Business process improvement: empirical assessment and extensions

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Abstract

Purpose – The purpose of this paper is to survey and analyze current process improvement (PI) approaches, their empirical results reported in the literature, and develop accordingly a conceptual framework and implementation guidelines.

Design/methodology/approach – A literature review of the popular business database to search for case studies and empirical research on PI methods was conducted. The empirical evidence on success and failure factors were inferred and tabulated. Based on synthesis of the lessons learned from this empirical evidence along with concepts drawn from economics, and operations management, a conceptual framework is developed.

Findings – It was found that the framework would serve as a diagnostic tool for identification of, and recovering from root causes of problems and inefficiencies faced in business environments. The framework proposed synthesizes and extends earlier PI tools and basic approaches used for mitigating disruptions faced in operations practice. The framework design consists of three main phases: Specify; Analyze; and Monitor closely. Accordingly, it is denoted by SAM.

Practical implications – Decision makers can be altered to both the success factors and causes of failure of different PI approaches, and a framework is provided along with implementation guidelines that help assure practical effectiveness of PI efforts. The guidelines provided for practicing managers comprise two categories: specific; tool-based, and general; system-based.

Originality/value – The contribution of this paper is two fold: first, empirical evidence on the drivers of success and failure of four main PI approaches, were synthesized. These include: six sigma, benchmarking, reengineering and process mapping. Second, based on this empirical evidence, a conceptual framework that guides both the choice and implementation of business process improvement programs is developed. The proposed framework and its implementation guidelines help assure actual effectiveness of PI practice.

Keywords Process management, Business process reengineering, Modelling

Paper type Literature review

1. Introduction

Companies are striving to gain market share in global economy, and the competition is so fierce. Quality and customer satisfaction are major items on each company’s agenda, but so is profitability. The effort has to start internally, by continuously improving their business processes in every area, as well as from the “Outside-In” to reflect the changes in market requirements, and in customers’ needs.

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It is noticed however that, not all process improvement (PI) efforts lead to profitability increase. Many companies have experienced impressive improvement in an individual process, where the bottom line improvement was next to none (Hall et al., 1993).

So, what is PI? How to measure its success? What are the main drivers of its success and the root causes of its failure in practice? How to avoid such failure, and help practitioners insure their PI programs achieve their intended outcome? This paper addresses these questions. The empirical lessons learned from actual PI programs are synthesized and used to develop a Framework that helps practitioners achieve the intended results from PI.

According to APICS, a process is “a planned series of actions or operations (e.g. mechanical, electrical, chemical, inspection, tests) that advance a material or procedure from one stage of completion to another.”

Oxford gives a more detailed definition. It defines a process as “a continuous and regular action or succession of actions, taking place or carried out in a definite manner, and leading to the accomplishment of some result; a continuous operation or series of operations.” However, recognizing and understanding a process is not always easy because it cuts through departments and hierarchical boundaries particularly in service organizations. Some distinguish between three process types: strategic processes, operational processes and enabling processes (e.g. management of human resources and management of information systems). This categorization does not give extra importance to one process over the other but “it provides a mechanism for categorizing processes at the enterprise level” (Peppard, 1996).

Hammer (2002) defines PI as “A structured approach to performance improvement that centers on the disciplined design and careful execution of a company’s end-to-end business process.” However, not all PI efforts are successful. As reported in the literature, 50-70 percent of the PI initiatives fail to achieve their objectives (Hammer and Champy, 1993).

Reasons for failure of PI effort include a focus on the tactical issues not on the issues that affect the entire business, and the lack of knowledge transferability of PI projects. Lapré and Van Wassenhove (2002) performed an extensive study of an European manufacturer and found that both the operational and conceptual learning are important for knowledge transferability, and consequently, for both productivity and “bottom line” improvement.

There are various methods of PI, some of them are statistically oriented (e.g. six sigma), and others utilize creativity and innovation (e.g. business process reengineering (BPR)). In this paper, we survey and analyze four PI methods; six sigma, benchmarking, BPR and process mapping, as these are the most widely used business process improvement (BPI) approaches in practice.

The paper is organized as follows: first, the main research issue, and methodology used are presented, in Section 1. This is followed by a literature review of four BPI methods. We discussed their pertinent empirical evidence; and articulated, accordingly, the critical success and failure factors of each, in Section 2. The lessons learned from this empirical evidence are then synthesized, and used to develop a new framework for guiding management practice, in Section 3. Practical extensions and implementation guidelines are then presented in Section 4. We then conclude, in Section 5, by a summary of the study findings and suggested issues for future research.
1.1 Research methodology

Our research methodology consists of three stages:

(1) First, we conduct a literature review of actual implementations of PI projects that used six sigma, benchmarking, reengineering, and process mapping. Our search comprised the ABI Inform and EBSCO Host – Business Source Elite databases and pertinent journals from Emerald database since they cover most of the business periodicals. For each search attempt, the key words: PI, and, one name of the PI methodologies, were used. We then reviewed the retrieved articles, and excluded the rhetorical, opinion-based, and theoretical articles. We kept only the case-based studies and the empirical research articles. This set of articles went through another round of review to choose the articles with enough information on BPI implementation and rigorous coverage. These articles were supplemented by another set that were hand picked – based on title and suitability – from their reference lists. The articles reviewed were categorized next by the four PI methods: six sigma, benchmarking, BPR, and Process mapping.

(2) Second, from this review we provided a summary of empirical evidence on the success factors and causes of failure of each approach.

(3) Third, the lessons learned from this empirical evidence were then synthesized with concepts drawn from Economics, and Operations Management, and used to develop a conceptual framework for advancing PI practice, and provided action guidelines that help assure its implementation effectiveness.

2. Literature review and classification of BPI empirical evidence

Reported evidence on actual implementations of four PI approaches are now discussed, and categorized. These include: six sigma, benchmarking, reengineering, and process mapping, respectively.

2.1 Six sigma

Motorola initiated six sigma concept which refers to reducing the failure rate to about 3.4/million. To understand the practical extent of six sigma, it is enough to know that the average process defect rate at most companies is about four sigma or 6,200 defect/million, while six sigma defect rate is 3.4 defect/million (with the assumption of process shift by 1.5 sigma). However, six sigma program is much more than that. It is not just a collection of statistical tools and metrics; it is a program that implements a wide range of tools in order to improve productivity and profitability. Six sigma is a standardized approach to problem solving and PI. Six sigma PI consists of five phases:

(1) define and quantify the problem;
(2) measure performance and determine defect levels;
(3) analyze data and perform root cause analysis;
(4) improve the number of defects; and
(5) control the process to insure improvements are sustained.

The success of six sigma could be attributed to many factors including: management involvement, adjustment of culture and employees’ attitude, organization infrastructure, training on six sigma methodology and tools, project management
skills, and linking six sigma to business strategy, human resources, customers and suppliers (Antony and Banuelas, 2002). Moreover, it is important to use structured methods, select the process for six sigma improvement strategically, employ full time specialists and relate the financial and business results to the bottom-line (Schroeder, 2003). In a research which highlights six sigma as a goal setting and goal achievement, Linderman et al. (2002) accentuate the importance of the explicit challenging goals, the structured methods of six sigma, the employees’ rewards, incentives and training.

Although six sigma was first used to reduce the variations and the defects in manufacturing processes, it has been extended and well received by many service industries; particularly financial institutions and healthcare (see examples in Table I). Despite of all the promises of six sigma programs and its great success reported by several companies like GE, Motorola and Allied Signal; many other companies are dissatisfied with the results from their six sigma projects. Velocci (2002) related this to lack of direct impact on customer, failing to involve both suppliers and customers, need of linkage to overall business objectives, in addition to viewing six sigma as just a tool and not as a complete PI approach.

Another problem with six sigma PI projects is their concentration on functional areas, which does not necessary lead to an improvement in the profit margin. Furthermore, applying six sigma, on a process to improve it, implies that the process is sound, while, sometimes, the process needs to be redesigned. Yet, six sigma with its analytical instead of creative orientation is not equipped for this task (Hammer, 2002).

Table II provides a summary of the critical success factors, and causes of failure induced from empirical literature on six sigma implementations.

2.2 Benchmarking
Benchmarking is the process of continuously measuring and comparing one’s business processes against comparable processes in leading organizations to obtain information that will help the organization identify and implement improvements (Watson, 1993). The American Productivity & Quality Centre has defined benchmarking as:

A systematic and continuous measurement process; a process of continuously measuring and comparing an organization’s business process against business process leaders anywhere in the world to gain information which will help the organization take action to improve its performance.

Benchmarking has been evolved from reverse engineering of competitive product, to process benchmarking, to strategic benchmarking, and then to global benchmarking. There are different types and scopes of benchmarking: internal benchmarking, external benchmarking, competitive benchmarking, and generic benchmarking (Watson, 1993). Xerox is credited for starting the use of benchmarking in late 1970s and early 1980s when it benchmarked its partner in Japan. Although benchmarking was originated in the US and American companies led the implementation, many European companies have caught up. Many initiatives have been growing in the UK: UK benchmarking index, Inside UK Enterprise and Cranfield Best Factory are just examples (Zairi and Ahmed, 1999). Same position is taken by other European countries, as illustrated in Table III. At the core of benchmarking is the comparison between the organization and the best practice. When an organization benchmarks the best practice, it is actually performing a gap analysis to access the difference between the two. This gap analysis is usually one-dimensional. Although, it is easier to monitor one dimension, organizations may miss on the
<table>
<thead>
<tr>
<th>Company/unit</th>
<th>Performance measures</th>
<th>Sources of variations/errors</th>
<th>Tools</th>
<th>Results</th>
<th>Citation</th>
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<tbody>
<tr>
<td>McMahon’s EZ – Acres Dairy Farm/the feeding system</td>
<td>Forage dry matter content Dry matter intake by lactating cow group Feed cost/kg milk produced</td>
<td>Purchased feed Feed dry matter and chemical composition</td>
<td>Control charts</td>
<td>Decrease variation in the diets offered to groups Reduce feed costs Improve safety factor levels used in ration formulation</td>
<td>Tylutki and Fox (2002)</td>
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<tr>
<td>Memorial Hospital in NJ/acute anticoagulation with heparin</td>
<td>Time interval between the collection of first and second partial thromboplastin time (PTT) Percentage of patients developing anemia while on heparin</td>
<td>Occasional episodes of incorrect pump setting Incorrect use of pumps Delay in obtaining and reacting to a PTT’s Mixing errors of heparin infusions Weighing patients only 48 percent of the time</td>
<td>Process map Control charts Run charts</td>
<td>Reduce errors Reduce no. of steps in medication administration Improve staff productivity Increase patient safety</td>
<td>Kooy et al. (2002)</td>
</tr>
<tr>
<td>Citibank/</td>
<td>Time to complete manual funds transfers Time to open an account</td>
<td>The number of handoffs The internal call back procedure</td>
<td>Pareto chart</td>
<td>Reduce process timelines Improve cash management Increase customer satisfaction</td>
<td>Rucker (2000)</td>
</tr>
<tr>
<td>Human resource function</td>
<td>Level of communication feedback Recruitment time Rate of return of feedback sheets</td>
<td>Personnel Geographical proximity of recruiters Type and timing of advertising Position type</td>
<td>Quality function deployment Control charts Run chart Cause and effect diagram Pareto chart</td>
<td>Reduce the HR cost/employee Reduce overhead cost Improve productivity Reduce throughput time</td>
<td>Wyper and Harrison (2000)</td>
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<tr>
<th>Company/unit</th>
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<th>Sources of variations/ errors</th>
<th>Tools</th>
<th>Results</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Froedtert Memorial Lutheran Hospital, WI</td>
<td>Frequency of error occurrence in medication delivered by continuous I.V. infusion or in lab analysis and reporting</td>
<td>I.V. rate calculation I.V. pump set up Order entry of lab work by the unit clerical staff Transportation of the specimens</td>
<td>Failure mode and effect analysis Risk priority numbers Cause and effect analysis</td>
<td>Create a standard for the ordering and processing of I.V. drips Reduce turnaround time Improve patient safety</td>
<td>Buck (2001)</td>
</tr>
<tr>
<td>Motorola's Austim Assembly plant: ultrasonic wire bond operation</td>
<td>Power measured in milliwatts Time measured in milliseconds Force measured in grams</td>
<td>Problem with the wire Lack of consistency</td>
<td>Pareto diagram Cause and effect analysis Control charts Design of experiment</td>
<td>Improve overall yield of the equipment</td>
<td>Kumar and Gupta (1993)</td>
</tr>
<tr>
<td>Student Loan Marketing Association</td>
<td>Ratio of loans falling out of rehabilitation</td>
<td>Failure to acquire loans that could be rehabilitated and refinanced High variability among account representatives</td>
<td>Cause and effect analysis Process capability index</td>
<td>Expected results are: reduce cost compete in the student transition loan</td>
<td>Taghaboni-Dutta and Moreland (2004)</td>
</tr>
</tbody>
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Table II: Success and failure factors of empirical PI implementations

<table>
<thead>
<tr>
<th>Method</th>
<th>Critical success factors</th>
<th>Failure factors</th>
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<tbody>
<tr>
<td>Six sigma</td>
<td>Management involvement&lt;br&gt;Adjustment of culture and employees’ attitude&lt;br&gt;A supporting infrastructure&lt;br&gt;Training on six sigma methodology, tools and project mgt. skills&lt;br&gt;Linking six sigma to the corp. strategy, human resources, customers and suppliers&lt;br&gt;Strategic selection of six sigma projects &amp; participants&lt;br&gt;Set Challenging goals for six sigma&lt;br&gt;Use of appropriate incentive systems and training</td>
<td>Lack of direct impact on customer&lt;br&gt;Failure to involve both suppliers and customers&lt;br&gt;No linkage with to overall business goals and objectives&lt;br&gt;Viewing it as a tool, not as a complete PI methodology&lt;br&gt;Focus on improve. of functional area which does not lead to profit increase&lt;br&gt;Use of 6sigma assumes the process is sound and just needs improvement, yet the process may need redesign, and creative orientation that six sigma is not equipped to fulfil&lt;br&gt;A one dimensional gap analysis may overlook main drivers and relationships that are key to the underlying business success&lt;br&gt;Is limited in ambition by the best in practice which may not be best in a changing world&lt;br&gt;Mgt. of proprietary info. And antitrust laws can pose problems&lt;br&gt;Lack of top mgt. support&lt;br&gt;Lack of clear association between benchmarking and profit increase&lt;br&gt;Its focus is on the tactical issues not on the issues that affect the entire business&lt;br&gt;It requires the cooperation among varies companies which brings issues concerning the management of proprietary information and anti-trust laws</td>
</tr>
<tr>
<td>Method</td>
<td>Critical success factors</td>
<td>Failure factors</td>
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</tbody>
</table>
| Business process reengineering | Questioning the fundamental assumptions of a process  
Integration of BPR with the Corp. Strategy  
Total commitment of the leadership  
Strong communication among the participating team  
The ambitious goals of the reengineering process  
Deployment of the most talented, competent and creative people in the project  
The process chosen for reengineering should be in the center of the organization for the improvement to be felt  
The effective use of information and communication technology | Negligence of the work environment aspects of the design process  
The importance of BPR projects  
The rigidity of the infrastructure system  
Consideration of human factors as cost that needs to be reduced, rather than a resource to be developed |
| Process mapping     | The focus on the customer and measures of process success  
Emphasis on achieving the company’s goals  
Focus on both the process’s efficiency & effectiveness  
Accuracy in collecting the process data  
Assuring full participation of every one in the process  
Creation of autonomous and cross-functional teams accountable for the results  
The inclusion of the decision points which are a key to effective analysis | Failure to define a beginning and end to the process  
Lack of identifying the purpose of the improvement effort and consequently the required details of the process’ depth and breadth. This may lead to unneeded extra expense or poorly designed process  
Failure to link the goal of PI to the organization competitive priorities  
Inability of defining the process boundaries; its begging and end (Savory and Olson, 2001) |
<table>
<thead>
<tr>
<th>Country</th>
<th>Industry/company</th>
<th>Type of benchmark</th>
<th>Areas to benchmark</th>
<th>Method</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Customer loyalty, innovation and attracting new customers</td>
<td>SWOT, process maps, analysis, implementation and evaluation</td>
<td>Cano et al. (2001)</td>
</tr>
<tr>
<td>Scotland</td>
<td>Tourism/hotel, tour operator and visitor attraction</td>
<td>General</td>
<td>Six key process from product introduction to circuit card assembly</td>
<td>The “plan-do-check-act” cycle</td>
<td>Pulat (1994)</td>
</tr>
<tr>
<td>USA</td>
<td>Electronic manufacturing/AT&amp;T Oklahoma City Works</td>
<td>Internal and competitive</td>
<td>Six key process from product introduction to circuit card assembly</td>
<td>The “plan-do-check-act” cycle</td>
<td>Pulat (1994)</td>
</tr>
<tr>
<td>UK</td>
<td>Retailing/Boots the Chemist</td>
<td>Internal</td>
<td>The promotion of new merchandise line</td>
<td>Find best practice among all stores Set a target Communicate to store managers Use five steps “product and market analysis, critical dimension; performance assessment and improvement priorities”</td>
<td>Simpson et al. (1999)</td>
</tr>
<tr>
<td>Brazil</td>
<td>Residential steel doors and windows</td>
<td>Competitive</td>
<td>Product and process development production and delivery</td>
<td>Find best practice among all stores Set a target Communicate to store managers Use five steps “product and market analysis, critical dimension; performance assessment and improvement priorities”</td>
<td>Carpinetti and Mole (2002)</td>
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</table>
complexity of the trade-off that exists within each company and among companies. A more comprehensive multi-dimensional gap analysis is captured in spider-web diagrams. The spider-web diagram can show at a glance multiple targets for various stakeholders (Ahmed and Rafiq, 1998).

Regardless of the tools and scope used in benchmarking, it has been accused of its limitation to ambition, since the aspiration is to be as good as the best in industry. Even the definition of the best in industry is not clear since the best this year may not be the best next year. Another issue is the management of proprietary information and antitrust laws (Pulat, 1994). Nevertheless, many companies attributed a great deal of improvement in their processes to benchmarking. Table III presents a summary of empirical results of benchmarking implementations.

It is noticed that these companies along with many others (e.g. Chevron, HP and Hughes Space & Communication) have attributed their success in benchmarking implementation to the effective transfer of best practices. The critical success factors of benchmarking are summarized in Table II.

2.3 Reengineering
Reengineering (or BPR) is a term that was coined by Hammer and Champy (1993) to describe a mean of radical process redesign in order to achieve large-scale improvement in business performance. They defined reengineering as: “The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures such as cost, quality, service, and speed.”

Reengineering is different from most other PI approaches because it does not focus on what is, but rather on what should be. It does not seek to alter or fix existing processes; yet, it forces companies to ask, whether or not a process is necessary, and then seeks to find a better way to do it. Peppard (1999) summarizes the key principles of BPR as: ambition, process focus, questioning fundamental assumptions of the process, and that information is used as an enabler and measurement of results, not as activities. He also emphasized the importance of integrating the business process redesign and the corporate strategy of the underlying business.

Many companies have implemented reengineering projects, and some achieved great success, and others failed. BPR has been implemented by both service (Hall et al., 1993, Attaran and Wood, 1999, Shin and Jemella, 2002) and manufacturing companies (Hall et al., 1993, Zimser et al., 1998, Tonnessen, 2000) in the USA and Europe. While there are many published success stories, the failure can only be deducted or found in published statistics and large studies (Hammer and Champy, 1993 and Hall et al., 1993).

From the above reported reengineering implementations, one concludes that, the improper choice of the reengineering process can lead to failure of recognizing its global benefits. The process should have enough breadth and depth. A broadly defined process should include more activities so the improvement is more likely to extend throughout the entire business. The depth is measured by the change in six elements: role and responsibilities, measurements and incentives, organizational structure, information technology, shared values, and skills (Hall et al., 1993). Moreover, the suitability of the reengineering method to the organizational context is of great significance. While process reengineering could benefits manufacturing and service firms, there should be distinction in its implementation to suit the unique situation of the firm (Shin and Jemella, 2002). Table II illustrates the main causes of failure in reengineering practice.
As to reengineering success factors, it is noticed that reengineering efforts were behind many positive outcomes such as: reduce cost; increase productivity; reduce time; improve quality; reduce business cycle; increase profit; and decrease response time. Examples of these efforts are shown in Table IV. The reader may notice that cross functional teams and investment in information technology are among the most common tools utilized in BPR implementation. In addition, time and cost reduction, were among the most reported results.

While the practice of BPR was found to be successful in the US and Europe (Table IV), it was not enthusiastically received by Scandinavian countries. The Scandinavian culture which emphasizes work place democracy and strong employee participation did not appreciate the top down approach used in BPR. However, the idea of radical change was appealing. They have integrated BPR with total quality management (TQM) elements that were already in place and they reported preliminary success in pilot studies (Tonnessen, 2000).

Based on the above empirical evidences, it is clear that the key drivers for reengineering success comprise: questioning the fundamental assumptions of a process, drastic improvement of this process, alignment with corporate strategy, and effective use of information and communication technologies.

2.4 Process mapping
The Russian writer Ivan Turgenev once said “A picture shows me at a glance what it takes dozens of pages of a book to expound” (Paradiso, 2003). Process mapping offers a “visual aid” to PI and provides a mean for analyzing the process. Process mapping is not data flow diagrams or flowcharts. It is a framework that shows relationships between the activities, people, data and objectives. There are two types of process mapping: value-added process map, and Cross-functional map or process interaction map. The first one checks whether the various activities add value to the process, or not. The second shows the activities done by various functions and their interactions (Savory and Olson, 2001).

Process mapping is a powerful tool for improving efficiency; it could show control breakdowns, bottlenecks, unproductive utilization of resources, redundant steps; non-value added activities and root causes of problems (Keller and Jacka, 1999, Savory and Olson, 2001, and Paradiso, 2003). However, it is noticed that process mapping may not be adequate for addressing cultural and political issues when dealing with human activity systems, as Biazzo (2002) indicated.

Like all other PI tools, process mapping has been used by both manufacturing and service organizations and proves to be beneficial. The following list summarizes the success of various organizations in implementing process mapping:

- Simplify claim process or work done which helps improve productivity and increase speed (Owens-Corning: Denton, 1995, Farmer insurance: Keller and Jacka, 1999).
- Help employees understand their role in the organization and how their work affects everyone else (Farmer insurance: Keller and Jacka, 1999).
- Increase the ratio of value added to non-value added time (Citibank: Rucker, 2000 and Goodwill: Mehta and Fargher, 2005).
<table>
<thead>
<tr>
<th>Company</th>
<th>Process type</th>
<th>Improvement result</th>
<th>How</th>
<th>Citation</th>
</tr>
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<tbody>
<tr>
<td>AT&amp;T</td>
<td>Global business communications system</td>
<td>Reduce time</td>
<td>Assign team members from a wide range of functions</td>
<td>Hall et al. (1993)</td>
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<td></td>
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<td>Reduce handoffs</td>
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<td>Increase profit</td>
<td>Create training program of the new skills</td>
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<td>Banca di America e di Italia</td>
<td>The bank transaction process – create paperless bank</td>
<td>Reduce cost</td>
<td>Significant investment in information technology and new skills training</td>
<td>Hall et al. (1993)</td>
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<td></td>
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<td>Improve customer service</td>
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<td></td>
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<td>Increase front office efficiency</td>
<td>Placing the best people in the redesign team</td>
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<td>Chase Manhattan Bank</td>
<td>Name and address change, the branch and ATMs cash, the service charge and the retail funds transfer</td>
<td>Reduce cost</td>
<td>Implementation of four segments methodology: energize, focus, invent and launch</td>
<td>Shin and Jemella (2002)</td>
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<td></td>
<td></td>
<td>Increase revenue</td>
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<tr>
<td>Ford Motor Company</td>
<td>Account payable</td>
<td>Reduce cost</td>
<td>Incorporate a centrally maintained database</td>
<td>Hammer and Champy (1993)</td>
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<td></td>
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<td>Reduce time</td>
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<td>Reduce staff</td>
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<td>Increase productivity</td>
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<td>IBM</td>
<td>Checking the potential customer credit</td>
<td>Decrease response time</td>
<td>Reduce the credit application process from multifunction activity to a single process format</td>
<td>Pegels (1995), Attaran and Wood (1999)</td>
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<td></td>
<td></td>
<td>Reduce handling</td>
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<th>Citation</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Reduce handling</td>
<td>prevention experts</td>
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<td></td>
<td>Increase productivity</td>
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<tr>
<td>Porsche</td>
<td>New acquisition of prototype parts</td>
<td>Reduce time</td>
<td>Systematic application of three phase process reengineering:</td>
<td>Zinser et al. (1998)</td>
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<tr>
<td></td>
<td></td>
<td>Improve time</td>
<td>initiation, definition and control</td>
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<td></td>
<td>Improve information quality</td>
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<td>Simens Nixdorf Service</td>
<td>Servicing process</td>
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<td>Total commitment of the leadership</td>
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<td>Keep strong lines of communication</td>
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<td>Build the moral of the workforce</td>
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• Increase accuracy of order taking (Owens-Corning: Denton, 1995).
• Reduce the defect rates by solving the defect problems (ABB: Denton, 1995, Goodwill: Mehta and Fargher, 2005).
• Clarify the importance of, and the relationships among various functions, which in turn reduce the interface problems (Healthcare: Snyder et al., 2005).

Table II includes a summary of the critical factors in successful implementations of process mapping, as well as factors that may diminish its value in practice.

Based on the empirical evidence discussed above, and the critical success and failure factors summarized in Table II; one can deduce the following key determinants of BPI outcome:

• Top management: the real involvement of top management in the PI effort is a must. It should be effective, real, active and clear to all involved employees.
• Strategic alignment: PI project should be closely aligned with, and tied to, the corporate strategy and core competency that are critical to the organization’s success.
• Process improvement project: should be carefully chosen and broadly defined and include more activities so that the resulting improvement is more likely to extend throughout the entire business.
• Human resources: the effect of the new “improved” process on the employees should not be neglected. They need to know how it is going to affect their future jobs and “what is in it for them.” Moreover, assure the use of the right people in the right project.
• Business environment: the new process may require new training, new technology, and new data availability. The change in the business and job environments, and the availability of supportive infrastructure should be considered.
• Performance measures: are important to be established and used both before, and, after the fact to evaluate the outcome. The choice of the metrics used to measure performance is critical; they should be objective, comprehensive, and reflecting important criteria in the process, which should be tied to the business “bottom line.”
• Sustainability: is important to ensure the “continuous improvement” of the process and not be satisfied with just the initial result of improvement, the move should be made from just “a process improvement project” to continuous improvement of process management (Popoff and Brache, 1994). This can be accomplished by having a structure in place to avoid backsliding, a system of formal problem solving process in place, a consistent focus on improvement activities and long-term measurable objectives which are linked to the improvement efforts.

Now, the empirical lessons discussed above along with relevant Economics and Operations Management theories are used to develop a conceptual framework that guides practitioners’ BPI efforts.
3. Proposed framework
Several frameworks and models have been proposed in the literature for undertaking business improvement programs. It is noticed that some of these have very limited focus, while others were more generic, yet, mainly theoretical in nature. Moreover, most of these frameworks did not address, nor made use of the lessons learned from the critical success and failure factors of the business improvement practice.

For instance, Motwani et al. (1998) provided a theoretical framework for implementing BPR. This framework comprises six phases: understanding, initiating, programming, transforming, implementing, and evaluating. Their approach was restricted to only BPR, and little effort was done to develop a comprehensive integrated model.

Carpinetti et al. (2000) presented a conceptual framework for deployment of continuous improvement. They emphasized prioritizing the improvement efforts to meet the strategic objectives, and to provide a systematic approach to achieve their goal. The framework was not integrative, and did not consider the factors that can contribute to the success or failure of the BPI method used, and was not clear on how to choose the appropriate method.

Another framework was offered by Adesola and Baines (2005), which has a structure of seven steps and named model-based and integrated PI. While this framework is intended to be generic in nature, it has focused on marginal improvement of current processes using only a bottom up approach. It neglected BPR concepts, that aim at achieving drastic improvement, and lacked measures of sustainability.

Mansar and Reijers (2005) introduced a framework to help practitioners choose the proper business process redesign. They identified six areas that the practitioner needs to consider when redesigning the process: customers, products, operations, organization, information, and technology. Their goal was to help practitioner to identify the best practice in the above areas when implementing business process redesign. While their framework was fairly comprehensive, it is primarily theoretical. It did not account for the empirical lessons learned from actual BPI implementations, nor the critical success and failure factors induced from practice, unlike our proposed framework, which follows next.

Now, the main features and role of our framework are presented first, and then followed by its design and contents.

3.1 The framework role and features
The framework proposed is a tool for triggering appropriate response to change in markets requirements and/or customer needs. It also serves as a guiding reference for recovering from, root causes of problems and inefficiencies faced in the underlying business environment. More explicitly, it is intended to:

- Make use and reinforce the core competencies of the underlying organization.
- Help trigger or initiate appropriate proactive moves needed to advance the firm’s competitive position (“from the Outside-In”).
- Help generate feasible and effective solutions and results (from the “Inside-Out”).
- Allow a direct mapping of the critical success factors of the method used for PI (outlined in Table II), and the metrics used for evaluating business performance.
and strategies, in the underlying business environment. These metrics should include the value created for the different stakeholders, e.g. the consumer surplus for customers; profit, market share, and learning and growth for producers, and distributors, as well as for other supply chain partners.

Additionally, it is designed with practical features in mind, as being: economical, i.e. its benefits must exceed its costs; easy to understand, and implement by all relevant parties; evolutionary, i.e. adaptable to fit the current stage of the firm’s business cycle, its external opportunities and threats, and its internal points of strength and weakness, and robust, i.e. generates reliable results and stable solutions that are appropriate for a wide range of changes in the underlying business environment.

Guided by the above features, and the empirical results presented in section II, the framework design is now discussed.

3.2 The framework design
The framework proposed consists of three main stages.
First: Specify; second: Analyze; and third: Monitor closely. Hence, is denoted by SAM, as summarized in Figure 1. Each of the three stages of this framework is now discussed in more detail.

3.2.1 The first stage: Specify. This stage provides the foundation on which the BPI planning and execution efforts will be built. It involves scanning both the internal and the external business environment of the firm:

(a) Starting from the “Inside-Out”: All inefficiencies and problems faced must be identified. The focus here should be not on the symptoms of problems faced or inefficiencies encountered internally, but more importantly, on identifying the root cause of each problem faced, and the pathway to its solution.

(b) Starting from the “Outside-In”: Changes in market conditions, in customer needs and requirements must be specified. The appropriate response to these changes must be delineated accordingly.

(c) Based on (a) and (b) above, the desired goals and outcomes to be achieved should be defined; and the scope of BPI delineated.

(d) Accordingly, the feasible BPI alternatives will be defined.

It should be noted that this stage includes all objective questions related to What, e.g.:

• What are the corporate strategies that the BPI approach used must be aligned with?
• What are the current core competencies and the potential ones?
• What are the customer needs and values, the firm must meet, for each customer segment?
• What are the current inefficiencies faced, the most significant of these, and the root cause for each?
• What are the expected results to be achieved, and/or the standards to be met?
What are the appropriate business performance metrics to use? These metrics must be necessary and collectively sufficient to provide reliable and complete measure of performance, and to trigger needed improvements, and pathways for corrective actions.

It should be noted that each of the three stages of the framework proposed illustrated in Figure 1, is both continuous and dynamic. Stage I above is no exception. It includes a continuous review of the relevant questions to be raised, so that the ranking in the next stage is updated accordingly.
3.2.2 Second stage: Analyze. At this stage, data has to be collected and information corroborated to answer each of the questions raised in Stage I above. Additionally, analysis is to be conducted – at this stage – to:

(a) Evaluate the potential impact of each feasible BPI alternative.
(b) Select those resulting in significant and widespread impact throughout the organization, scope-wise, and significant impact time-wise. This means making sure that the selected BPI approach will result in positive results which impact the whole organization, and extend not only for short period, but be sustained in the long run, as well.
(c) Assure compliance with the empirical evidence on the Success Factors pertinent to each BPI approach, as summarized in Table II.
(d) Avoid the empirical failure causes associated with each BPI tool used, as illustrated earlier.
(e) Insure that the selected BPI approach fits the goals desired and outcomes specified in Stage (I-c) above.

The analysis at this stage should result in, answering the “How” questions. It includes:

- Identifying the priority of the appropriate activities to be improved, and scope of each BPI project to be carried out.
- Identifying the appropriate tools and BPI approaches to use for achieving the specified goals and desired outcomes, as delineated in Stage I, above.

It should be emphasized that, in selecting the most fitting BPI approach to use, management should be guided by the success factors for each method, and avoid the failure causes, i.e. adhere to the lessons learned from empirical practice as summarized in Table II, in addition to making use of the appropriate quality and operations management theories.

For instance, as noted by Lapré and Wassenhove (2002), PI projects should produce knowledge that is transferable. This comprises both conceptual learning, defined as “Know-Why”; and Operational learning, i.e. “Know-How.”

Based on the goal of improvement, two basic theories of PI can be characterized: Gradual and continuous improvement on one hand vs Drastic and discrete improvement on the other hand. The former one comprises all TQM approaches and tools, including six sigma and benchmarking. The later one uses BPR as the main tool for realizing drastic, i.e. revolutionary, improvements that are not just marginal or gradual overtime. While these two theories for improvement have different goals and use different tools; yet they both share a common focus, as noted by Tonnessen (2000).

It should be noted that, regardless of the primary goals intended and tools used, all BPI approaches should focus on promoting: customer satisfaction, real PI, teamwork, quality, effective change, and efficiency.

Additionally, it is important to select a set of improvement methods that complete each other, such that, maximum synergy is realized by their simultaneous deployment. As indicated earlier, each tool is most effective for specific results, and for specific set of operating characteristics, needs, and contingencies. The selected improvement approaches should allow for measuring the specific results desired (e.g. customer satisfaction) and not the individual activities.
Other important consideration is the budget and/or resources needed, along with an effective allocation of these. Such allocation must be both feasible, i.e. within the company’s capabilities, on the one hand, and fulfill the needed improvements, on the other hand.

3.2.3 Third stage: Monitor. The first two stages of the framework proposed above focused on planning and setting the right conditions for execution to take place effectively. This third stage focuses on monitoring closely the actual BPI execution to assure effective implementation and actual achievement of the desired outcome specified in Stages I and II.

What cannot be measured cannot be managed effectively. Hence, to monitor the progress closely and effectively, objective and comprehensive performance metrics must be used to guide this process.

It is noted however that because execution is subject to many uncontrollable variables and contingencies, the necessary fine-tuning, and/or modifications of plans – set at the prior two stages – is a core part of this stage. Here, is the real test of whether or not, the desired goals and planned outcomes have been materialized.

It should be emphasized that monitoring is continuous. It requires close attention before, during, and after the fact. It includes detailed follow-up of all aspects required to assure effective execution and control. It is affected by a wide range of factors in every step of execution. These include work force related issues, financial aspects, and intangible drivers of business performance, e.g. the organizational culture, behavioral norms, and work climate.

Close monitoring that assures effective performance requires using the right strategy that we label as the “Right 3 Rs”; namely, the Right:

1. Readiness, i.e. full preparedness, before the fact.
2. Response, i.e. appropriate action, during execution; and the right.
3. Resilience, i.e. assure sustainability of the positive BPI outcomes, after the fact.

Resilience requires accounting for the long range impact, and not seeking, nor adopting only temporary solutions, or results that fade quickly as time goes by.

In general, effective monitoring at this stage involves three main tasks:

1. Continuous alignment of the employed PI approaches with the corporate strategic goals.
2. Matching and continuous mapping of the PI tools, and their implementation steps with the metrics used to measure business performance. This should be realized within each firm, i.e. “intra-firm” wise, and mapped with the stakeholders’ expectations and partners across the value chain, i.e. “inter-firm” wise.
3. Continuous assessment and evaluation of the actual results achieved vs those desired, or, planned. This is attained by analyzing the root causes of variations between the actual and planned, and taking corrective action, accordingly.

Key to this monitoring and evaluation phase, is to understand clearly the relationship between the Process and the Outcome, and how such relationship differs at the execution stage, from that at the planning stage. More on this point follows in the next section.
4. Implementation guidelines
Guidelines aimed at facilitating the actual implementation of the Framework proposed above, and on expanding its use for different types of operating environments, are now discussed. These guidelines are classified in two main categories: specific, i.e. tool-based, and general, i.e. system-based. Each of these is now discussed in more detail.

4.1 Specific: tool-based

- As a general rule, the actual performance level achieved depends primarily on the goals planned, and the pertinent level of performance sought. An ambitious plan will result in higher actual achievement level, than those resulting from much less ambitious goals and plans. In a nutshell, if one shoots high ends up high. Yet, if one shoots for low level, will end up lower in actuality. Based on this fact, whenever benchmarking is used as a tool for PI, we note that the effectiveness of this approach is not determined only by the success factors reported earlier (Table II), but by a more ambitious benchmarking goal. The goal should be, not only closing the gap between a firm and the current “Star,” or “Best-in-Class” performance, but to go much beyond that to eventually reverse the gap between the current “Star” and the underlying firm. Figure 2 provides a graphical illustration of this point.

- As for business process reengineering implementation; to maximize its practical success, we suggest to follow a “Backward Path,” i.e. to start first with the ideal outcome desired to be achieved at specific future time period, and then move backward to the present, to specify the gap between the desired goal of this future time period, and, the current state of affairs. This should be then followed by a “Forward Path” afterwards, i.e. start from the actual present state, and then moving forward to the desired future, to delineate the specific action needed, to close the gap between the desired future and the actual status at the present time.

![Figure 2. Benchmarking: reversing the gap](image-url)
To help assure maximum effectiveness of BPR practice both these “Forward” and “Backward” paths should be followed, simultaneously, as they complete each other.

4.2 General: system-based

1. Regardless of the specific approach or tool used for BPI, practitioners must understand the relationship between the Process and the Outcome. This relationship is reversed in the execution phase, as compared by the planning phase. In the planning phase, the approach planned for PI is a function of the outcome desired, i.e. The Process planned to be used depends on the goal desired. Hence, at the planning stage the goal desired is the independent variable, and the planned approach to achieve this outcome, is the dependent variable. However, the opposite is true in the execution phase. At execution, the actual outcome realized, is a function of the actual process followed. Executed processes may, and in most cases will, differ from what was planned. This is due to the occurrence of many contingencies unaccounted for, and mostly unexpected, during the planning phase (for more detailed discussion on this relationship the reader is referred to Saad and Siha (2000)). Therefore, it is imperative that alternative BPI approaches, and contingency plans be considered in order to assure that the actual results achieved are in full compliance with, the desired goals, or, close as possible to the planned goals, and intended outcomes. This is a necessary condition for effective preparedness at the planning stage, i.e. before the fact. In essence, this would assure being prepared proactively for the future.

2. An important guide to practitioners is to use Pareto’s “80/20” rule in implementation of the Framework proposed. This rule assumes that most of the result achieved, i.e. at least 80 percent of the outcome achieved is due to, less than 20 percent of all affecting factors.

   Accordingly, we recommend that the practicing managers focus their attention and effort on the few most significant factors, and may neglect –or give much less attention to – the many insignificant factors at each of the three stages of the proposed framework.

   Making use of this 80/20 rule by practitioners in their BPI implementation would result in achieving the greatest PI outcome, with minimum cost and effort. Hence, maximize the value-added from BPI practice.

3. An important guideline for effective implementation of the framework proposed is the alignment of, and coordination among all tools used for PI:

   • With each other, in an integrative way, i.e. the disadvantages or cones, in one approach should be compensated by the advantages and pros of the alternative approach used with it simultaneously.

   • Among all divisions in the firm, i.e. intra-firm wise; to assure both consistency in implementation, and widespread impact as well.

   • Across all firms along the supply chain, i.e. inter-firm wise. As this will assure a win-win outcome to all the supply chain partners, and would smooth significantly the underlying supply chain operations, and management.
(4) Since:

- PI projects should produce knowledge that is transferable, to assure both conceptual learning, i.e. “Know-Why”; and operational learning, i.e. “Know-How” as indicated earlier (Lapré and Wassenhove, 2002).
- Any firm cannot operate in isolation of, and full independence from others across its supply chain.
- A firm’s performance is driven by the weakest link in its supply chain. For example, disruptions in material supply as a result of a main supplier goes abruptly out of business, will result in direct disruption in the producer/buyer’s processes.

It is imperative to have information sharing, and supply chain visibility to assure such learning transferability to take place; and to avoid operations disruption, and preempt them, as possible.

Furthermore, establishing coordinated, cooperative, and collaborative relationships among supply chain partners would help improve business processes for each partner in the chain, and makes them more efficient and more robust than if each firm is acting in isolation and independent from its suppliers. Thus, a “win-win” outcome would result to all firms across the supply chain.

5. Summary and conclusions

Business process management and improvement are among the hottest topics for both practitioners and academicians, as a process constitutes the core of “How” to advance. There are various methods of PI and many articles that have been published in a wide range of journals and periodicals addressing these methods. We surveyed the Case-Based BPI literature focusing on empirical evidence on the critical success and failure factors of four PI methods; six sigma, benchmarking, BPR and process mapping. The empirical evidence on both the success and failure factors for each method, have been discussed and summarized. The involvement and total commitment of top management, the importance of knowledge sharing and communication, the effective use of information technology, the emphasis on knowledge transferability, and the smart choice of the process to be improved, are among the critical success factors of PI methods.

Based on a synthesis of the empirical evidence, with appropriate management theories, a general framework was developed to guide the choice and implementation of BPI approaches in practice. This framework is denoted as SAM as it comprises three main stages: Specify, Analyze, and Monitor. Each of these stages has been discussed in detail. Guidelines that facilitate the actual implementation of the framework proposed, and help expand its actual effectiveness have been discussed.

A logical next step for further research is to test this framework in several business environments, and verify its actual outcomes for different operations characteristics, and market dynamics. The effect of variables like: type of industry, the firm’s size, culture, and operating strategy may be investigated, as well.

Moreover, further research is needed to examine BPI practice, not only at the firm level, but perhaps more importantly, across the supply chain partners, since a supply chain performance is determined by its weakest link. A relevant conjecture to explore here, is how the different supply chain partners can reinforce each other through appropriate BPI collaborations.
References


Further reading


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