desired improvements. During this phase of the project, ManuCo invested in electronic design technology that supported interactive product design. Customers and designers could make changes to product artwork quickly and receive design approvals electronically. This IT-enabled BPR increased customer value. However, as the low-cost producer in a commodity industry, ManuCo could not make significant price increases. ManuCo was a late entry in the market with this design feature.

During the next phase of its BPR project, ManuCo identified the capital costs of manufacturing that would be required to continue the redesign process itself and to sustain the realized gains. ManuCo did not know whether the costs of additional investment would be recouped, so they chose not to invest in the new production technology suggested.

In addition, some problems resulted from imposing plant-level measures. Inter-plant cooperation was inhibited when plant managers perceived that sharing resources could affect their own measurements. Intermediate metrics such as employees' time spent proved difficult to define and measure. In addition, the emotional commitment to reengineering depended on how involved the plant-level leaders were. Some productivity gains were achieved such as reduced lead-time required for order fulfillment. However, customers perceived only marginal value from the process improvement. In the end, ManuCo gave priority to overall profitability as the effectiveness measure. It has viewed productivity and customer value as intermediate to profitability. In addition, it treated investment in IT as decreasing profitability because the customer perceived it to be of marginal value.

ManuCo Data: ManuCo viewed profitability as its primary project focus variable, relegating productivity and customer value to intermediate variable status. All three variables were viewed as important. At the intermediate level, ManuCo has measured the manufacturing processes at the plant level. The intermediate variables include labor costs, reliability of the product, throughput, plant efficiency, and production resource usage. Improved customer relationships, cycle times, and operational flexibility have resulted in greater customer value, especially in the product design phase. However, the gains are subsumed into the process without resulting in improved profitability even though market share has been retained.

By concentrating measurement at the plant level, ManuCo viewed improved unit-operating cost as a primary element of profitability. This focus supported an overall operating cost minimization. ManuCo identified its project focus variables as profitability, productivity, and customer value. It decomposed its performance indicators by unit, targeting the gains realized in a reengineered manufacturing flow process. Customer value and process flexibility allowed ManuCo to retain customers who might have gone elsewhere. However, this cost of doing business resulted in no improvement in the revenue stream. With profitability as the primary project focus, ManuCo recognized and measured its intermediate variables even though the reengineered process was less successful than it might have been if investment had been made in capital technology. ManuCo views its project as a partial success.

HealthCo: HealthCo is a leading provider of health services in a number of regions of the US. A significant portion of the healthcare business involves providing care for the elderly, covered by the Medicare program. Healthcare Maintenance Organizations (HMO) and managed care programs cover many other patients. Medicare, HMO's and managed care organizations reimburse hospitals for services provided to patients covered under their plans. The amount of reimbursement by payors has been steadily decreasing for the last several years. This has pressured the hospitals to reduce costs and improve efficiency. The cost-cutting pressure has led HealthCo to conduct BPR at the administrative and patient care levels. The first round of BPR resulted in the short-term outsourcing of development and maintenance of administrative systems functions, while a new infrastructure was being constructed. The strategic IT function was retained; however, the functions and processes were reengineered for efficiency and increased customer value. The second iteration of BPR resulted in consolidating the functions of subsidiary organizations and providing administrative and IT services from a central location. HealthCo took the opportunity of outsourcing and consolidation to invest in upgrading the information systems, implementing a centralized Enterprise Resource Planning (ERP) system, and leaping into the 'Internet-age' of access to the users. Performance measures of IT-enabled BPR were based primarily upon the potential for reduction of cost savings i.e. increased profitability. Even when the performance measures were based upon improved quality and ease of access, such measures were viewed through the lens of cost savings.

HealthCo Data: Given that increasing revenue in this sector is almost impossible, HealthCo viewed cost savings through improved administrative productivity as the primary way to enhance profitability. In fact, maintaining a steady profitability is the more likely scenario. Competitive forces and the economics of healthcare business are such that even achieving a break-even point requires significant effort. Through managed care, customer value is mandated and cost reduction is the only remaining way to stay in business.

HealthCo implemented a centralized ERP information system to enable a redesign of its administrative processes. As intermediate measures, HealthCo captured unit operating costs, the quality of routine transactions, number of tasks per employee and process integration. When examining the quality of exception transactions, it measured the access to external information, decision aids, and the scope of decision authority. At the same time, HealthCo measured resource utilization, waste, and quality of operations. Since the administrative system is primarily for managerial purposes, management processes were also crucial. Administrative expense, control, reporting, and degree to which activities become routine were part of the success formula. Additionally, HealthCo measured effectiveness, decision quality, resource usage, and competitive flexibility at the process level. HealthCo viewed these projects as successful.

	FinCo	ManuCo	HealthCo
Focus Variables Hitt & Brynjolfsson (1996) (3)	3	3	1
Intermediate Level Variables Barua, Lee, Whinston (1996) (14)	5	3	10
Mooney, Gurbaxani, Kraemer (1996) (25)	8	9	15

Table 7. Count of Reported Measures.
(Numbers in parenthesis represent the total number of variables in the framework. Numbers in columns 1-3 represent the number of variables measured by the organization.)

Variables Common to All Cases	
Focus Variables Hitt & Brynjolfsson (1996)	Productivity
Intermediate Level Variables Barua, Lee, Whinston (1996)	Unit Operating Cost Number of Tasks per Employee
Process Level Variables Mooney, Gurbaxani, Kraemer (1996)	Efficiency Cycle times Customer relationships Resource usage

Table 8. Common BPR Variables

Results

FinCo and ManuCo were ambiguous in their project focus variables of the BPR initiatives. Although both organizations understood the goal of BPR, their inability to choose appropriate overall measures may have led to less than successful results.

Although FinCo wanted to retain its customers, it appeared to be more engaged in the deployment of the imaging processing system, which does not have an established impact upon increased customer value or profitability. Further, although intermediate variables of efficiency and quality of transactions are being captured, their link with retaining customers was unclear.

		FinCo	ManuCo	HealthCo
Business Context	Business Drivers	Customer relationships Knowledge providers Profit on the investment more than on the transaction	Cost Per Unit Sold Quality deliverers Flexibility in product design for customers	Information deliverers Centralized administrative support
	Motivation for BPR	Reduce costs of transactions in a bull market Support the knowledge providers with customer information	Reduce production costs Reduce cycle times Shorten lead times for product design	Reduced administrative costs
	Processes Involved	Customer account servicing	Production and design	ERP administration
Process Changes	Business Impact	Reduced costs of account servicing Improved customer satisfaction	Reduced cycle time Reduced lead time for product design Minimized costs	Reduced costs Improved accuracy & reliability
	Duration of BPR	3 years	3 years	3 years
BPR Investment	Major Infrastructure Investment	Enterprise-wide imaging and account tracking system	Electronic design capabilities Plant-flow redesign	Client –server administrative information system
Extent of BPR		Redesign	Improvement	Redesign
BPR Measurements	Focus	Productivity Profitability Customer value	Productivity Profitability Customer value	Productivity Customer value
	Intermediate	Unit Operating Cost Capital Cost of BPR Non-capital cost of BPR Number of tasks per employee Electronic monitoring	Unit Operating Cost Capital Cost of BPR Number of tasks per employee	Unit Operating Cost Non-capital cost of reengineering Number of tasks per employee Electronic monitoring Process integration Intra-process information access Quality of exception transactions Access to external information Decision aids Scope of decision authority
	Process	Labor Costs Efficiency Cycle times Customer Relations Administrative Expense Control Effectiveness Resource Usage	Labor Costs Reliability Throughput Efficiency Operational flexibility Responsiveness Cycle times Customer Relations Resource Usage	Throughput Inventory Costs Efficiency Utilization Wastage Quality Administrative expense Control Reporting Routinization Effectiveness Decision Quality Resource usage Competitive flexibility Competitive capability
Perceived Outcome of BPR		Partly Successful	Partly Successful	Successful

Table 9. Case Studies' Summary of Findings

Having noted FinCo's ambiguous project focus, we argue that the process orientation appears to have helped it recognize its limited IT/BPR success. We propose that in the absence of some process-oriented measurement, FinCo might not have been able to identify the limited success. Such recognition, although unwanted, provides FinCo with an opportunity to learn from its mistakes and realign the project.

ManuCo's project focus incorporated all three focus measures - productivity, profitability and customer value. It is clear that customer value was the primary focus of the IT-enabled BPR initiative. Yet ManuCo did not place a high priority on assessing customer priorities. Furthermore, the project focus communicated to the BPR team was also broad and lacked direction. Therefore, the result was that the investment was not sufficiently valued by the customer(s).

Given this scenario, ManuCo's BPR neither created barriers to entry for the competition nor created significant customer value. ManuCo also measured intermediate variables of BPR assets and impacts resulting in the realization of limited customer value and plant-level organizational issues. HealthCo has one primary BPR project focus - efficiency. Its singularity of purpose has led to the recognition that costs have to be contained while maintaining or enhancing customer value. The measurement of efficiency as well as customer value may appear as a fine distinction between HealthCo, and ManuCo and FinCo, but it is a vital distinction. HealthCo has efficiency as the primary focus - which, if not achieved, would render the BPR initiative as a failure. However, as a good business practice, HealthCo measured customer value to insure that efficiency is not at the cost of customer value.

As discussed above, performance was measured at multiple levels in the process at FinCo, ManuCo and HealthCo. All three organizations included variables at the project focus and intermediate levels. Additionally, all three organizations used measures that aligned through all the levels resulting in somewhat successful BPR organizational impact. Through a 2x2 grid with high and low process orientation on the x-axis, and high and low focus on the y-axis, we subjectively place FinCo, ManuCo and HealthCo on the grid in Figure 3. The location on this grid indicates the relative status of each organization with regards to IT-enabled BPR measurement.

Discussion

Our findings support the process-oriented measurement of Intermediate Assets leading to organizational impacts proposed in the IT literature (Soh & Markus, 1995). The findings of our case studies also support the notion that organizations do engage in measurement of IT-enabled BPR efforts at multiple levels of the process (Barua et al., 1996). The project focus generally exists as a primary antecedent to the success of the project. However, we also find that organizations measure BPR success through intermediate variables, in addition to project focus variables. Such variables are possible if IT/BPR itself is seen as a process with intervening steps that need to be measured. There are performance indicators at multiple levels that show a return on investment.

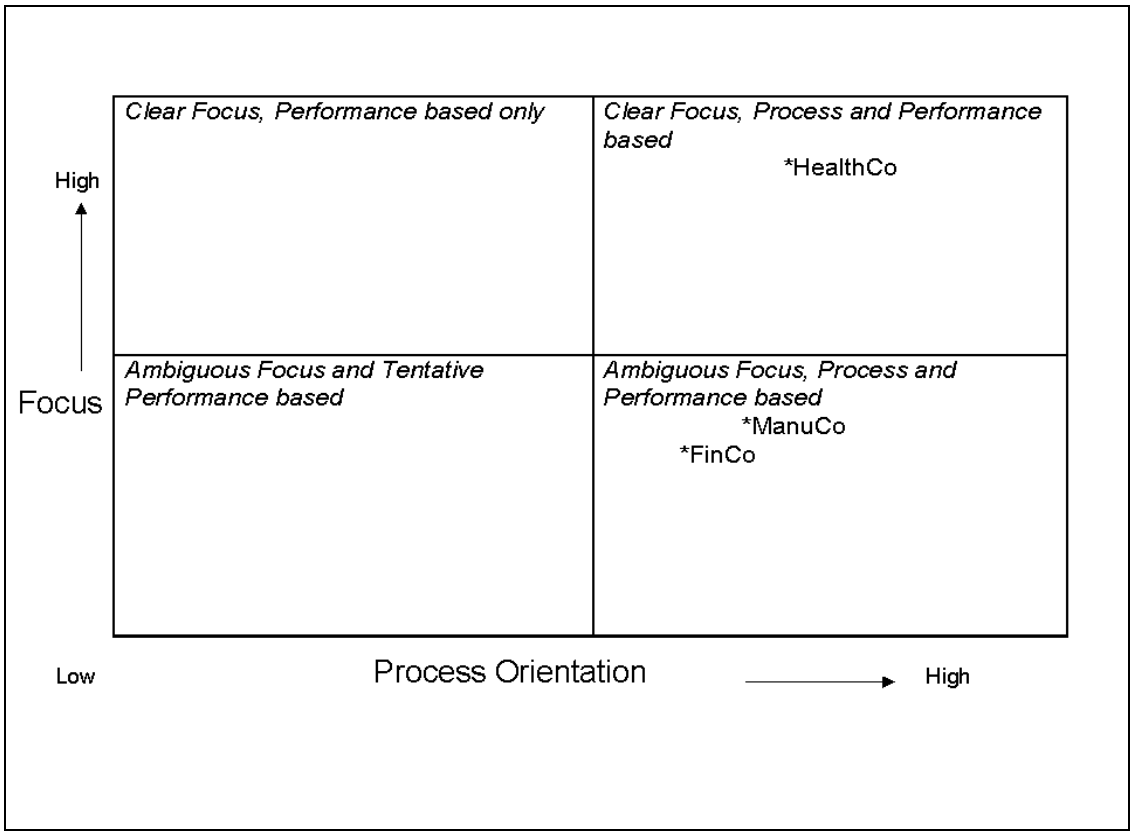

Figure 3. Focus-Process Orientation grid showing the location of FinCo, ManuCo, and HealthCo

Similarly, there are performance indicators that show that if they do not invest resources, there will be little or no return on the BPR efforts. Sharing of metrics can provide learning for organizations in multiple industries. In these cases, the organization that was better able to measure its process variables, HealthCo, perceived a more successful outcome of their project.

The prevailing management literature calls for organizations to engage in creative destruction (Foster & Kaplan, 2001) and to rethink the way they do business in order to gain the greatest outcome from the IT/BPR project. This was not evidenced in the firms we studied. Instead, these organizations concentrated on controlling the parts of the value equation that were most tangible to them – operating costs and customer relationships. The resulting cost savings were used to further their overall strategic goal. For HealthCo, that was passing the savings to the consumer to stay competitive in the market. For ManuCo and FinCo, it was to use the savings to fund market-focused strategies they would not have otherwise been able to pay for. The process-oriented attention provided them more flexibility in considering strategies available to them. None of our firms set out to transform their businesses.

Change management, a determinant of BPR success, which we did not identify in our model, was found to be of significant value. Change management involves countering the resistance to change. BPR by definition embraces change. Change, if not managed, brings resistance. Previous case studies have shown a lack of formal change management processes, particularly when BPR projects are led by information systems groups (Guha et al., 1997). The results of our case studies indicate that when organized change management support was provided, BPR proceeded with minimal resistance and generally on schedule. We also found that constant and honest communications was a major factor in successful change management practice.

In addition to support for past research in BPR and IT payoff measurement, we found learning experiences and lessons that are distinctively products of a case study approach. Although the literature suggests measuring the BPR value through a process, the case studies reveal that it is harder to achieve such process orientation in practice. Organizations often do not have the data or the time to collect data to facilitate such analysis. Furthermore, there is no established theory of measuring the organizational impact of BPR, and the control measures to separate the effect of BPR from other internal and external factors. We present below our observations and lessons learned from our interaction with practitioners in these case studies. We hope that these lessons will benefit the practitioners and researchers and perhaps lead to future research.

Lessons Learned

1. **The project focus of the BPR dictates which measurements are appropriate.** There is not one specific set of measurements that determine BPR success or effectiveness. Organizations compete differently and measure overall success differently. Likewise, BPR initiatives may have different goals as the organization improves different processes. In the organizations examined here, the importance of multiple levels of measurement and overall project focus were important factors in the success of the projects. This finding provides objective confirmation to the executive perception reported previously by Tallon et al. (2000). To paraphrase a popular saying, if you don't know where you're going, no road will get you there. Project focus, direction, and the use of intermediate measures to guide and correct progress are critical to project outcomes and returns.

   This finding confirms the broad range of IS Effectiveness measures proposed by Seddon et al. (1999) classified on stakeholder and system aspect dimensions. Overall organizational impact affects the management/owner stakeholders; these case studies specifically examined the organizational or sub-organizational aspect of the information systems. The Seddon et al. collection of variables includes most of those revealed in our surveys.

2. **Businesses engaged in IT-enabled BPR concentrate on components within their own links in the overall value chain to create strategic advantage.** Management literature proposes that organizations boldly revitalize their businesses by moving beyond incremental change to radical reengineering (Hammer & Champy, 1993) and to changing the dynamics of their entire industries for competitive advantage (Hamel & Prahalad, 1994). Contrary to the recommendations of this literature, the firms in our case studies did not engage in radical redesign. Perhaps our firms were too small, lacked transformative creativity, or were risk averse. They chose instead to strive for decreasing costs and improving productivity. These redesign measures provided them the opportunities to compete in an industry with high cost pressures or to use the extra resources in to create customer value.

3. **By targeting the industry value chain elements within their direct control, firms enable specific business strategies.** HealthCo and ManuCo

were able to pass cost and productivity improvements on to their customers in order to survive in highly competitive industries. FinCo was able to use available resources to enable a customer value strategy of improved customer and account service. In all these cases, the overall strategies were successful to the extent that the firms were able to control their costs. The payoffs for controlling operating costs are evident in the airline industry where discount companies have been able to move into markets and control the customer prices where larger airlines have been forced to cut flights (McCartney, 2004). Yet just cost-cutting alone may yield detrimental outcomes. When cost-cutting involves downsizing, organizations that pay attention to the human condition within have shown to recover more fully than firms that slash and burn (Caza et al., 2004). How organizations use the available resources freed up by controlling costs depends on the industry. Firms that face high degrees of customer power in their industries, such as HealthCo and ManuCo, return those costs to the customer to maintain the revenue stream and to compete successfully in the industry. Firms that face lower customer power, such as FinCo, use the additional resources to enable a strategy of customer service and product features to increase their market share. In either case, the cost savings become fuel for the strategy. We anticipate that this will prove even truer in the e-commerce environment.

4. **Those firms that measured intermediate process variables were more successful in improving overall organizational impact measures such as productivity and customer value.** HealthCo monitored and controlled more intermediate variables than did ManuCo and FinCo. This made it possible for HealthCo to identify cost savings and productivity improvements at the process level. FinCo and ManuCo used more of a black-box approach, viewing costs and productivity at a higher level except for the very tangible measures of cycle-time and labor costs. Additionally, HealthCo viewed its project as more successful overall. The number of variables measured provided more opportunities to succeed, and therefore contributed to an overall perception of success.

5. **The process approach was more helpful in guiding the project to successful completion than the strategy process alone.** The nature of BPR projects is that it is difficult to connect the cause-and-effect pieces when they are separated by time and space at the organizational level. Process level variables provide monitoring within the scope of more individuals' work, supporting quicker intervention in case of variance. Because BPR is focused on processes, it is more tuned in to operational improvements than other large-scale organizational changes such as restructuring.

Measuring IT/BPR Organizational Impacts

Our findings and lessons learned from the case studies support our IT/BPR payoff model in Figure 1. Tools and techniques of BPR create Intermediate Assets. When proper assets are created, IT-based or otherwise, they lead to the intended objective of BPR. Such assets have included EDI or transaction systems for better customer service (Barua et al., 1995; Beath et al., 1994; Mukhopadhyay et al., 1997; Weill, 1992). However, when appropriate assets are not created, BPR leads to inappropriate impacts resulting in failures of the BPR initiatives (Bashein et al., 1994; Martinez, 1995; Sarker & Lee, 1999). Measurement of intermediate variables during the process of BPR assets leading to impacts is also a key criterion in assessing whether BPR has resulted in the expected outcomes. This measurement is an important tracer particularly when BPR does not show organizational impacts and is deemed a failure.

Organizations may continue to look for overall organizational impact as a financial measure such as ROI of the capital investment of the IT project. However, more evidence of success is available and supportable when process-level intermediate assets are valued and measured. These also support mid-course correction of IT/BPR projects as they span multi-year projects.

Table 10 presents examples of metrics used under each focus – Customer Value, Productivity, and Profitability (Hitt & Brynjolfsson, 1996) -- as they relate to each step in the measurement of organizational impact. The measurements may also differ based on the degree to which an organization chooses to invest in BPR assets. Table 10 represents a further refinement of the Seddon et al. (1999) measurement table along its management/owner stakeholder dimension.

Implications of Results

The results of our case studies have implications for businesses as well as for academic research. For businesses, the process model of measuring organizational impact will help managers understand the conflicting results of IT-enabled BPR that have been reported in the trade literature.

BPR Project Focus	Customer Value	Profitability	Productivity
Process Salience-Worth	▪ Identity Asset	▪ Priority Processes	Background Processes
Process Assets	▪ Informational features added ▪ Reduced process steps ▪ Customer-relationship personnel hired	▪ New products launched ▪ New patents issued ▪ Value-added products ▪ Product/Service alliances	▪ Enabler systems implemented ▪ Additional personnel trained ▪ Functional Teams created ▪ Quality control
Process Impacts	▪ Repeat users ▪ Customer satisfaction ▪ Number of Returns	▪ Process usage ▪ Reduced costs ▪ Percent process availability	▪ Problem resolution time ▪ Absenteeism ▪ Decision layers ▪ Wastage
Organizational Impact	▪ Retention rate ▪ Market share ▪ Complaints ▪ Ideas implemented ▪ Referred new customers	▪ ROI ▪ ROR ▪ Profit per employee ▪ Share value	▪ Sales per employee ▪ Expenses per employee ▪ New product cycle time

Table 10. Examples of Variables to Measure BPR Organizational Impact

An examination of the reported BPR studies through our proposed framework can help mangers understand whether the mixed results for IT-enabled BPR was due to a failed implementation or improper measurement. Further, the process approach has the potential to identify the extent of the benefits even when they are localized to a process or business function. For instance, when BPR creates value to the organization by reducing risks of mistakes or legal exposure, such benefits generally do not appear in traditional measures of performance. Our experience indicates that the ability of process leaders to identify and present tangible and intangible outcomes of BPR to the senior management will be of significant value in securing the credibility of IT-lead BPR.

The implications for research from this paper include setting the stage for empirical testing of the framework. Future research can assess the impact of BPR as a contributing factor to IT payoff by separating the payoffs from BPR in the implementation of a specific technology. More specifically, future research can show the value of each component of our proposed BPR framework and test propositions such as: Does Change Management facilitate or hinder the BPR? This paper also synthesizes the literature from previous BPR measurement studies and those IT payoff studies that propose BPR as a key factor of IT success.

Limitations

Along with the above-cited contributions, there are some limitations of our case studies. First, the findings are based upon a limited number of organizations that we studied over a limited duration of time. It would be interesting to review the long term performance and measurement of the initiatives studied for this research. Second, although we were granted access to people and documentation, we cannot rule out the possibility that there were other elements of BPR objectives and measurements policy that we were not privy to. Although we triangulated our interview findings through documentation, FinCo data may be biased because it was being reported through a contact person. Third, we examined the BPR projects and their performance as it related to the process and its impact on the organization. We did not attempt to investigate whether there were other competing processes or control variables that could have contributed or limited the impact of the processes we examined.

Conclusions and Further Research

Through comparative case studies, the paper contributes to our understanding of how organizational impact of IT-enabled BPR is measured in practice. Case studies allowed us to probe deeper into understanding why organizations choose certain variables and how such variables lead to measurement of impacts or lack thereof.

Our findings indicate that IT-enabled BPR has matured to the point where organizations want empirical evidence of payoffs to the organization. Its measurement maturity level can be considered midway between the maturity of organizational information technology payoff measurement and that of electronic commerce. BPR has not fully developed a concrete set of metrics for organizational impact. We believe that implementation of management practices and technologies follow a life cycle in which the need for measurement arises following the haste to deploy them. For instance, IT Payoff measurement emerged as a research topic two decades ago after the widespread deployment of IT in organizations. After

the initial excitement of the 1990's BPR is at the stage where researchers and organizations are pausing to assess its value in complementing IT investment. Similar interest in the measurement of electronic commerce, enterprise resource planning, and customer relationship management is now beginning to generate widespread interest indicated by special issues of information systems journals.

Future studies can empirically test our findings of the project focus and process-orientation conditions under which organizational value is realized. Future research may test the validity and robustness claims in literature that BPR follows a path to organizational value and effectiveness similar to that of IT Payoff and attempt to answer questions such as -- How can organizations relate the investment in BPR assets to improved technology, infrastructure, and organizational knowledge? How can BPR investments be isolated to measure its impact on improved products, processes and/or services?

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Appendix: Resultant Questions

The questions asked were not necessarily in the order presented here. The data were gathered from documentation, followed by interviews to verify or fill in the missing information.

The focus of BPR: The driving force behind the BPR initiative was reviewed to assess the primary focus of the organization as it initiated the project. The focus can be any one of the focus measures - to increase productivity, profitability or customer value. While the three objectives are related and indeed may be simultaneously pursued by an organization, we identified the one that was the primary impetus for the BPR initiative (Hitt & Brynjolfsson, 1996). In order to assess the focus we inquired as to the one objective, which if not met would signal the project as a failure.

> *Resultant Question: What was your organization's purpose in initiating this BPR project? Was there any particular outcome that would have signaled a project failure?*

The extent to which the organization analyzed the worth of BPR: A focus measure of organizational value determined by whether or not the firm was driven to BPR by the competitiveness of the process selected.

> *Resultant Question: Was the process selected for redesigning an asset and did it create economic value for the firm?*

The extent to which the BPR initiative created appropriate measurable assets: Literature in the IT payoff research indicates that merely investing in an initiative does not necessarily lead to organizational impact. The investment should lead to appropriate assets such as supporting information systems, technical and analytical competencies among the staff, and a reward structure for the BPR effort (Moad, 1994; Soh & Markus, 1995).

> *Resultant Question: What additional measurable outcomes resulted from the BPR project? Were there any surprises?*

The extent to which the BPR assets had a measurable impact on the process: In order for the BPR assets to result in process impact, they have to be applied effectively. Assets now applied effectively, although appropriate, may fail to show the impact upon process improvement. The literature in the IT payoff to the organization indicates that assets have to be focused and their use channeled so as to yield expected results (Soh & Markus, 1995).

> *Resultant Question: How did these additional outcomes affect the overall project?*

The metrics applied to measure process impact on the organizational performance:
The process redesign, although successful, should be linked to an improvement in organizational performance. Most often, the organizational improvement is a tangible outcome and can be measured in financial indicators such as ROI, ROR, or ROE. Similarly, sales per employee can be reflective of the organizational performance. An increase in market share is also a tangible indicator of organizational performance. One of the challenges in the measurement of organizational impact from BPR is to identify and separate the focus performance improvements from the intermediate and lower level improvements.

> *Resultant Question: What measurements did your team and/or managers use as performance indicators on this project?*