Title: Reengineering: Developing Key Success Factors Through an Exploratory Study

Course: EMGT 590/690
Term: Summer
Year: 1997
Author(s): A. Al-Harbi, M. Almuhairi, T. Gribble and R. Hammer

Report No: P97037

Abstract:

Reengineering: Developing Key Success Factors Through an Exploratory Study

A. Al-Harbi, M. Almuhairi, T. Gribble, R. Hammer

EMP-P9737

REENGINEERING: DEVELOPING KEY SUCCESS FACTORS THROUGH AN EXPLORATORY STUDY

Portland State University
EMGT-590
Summer 1997
Dr. Dragan Milosevic

By

Ali Al-Harbi
Mubarak Almuhairi
Ted Gribble
Raik Hammer

August 1997

TABLE OF CONTENTS

Abstract

This exploratory study analyzes key factors that lead to successful reengineering. Through an extensive literature search five factors emerged as key to success due to virtual consensus by multiple sources. These factors are adequate customer and user inputs, adequate sponsor's authority, proper use of consultants and training, linkage to solid strategic planning and adequate authority for implementation and utilizing resources. These key factors were carefully incorporated into a questionnaire. Structured interviews with managers who have participated in reengineering projects in the past were conducted utilizing the questionnaire. The results of these interviews are analyzed and presented. The results of the analysis indicated correlation with three of the factors and success. These are customer focus, sponsorship, and consultants/training. Extensive discussion as to research methodology and associated problems is included. Reengineering was found to be more prevalent than the literature stated. It is proposed there are more than the five factors in successful reengineering, and that three of the stated factors were especially valuable in predicting reengineering success.

Introduction

In 1993 Hammer and Champy published Reengineering the Corporation. This event heralded the advent of formal reengineering. Prior to 1993, reengineering as an informal or chance practice, though rare, was not completely new. In fact it has its basis in many traditional management techniques and theories, such as those of Frederick Taylor and Peter Drucker. Formally, though, modern reengineering as a recognized business tool owes its inception to this event. Some innovative businesses were beginning to develop the reengineering concepts and framework in the late 80's.[4] In fact, Hammer and Champy observed some of these contemporary successes and failures in developing their edicts. In their book Hammer and Champy offer a definition of reengineering: "The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed."[26]

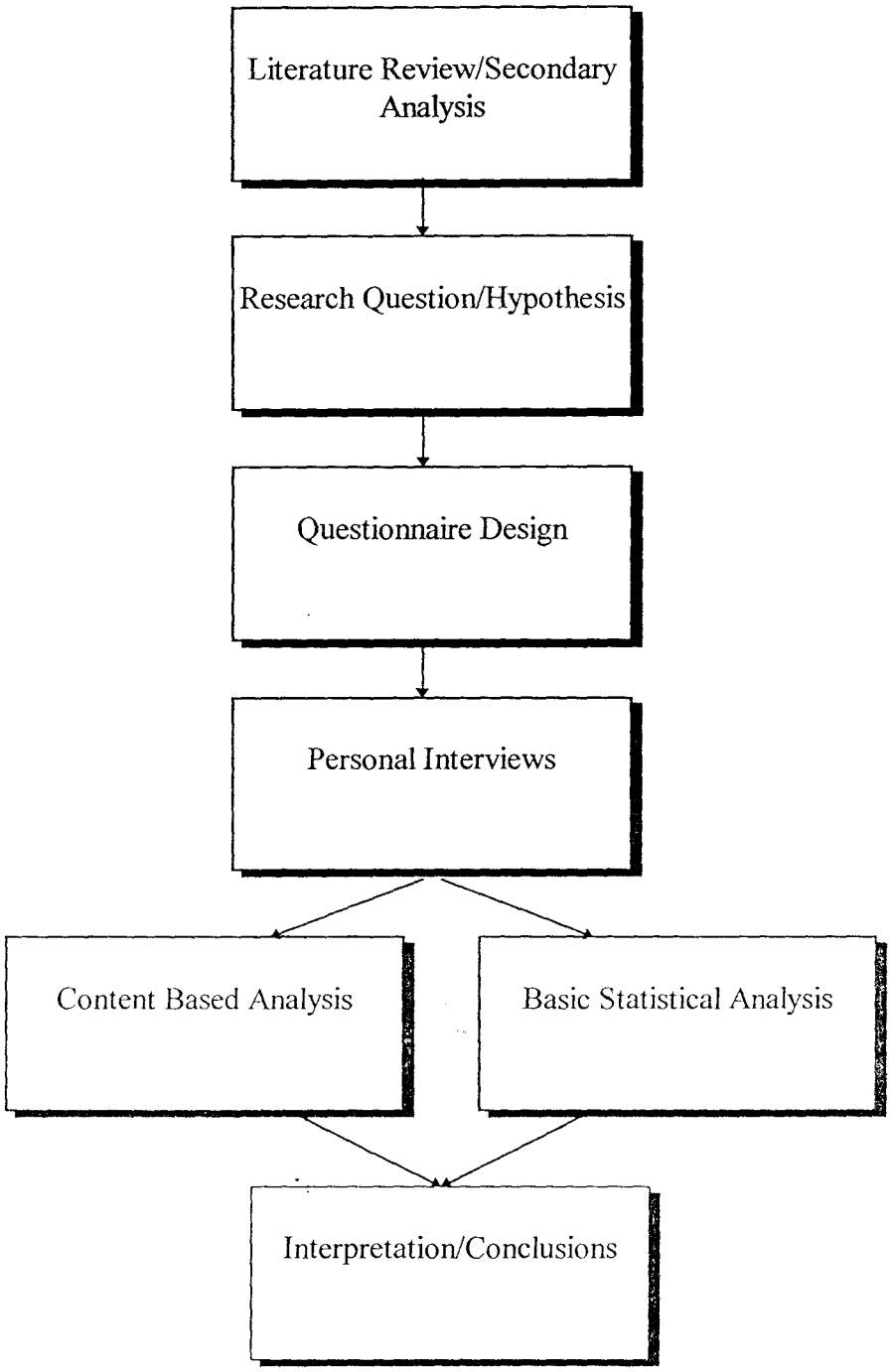
Others who followed have offered their own definitions or variations on this basic statement such as C. Johnson who wrote "Reengineering is the fundamental analysis and radical redesign of business process to achieve dramatic improvements in performance."[53] As can be seen this definition is very similar to that posed by Hammer & Champy, but with more latitude left to the user.

It is important to note that Hammer and Champy placed special emphasis on the four key words fundamental, radical, process, and dramatic.[26] All of this emphasis is important in that it ensures that one selects the right projects for reengineering and recognizes when it is reengineering. However, this leads us to the key point of how to conduct reengineering.

Reengineering, and the methods to implement reengineering projects, has been widely written upon. Research of the literature does point out one major short fall, a lack of true

Figure 1

Research Approach



research. Most literature on this subject is confined to antidotical and experience based recommendations. In fact, reengineering has become quite common in today's businesses, with one source suggesting almost half of all companies involved and another close to 80%.[53][4] With such vigorous activity the need for research would seem to be clearly evident.

With this in mind the authors of this project sought out a research need in reengineering. An initial review of literature revealed that it is quite common for authors and consultants to each provide a list of key success factors, or how-to guide, such as the six step process suggested by Furey (see Appendix A) or the critical success factors suggested by Andrews and S. Stalick.[17][1] Lists such as these are based primarily on experience, not research. Such key lists presented with little or no comprehensive research are, in fact, quite common but of dubious reliability. In this report the authors propose five key success factors (KSF). Utilizing research tools an attempt is made to produce links between a projects success or failure and these KSFs as well as support the basic validity of the factors as keys to success. Each factor may further be assessed as to it's need for further research in an attempt to focus such efforts. This report should be viewed primarily as an exploratory instrument. While the research will attempt to validate KSFs and linkages, its primary purpose is to identify and develop needs for further research in this field and to provide a focus for such needs.

Research Question

A basic question frequently encountered when implementing a new business process is, what are the key factors needed to succeed at this endeavor? In reengineering these "Key Success Factors" are as important as in any other process. If one can identify such key factors they can be emphasized and reviewed to enhance the likelihood of success. Such a discussion leads rapidly to asking - What are the Key Success Factors for Reengineering Projects?

Developing Initial Key Success Factors

A preliminary search was made of literature concerning reengineering. This preliminary search focused on identifying KSFs as posed by other authors, consultants, or researchers. It is hypothesized the selected factors are directly related to project success. The listed factors were developed and selected based upon their recurring themes in the various initial sources.

- **A successful reengineering effort must be based upon adequate customer (end user) inputs.[10][25][26][27][32][33]** Must the team represent all users? Can research overcome this? Must the end user determine final project success?
- **Reengineering sponsor/manager(s) must possess adequate authority to drive the project and the organization must buy-into the reengineering.[25][26][27][32][33]** Are successful reengineering initiatives driven from the bottom or middle of an organization? Does internal resistance from the organization affect the ultimate success?
- **Extensive and proper use of reengineering internal/external consultants, training, and experience is required for success.[10][25][26][27]** Must the reengineering team educate the rest of the organization as to the reengineering process? Do all of the team members need training in reengineering? Do consultants enhance the probability of success?
- **Reengineering efforts must be linked to strategic planning to succeed.[25][32][33]** Are an organizations vision, mission, & goals required to have a reengineering base? Will the end results actually be impacted by a lack of strategic planning?
- **Adequate authority to implement reengineering and utilize resources is a requirement for success.[26][27]** Can a project succeed without adequate internal authority?

Literature Search

The literature is overwhelmingly full of sources such as articles and case studies dealing with the topic of business process reengineering. However, few research studies were found on this subject. Most case studies provided information specific to the individual case with little support for applying it to the industry as a whole.

Reengineering Definition

There are several definitions of reengineering occurring in literature. Morris and Brandon define reengineering as an "approach to planning and controlling change. Business process reengineering means redesigning business processes and then implementing these new processes."[43] This definition does not emphasize the "radical" change of the processes or the overwhelming result reengineering is capable of, which is different from the definition of Hammer and Champy quoted in the introduction.[26]

A very critical divergence from Hammer and Champy is the definition posed by the Price Waterhouse Change Integration Team. They emphasize a more people focused approach: "Intelligent reengineering is broad-minded and multidimensional. It emphasizes giving workers multiple skills."[51]

Lowenthal provides a broad view and includes the whole organization in the reengineering efforts.[37] He states: "Reengineering efforts usually have four major components:

1) A greater focus on the organization's customers (both internal and external).
2) A fundamental rethinking of the processes in the organization that lead to improvement in productivity and cycle time (known as process improvement or business process reengineering.

3) A structural reorganization typically, typically breaking functional hierarchies into cross-functional teams (team building and organizational development activity).

4) New information and measurement systems, using the latest in technology to drive improved data distribution and decision making (e.g. quality and information technology)."

Furthermore Lowenthal recognizes the requirement of a fundamental rethinking and redesign of operating processes and organizational structures, but this restructuring has to be focused on the organizations core competencies to achieve dramatic improvements in overall performance.

Hammer revised his own definition of reengineering from 1993.[26] In his 1996 book states: "I have now come to realize that I was wrong, that the radical character of reengineering, however important and exciting, is not its most significant aspect. The key word in the definition is 'process'."[25] It appears the inflation of literature written on reengineering has made today's term of reengineering into a buzz term.[56]

KSF Lists

McCann and Bruckner conducted a study of approximately 180 HR professionals.[39] They stated that "work redesign is a broad concept.." They proposed a profile of successful work redesign relationships. Significant on an 0.05% significance level these were:

- More strategic impact from work redesign
- Acceptance & understanding of work redesign in the top management level
- HR managers play pivotal rule
- A clearly defined, and comprehensive plan for reengineering projects exists

- Business objectives & work redesign initiatives were well integrated

A crucial statement of the authors is:" Creating an educated and skilled workforce is an important element for supporting work redesign,..."[39]

Bradley T. Gale looked at reengineering at AT&T in a case study. The primary conclusions from this is to examine key processes that affect the way your customers perceive quality and value. At AT&T the approach is to benchmark and reengineer specific processes that have a major impact on the (companies) competitive position.[18]

Major worldwide-consulting companies surveyed by Heering, et.al. reveal that each has quite different key success factors. The issues they see as important and on which they structure their approach for reengineering are company specific.[29]

BCG, McKinsey, Anderson, et.al. propose the following factors (among others):

- Senior management must lead reengineering
- Strategy must drive reengineering
- Add value for the customer
- Focus on process no function
- Take a system view
- Care for the human dimension
- Reengineering is not a one-time thing
- Communication is crucial
- Senior management must be ready for organizational change
- Tight focus on performance metrics

- Cross functional involvement
- Top management sponsorship
- Investments to align organizational components
- Systematic, thoughtful, and conservative implementation
- Flexibility
- Joint training
- Understand, embrace and work towards clients' fundamental strategic objectives
- Knowledge transfer

These factors are derived from the experience and knowledge of these consulting teams based on successes.[32] A key point would be to prove if in practice these key factors are valid. This explanatory study is an attempt to research this question.

Gilmore states that the failure of a reengineering project is not an issue of who participates in the project, rather: "how the design process is performed." An interesting statement is given by Gilmore: "Yet another reason for poor results is that many initiatives are not radical redesigns at all, but traditional process methodologies cloaked in a new vocabulary."[21]

All authors do not believe in reengineering. Moad states very clearly "Reengineering usually brings with it big-time problems and, very often failure".[42] Many others, however, disagree with Moad and believe in the positive value of reengineering. Davenport states "Reengineering is important and more than just another management fad."[12]

As previously stated a preliminary search of literature was utilized to identify five consistent factors that are key to the success of reengineering as used in business processes. The term consistent refers to these factors appearing in a consistent manner among different authors.

The five factors were then affirmed through an extensive literature review. While researching articles on this subject, the authors observed that numerous sources did view these five factors consistently as essential to the success of reengineering. According to these sources, to successfully implement reengineering, these factors should be taken into account and followed.

For further reference these factors will be abbreviated as follows: 1) Reengineering efforts must be linked to solid strategic planning, = Strategic; 2) reengineering sponsor/manager(s) must possess adequate authority and the organization authorizes reengineering, = Sponsor/Resistance; 3) project personnel have adequate authority to implement reengineering and utilize resources, = Implementation/Authority; 4) the project team properly uses reengineering internal/external consultants, training, and experience = Consultants/Training; and 5) reengineering efforts are based upon adequate customer (end user) inputs = Customer.

Strategic

In order for any reengineering to lead to success, these efforts, and the concept of reengineering itself, must first be linked to solid strategic planning. Without strategic planning the project managers will have inadequate vision as to where the problems are and what the solutions could be. Cook states that "But no change program can succeed without a vision."[10] There are many reasons for corporations to reengineer, but if there is no strategic vision associated with it, there is little point to it. A process must be designed, or reengineered, to meet the criteria necessary to accomplish the goals, such as provide the customer with a specific product.[19][50]

A linkage between strategic planning and reengineering is emphasized by Furey et.al. The authors state: "...the most successful companies recognize that more critical goals for reengineering are adapting corporate strategies and achieving sustainable profit growth." In this case study Wal-Mart, Southwest Airlines, and Compaq Computer aggressively applied

reengineering without naming it in this way, and succeeded. Furey and Diorio give the following strategic suggestions:[17]

- Reengineering should drive fundamental strategic change
- The goal of reengineering is not just cost reduction
- Successful reengineering focuses on a few business processes critical to the mission
- Strategic reengineering seeks opportunities for new sources of revenue growth
- Profit growth is the ultimate measure of reengineering success

Case studies dominate the literature overview. Such as Stow who examines CAT Pharmaceuticals Corporation and ConPro Diversified, Inc. and comes to the conclusion that objectives in every reengineering effort have to be strategically defined first.[49]

A case study by Cole, Clark, and Nemec at Milacron Cincinnati asserts that Division management and the process teams involved with reengineering have to formulate a broad strategic vision for their division. The authors state that: "One of the key success factors was instituting a very visible and approval process (for strategies)."[8]

Earl, Sampler, and Short conducted four in-depth case studies over two years. They submit that understanding of linkages between business process reengineering and strategic planning likely to rest in the four domains that made up their initial analysis: process, strategy, information systems, and change management control.[16]

Business reengineering efforts are frequently described as "clean slate" attempts to determine the most appropriate future design for an organization. Such reengineering efforts generally attempt to start without preconditions about the company's future strategy or operating environment and are restricted by the company's current strategy, business environment, or

technical capabilities; this creates considerable uncertainty about the precise details of the future for which systems are built.[6]

Drew studied reengineering processes in financial services. This study included 43 top executives from banks, savings and loans, insurance companies, securities firms, credit unions, trust companies and other institutions. The basic findings were that customer service improvement is an overriding concern in many instances. Strategic planning is in this study was considered as important too, if it is done in alignment with reengineering.[15]

Implementation/Authority

The reengineering leader and team must possess adequate authority from the organization. Keith E. Ferrazzi, formerly national director of Deloitte &Touche Consulting Group, says, "I would give the team clearer and broader authority early on"[55]. Without proper authority the process can become costly without gaining any advantages. The manager must also have authority to implement decisions and utilize resources to complete the process. According to Hales and Savoie, president and vice president of High Performance Concepts Inc., Marietta, Ga., "If you provide the best facilities, methods, resources, tools and support, the reengineering team will then be constrained only by their own energy and imagination."[24] Therefore, the reengineering team needs the authority to access resources to implement and enforce the change. Without this authority the reengineering process will fail prior to completion.[29]

Sponsor/Resistance

Top Management support is a necessity for reengineering programs to succeed.[30][48] "If there's anything that's universally fatal to a BPR project, it's not having the mandate come from the very top of the organization" says Ovans.[45] Cook states: " Active, Visible involvement at the top is vital."[10] McElroy states that, "In this way, the entire organization becomes aware

that the reengineering effort is a high priority, a top-notch team can be assembled and results must happen."[41] Arnold explains that, "team members need to know who sets their direction, how that direction is set, who influences the team, how leadership works, how followership works, and who decides all these ground rules."[2] These are critical in the planning stages in order for the team to begin successful implementation. Top management involvement will insure and mobilize resources for the reengineering project. Also, senior management can get a time commitment form critical personnel.[22] According to Hyde: "Top management involvement means two things. First, it requires major involvement of top management. The top managers had to commit 20 to 30 percent of their time personally to champion the change effort work. Second, it means that top management must really want the change effort."[31] Management support is posed as the corner stone for any reengineering effort to succeed.

Just as critical as the sponsor ,and related to, is organizational resistance. Employees need to feel secure in self-directed teams and that others will take on the roles for leadership and followership to make their contribution and experience both fulfilling and successful.[2] Employee resistance for reengineering is natural, but the reengineering leader and team should know how to understand it and manage it. Otherwise, it may become a reason for the reengineering failure, or at least delay its positive outcome.[27][41][47] One of the most critical success factors is summarized by Scott who emphasizes reengineering can succeed, if the process personnel fully understands the need for BPR.[46] Cook emphasizes the importance of communication with individuals in order to hear their concerns and address them. People are afraid of change because it affects their actual lives, he says: "Major change involves dislocation and job losses. Everyone is affected, and it is how one deals with this that determines success or failure."[10] Doilette & Touche 's survey 431 CIO's in 1996 reveals that 76% of the respondents

were satisfied with the results of their reengineering efforts.[34] Organizational resistance to change was one of the most frequently cited most frequently as a major cause for the failure of reengineering projects was quite frequently cited.

Consultants/Training

Internal/external consultants, training, and experience must be properly used for successful reengineering. Reengineering is a process that must be examined from many different perspectives. Maximizing the benefit of available expertise can improve the potential outcome when problems and solutions are examined by internal and external experts. "They provide that essential impetus, whether in the form of a change model, their experience, or relentless pushing, without which only marginal change may occur"[10].

Even though most of the references appointed out that consultant participation is important for the success of the reengineering, they frequently assert that the outside consultant can not do everything. Consultants can help you where you can not help yourself because of limited expertise or resources.[1][7][10] Andrews and Stalick caution the use and selection of outside consultants. "You can contract consultants to complete specific implementation tasks - testing through simulation, building systems, ..., but the delivery and installation should be done by your own people"[1]. Therefore, executives should know that "consultants are advisers, not managers".[27] A key point in the literature is that consultants are often used hand-in-hand with training, and that consultants can be internally generated.

Customer

Reengineering efforts need to be designed with the consideration of the customer's needs and insights. A cost reduction reengineering program may be viewed as successful when considered against the cost saving benchmark, but can quickly become a failure if the reduction is

seen by the customer as a reduction in quality with sales consequently declining. By including these considerations in the strategic planning stages the reengineering is not likely to fail from this type of oversight [38]. Hammer emphasizes in 1996 the fact that: "...process design must be customer-driven".[25]

Many authors stress the importance of customers and defining these customers and their needs before the beginning of the reengineering effort.[5][9][10][38][40] The company owners and stockholders are as much its customers as clients buying the product or service provided, but the customer sometimes overlooked is the employee. For example, when the reengineered process involves an internal enabling process that supports another main process, such as reengineering the budgeting process for a company. Businesses that sustain high performance demonstrated a balanced satisfaction of all customers including employees.[47] Without consideration of the customer's objectives, the process can be a perfect product, but useless if it does not meet the customer's need.

Summary

The literature is full of papers and studies concerning reengineering. Most of them share the five KSFs, which are presented above, and a few articles and papers disagree with the KSFs. For example, regarding a company vision and strategic planning in reengineering projects Davidson is convinced that: "...it is not always necessary to have a vision in order to realize the benefits of business transformation."[13] One example of this is American Airlines with the implementation of SABRE, a registration and booking system.

It is difficult to rank these five criteria as each one appears to be interdependent on the others to some degree. However, the concept of basing reengineering upon customer inputs was easily the most mentioned.

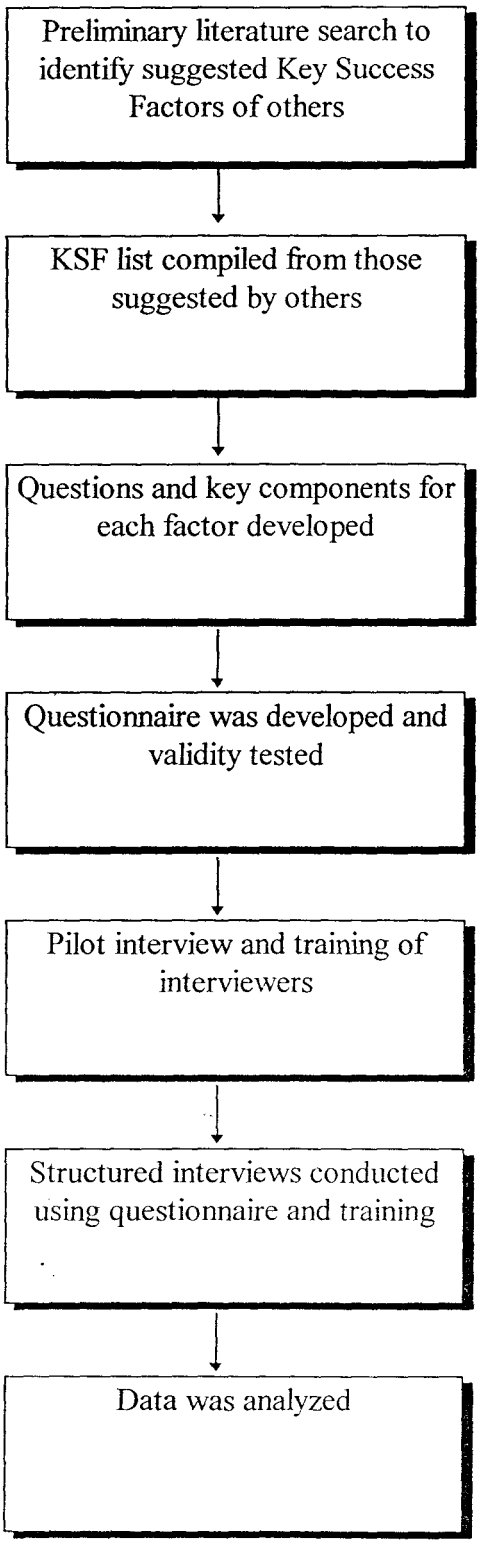
This research studies' five hypothesis are based upon wide and strong literature support. The trade-off was to go for more than five hypothesis and end up with huge survey that will lead to few responses, or stick with fewer hypothesis and have a short well structured questionnaire. The choice was to concentrate on these five taking into consideration time constraints and the number of potential respondents.

Methodology

The basic method of data collection utilized for this research was one of structured interviews. Interviewing provides detailed and relevant information while ensuring an accurate understanding of the questions being posed by the respondents. However, with interviews one must be aware of the possibility of interviewer bias. This can be mitigated with structuring of the interviews. For this research a questionnaire was developed to provide a basic framework for the interviews. Each interviewer participated in a group interview and discussion of the process as training. Training provided the basis for uniformity between interviewers. Finally, each interviewer was instructed to take careful notes during the interview and to review and refine these notes immediately following the interview while the information is still fresh in memory. Structured interviews are a proven process to collect objective and accurate information in research studies, especially when the data set will be relatively small. Figure 2 shows the basic methodology steps.[46]

The unit of analysis for this research is a single reengineering project. To ensure that the respondents correctly understood the meaning of reengineering and did not mistake other initiatives such as, TQM or information technology development projects as a reengineering initiative, reengineering was carefully defined at the beginning of the questionnaire. Hammer & Champy's definition of reengineering was chosen for this purpose.[26]

Figure 2 Steps in the Research Methodology



The importance of breakthroughs in quality, speed, customer service, and cost, were further emphasized in the definition. Additionally, it was pointed out that reengineering has often been undertaken under other titles such as Process Improvement.(see Appendix B) Participants were asked to select a recently concluded reengineering project in which they had participated or had direct contact with. They were also asked to briefly describe the project, or the process being reengineered. This detailed characterization of the respondents' efforts allowed the interviewer to ascertain with a high level of assurance that the projects in the survey were indeed reengineering initiatives.

A formal survey instrument was developed and used to solicit the significance of each item in the question set to the project identified. Respondents were asked to rate the extent to which they encountered most dimensions on a five-point scale. Other studies encountered during the literature research used similar scales.[23][34] Additionally, "Anchors" were added to each scale to further define the dimension resulting in greater accuracy.[52] Reengineering success was measured multidimensionally using three different perspectives: Customer perspective, new vs. old, and traditional measures of cost, time, quality, and overall.

Such answers should be particularly meaningful as a success measure since reengineering has been conceptualized as a deliberate change initiative aimed at "breakthrough" performance gains. The very dramatic and noticeable nature of these changes is central to the reengineering concept. Thus, the major emphasis on improvement of process performance was considered. In the questionnaire, for each of the performance goals, respondents indicated the level of performance improvement. They were also guided to leave the spaces blank if the presented dimension was not applicable to their reengineering projects. For the actual performance

indicator, the rated level of improvement in all six dimensions was compared with a preset level of truly dramatic improvement.

Members of the business community who had attempted reengineering in the past were contacted and asked to participate in an interview. The criteria for being interviewed was that the individual must have been an active participant or had close knowledge of a recent reengineering project. They must also have been in a position so as to be present during all phases of the reengineering project. These individuals were primarily developed from personal business contacts, as well as referrals. After the interviews were conducted and surveys completed, they were returned to the team for discussion and analysis.

Interview Instrument

The interview instrument provided the foundation of the data gathering and ultimate conclusions on successful reengineering. Using the initial hypothesis that the five KSFs are indeed linked to successful reengineering, an interview instrument was developed to guide the interviews to test this hypothesis. First a list of questions and factors related to the hypothesis was developed. These elements were then studied for key relationships to the five KSFs. Each selected element was then developed for the questionnaire, which included both direct and indirect questions that represented different perspectives of the KSFs. It is important to note that the questionnaire did not contain any direct references to the authors selected KSAs.(see Appendix B)

The use of a standardized interview instrument was deemed the best way to obtain reliable results. With this in mind most of the questions in the survey utilized a Likert rating scale of one to five. Each question also had a comments section included to further clarify and solicit important information. Three open-ended questions were included at the end of the survey to

provide a forum for open input from the respondents as to their ideas for KSFs for reengineering. Finally, there was an opportunity for the individuals to add comments at the end of the survey, these open-ended comments were useful in analyzing the results and ensuring that the interviews solicit relevant information.

Sample Profile

The interviews in this study represented a quite varied cross section of organizations (see Table 1). Of the 17 interviews, 14 had actually conducted at least one reengineering project and were selected for the data set. As shown in Table 1, eleven of the respondents represented manufacturing and service, with only three from high-tech.

During interviews a question was asked concerning the frequency of reengineering projects: Common, Rare, or Nonexistent. In the sample set only two respondents indicated that this was the first reengineering project. It is also noteworthy that all of the failures indicated that reengineering projects are rare at their business. Table 2 summarizes this data.

The sample profile included companies of many sizes (see Figure 3). Organization size was measured using the number of employees. This data indicates diverse groupings of the 14 companies in the data set, 3 have over 1,000 employees (23 percent), 3 have between 100 and 1000 employees (23 percent). One had 5 to 100 employees, and 7 had fewer than 50 employees. It is important to note that the number of employees represents those at that particular unit or site, the entire organization may be larger. This measure provides a better context to the company culture than total size only. As can be seen in the interviews the sample profile is quite varied and well representative of the overall business community.

	Success	Failure
Manufacturing	5	0
Service	4	2
High-tech	2	1

Table 1: Surveyed Companies by Type

	Success	Failure
None	2	0
Rare	4	3
Common	4	0

Table 2: Previous Reengineering Project

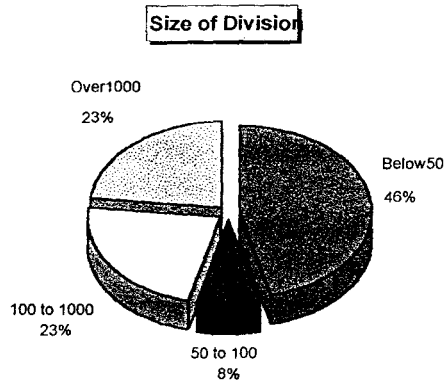


Figure 3: Size of Division in Survey

Analysis

The data was analyzed using content analysis as well as the statistical packages SPSS 6.3.1 and MINITAB 11. The usage of both packages was due to the fact that all features needed were not provided by either package.

The answers given in the interviews to questions were rated on a Likert scale from one to five. A summary of the raw data appears in Appendix E. Rating scales represent in this case ordinal data, which lead to the question of the appropriateness of statistical tests, and respectively if parametric methods are applicable.

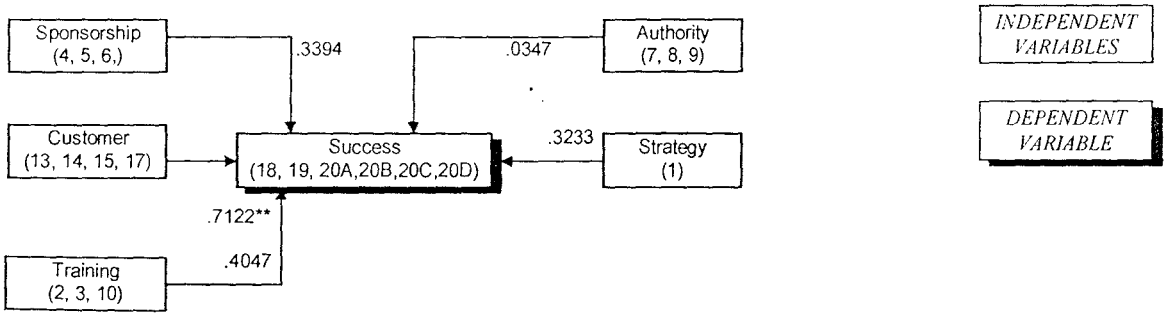


Figure 4: Multidimensional Variables and Correlation Coefficients

Figure 4 represents a model of dependencies proposed by the hypothesize versus the research question and success. The variable Success is multidimensional computed from the questions 18 through 20 as shown in figure 4 and previously discussed. The questions are unweighted and represent multidimensional values. The data from these questions was averaged and conformed to a set minimum of 3.0 for a successful project. The sample size of 14 respondents was divided into two groups according to this definition of success. There were 3 failures and 11 successes.(see Appendix C & D)

The answers to questions were compared to a preset minimum value for each as an initial linkage test.(see Appendix F) Each question showed quite high values. According to the hypothesis, the question was to show relationships between question variables ,KSFs, and success. Basic statistical analysis was applied to the data such as correlation analysis and t-Test to support this exploratory study.(see Appendix H, I, J) The means were tested of the two groups to show significant differences, the null hypothesis is that the means of both groups are equal.(see Appendix G)

Results of the analysis are given in the next section. The normality of the variables was tested and deemed sufficient to use parametric statistics. The analysis was conducted on all data utilizing the Pearson Correlation coefficient, assuming the not always uncriticized usability of rating data (ordinal scale) with a parametric analysis.[11][14] It is important to note that the methodology applied was not a randomly chosen sample, but happened through self-selection.

Strategic Planning and Reengineering

As shown in the general model in Figure 4 the correlation between the multidimensional variable strategy and success on a whole is weak and not statistically significant. This means that high recognition of strategy in reengineering projects might lead to success. Strategic planning is

heavily emphasized in literature as a critical factor that determines the success of reengineering projects. It is proposed that the goals of the reengineering effort should be linked to the strategy of the company, and that reengineering in the strategical frame of the business is necessary to succeed.[12][17][25][26][29]

According to the t-test and the differences in the mean of the samples, a significant difference in this issue can not be observed. That reveals that the higher mean from the success group is statistically significant at the 0.01 level.(see Appendix H) A corporate strategy is more important to the success group than the failures. However, if the correlation analysis does not show a heavily positive relationship between this variable and the success variable, this could be due to the size limitation of this study. A conclusion from the findings is that both groups are recognizing the strategic orientation of reengineering efforts. A contradiction arises while looking at the answers of question twenty-two, which asks directly for key success factors for this reengineering project. Not one respondent mentioned a necessity for a vision, mission, or strategic objectives as a success factor for a reengineering project. (see Appendix L) This indicates that the respondents do not perceive the strategic orientation of the reengineering effort for a given project. Another reason could be that the respondents are comfortable and view it as common sense to let a strategy guide the reengineering effort, but forget this basis when it comes to implementation.

A more operational view of the reengineering problem is given by the respondents, indicating that the reengineering effort is certainly seen as a "narrow" process improvement, which is without doubt done in the framework of reengineering. Additionally they seem to be evolving their own, company special approaches to reengineering. Not all factors that other authors in literature mention appear to be equally looked at in the real world application of

reengineering. This may at least partially due to the lack of, a structured approach as used to reengineer a process. McCann and Buckner in their study found that 52% of surveyed companies disagreed with the statement that larger business objectives and work redesign goals are well integrated and consistent.[39]

Reengineering in line with strategic goals is not as simple as it sounds. Our findings show somewhat different results. The success group has a higher mean in the variable one (question one) than the failure group, however, the t-Test shows insignificance at the 0.05 level, so the probability for having the same mean is "only" 10%, which is considered low.

This indicates that the failure group likely has not considered a strategic direction for reengineering, and probably did it without looking at the external and internal environment of the company. The concept of reengineering is reduced to "downswing" and "quick-fix" approaches which should not be named reengineering.

The authors of this paper think that the issue of strategic planning and the linkage to reengineering is a somewhat theoretical construct. It may be difficult to understand this approach, especially in a narrowed view of the urgently needed improved process.

Sponsorship

The general model does show weak positive correlation between the multidimensional variable and success. The literature is relatively clear that reengineering efforts should be guided and heavily supported by the upper-level management.[17][25][26][29][39]

Our study reveals that the variables four, five, and six do have weak relationships. Notice that variable six (Question six) is negatively correlated with success, due to the direction of measurement.(see Appendix K) While looking at the single questions (variables) the t-Test and the differences in the means of question six are statistically significant on the 0.01 level. The

results show that the perceived internal resistance from the successful projects is significantly higher than from the failures. That is an interesting observation. Variables four and six do not show significant differences.

The explanation for the non-significant relation between variable four and success could be due to the fact that it is common and in general perceived as a necessity in industry that reengineering efforts always starts at the top-level of the companies, so a correlation may not occur by definition.

The findings in the question twenty-two provides insights to the companies success factors as effected by their day to day experience while reengineering.(see Appendix L) The answers according to respondents support this hypothesis.

Interesting is that from the failure group the mean of the variable from question four is higher than the success group. Even if this result is not statistically significant, it can show that the starting point for reengineering efforts are usually top-down approaches.

Consultants, Training and Experience

The literature is not quite as united in the fact that consultants are necessary to undertake a successful reengineering project. Our study showed that companies who failed in their reengineering efforts relied heavily on outside consultants. This could be interpreted as a factor in failure for reengineering.

A positive relationship is given with variable two and project success as shown in Appendix H. This question asked for the education of the overall organization regarding the issue reengineering. The t-Test supports the hypothesis that the means from the two groups success and failure are statistically significant in their difference according to the t-Test in Appendix H.

The higher the education the organization received the higher the success. The other variables three and ten do not show significant differences, or relationships. The answers to question three can be interpreted in the way that team members educate others in the team has little, if any, influence on the outcome of the project. Question ten is showing that while looking at the means the two groups are close together. While looking at the rating scale this shows that both groups received training and education at a very minimal level, so this variable can influence the outcome, but this relationship was not observed here, because the standard deviation is extremely high in both means and it might be sufficient that only the leader (score: 2) gets training in both groups. From the failure group no one used internal experts (groups or individuals) as a resource for reengineering projects.(see Appendix M)

Reengineering and the Customer

The customer is indicated to be very important, because every reengineering effort should be oriented on processes that creates a high amount of value to the customer. For instance customer order processing might be a crucial process. This is reflected by the general model in Figure 4.

The results from the single variables in Appendix I show that there is a positive correlation between the variable from question seventeen and success on the 0.01 significance level. This should not come as a surprise, as it is perceived as a core principle of reengineering to look at the customer first. From Appendix H the means from the t-Test are not proven differently on a at least 0.05 significance level (Reject null-hypothesis: means are equal), so random effects might have influenced this result, but nevertheless with a certainty of 75% the means are different, which is a high level. The key success factor customer as recognized by the respondents occurs in the question twenty-two only twice. This recognition of the external customer as a success factor is

not lightly perceived in the industry. The internal customer is recognized as important in half of the sample by virtue of question 13.

Identifying the customer base for the reengineering process (Question fourteen) is very different between the two groups of respondents. The means differ on a significance level of 0.06. The results show that identifying the customer base is very important and leads probably to the positive outcome of the project.

Authority for Implementation

Authority given a team to start the reengineering project in literature is mentioned as very important for succeeding in these efforts.

There was no statistical significant difference found between the means of the two groups of respondents in answering the questions 7,8 and 9. The means of the variables seven and eight are both on a high level, which indicates that both groups were given a high level of authority. Interesting is that the means of the scores in seven and eight are somewhat higher in the failure group, but this might be due to random effects.

Measurement of Success

The techniques of measurement of success of the reengineering projects vary widely in this survey. In the open question feedback information, cost, and quality are considered as the most important. The reduction of time is only considered in 15% of the cases. A somewhat critical benchmark is sales volume, as mentioned by some companies. This is alone a quite insufficient factor for measuring success, because sales volume is dependent on external factors that are not so easily extractable, for instance an increase in sales volume could be due to increased marketing effort.(see Appendix N)

Communication

Communication is a crucial issue while pursuing a project dealing with reengineering. Communication refers to both informal and formal. The reengineering team has to communicate internally and externally very efficiently to maintain the cross-functional status and to identify critical processes and improve them according to the company's strategy.

Even though a direct question to communication was not asked in this survey, three respondents saw the communication as a big issue. This was indicated in the comments column in question 3. Communication may be an ever present problem and should be concentrated on at the very beginning of the project.

Time, Teamsize and Previous Projects

The average time spent on the reengineering project are quite similar in both groups. This time varies for both groups from seven to nine months.

Reengineering teams averaged 5 persons in size. Both groups showed almost the same mean size. The group size of five is generally considered an efficient one for teambuilding and communication issues. If reengineering efforts get larger in size, teams may be sub-grouped into smaller units, which are then guided through entities (teams) on a higher level.(see Appendix O)

Limitations

Basic statistics were applied in this study, these were primarily descriptive statistics as far as correlation analysis and tests of statistical significance.

The correlation analysis was made with all data to see some relationships that occur for further exploration. A Pearson correlation coefficient was used to examine the data. One can claim that the paper is here not consistent: that parametric methods cannot be applied to ordinal scale data, then in the same way using Pearson's correlation coefficient, which is used for ordinal

data. Due to the fact that there are two major opposing views when data confront the statistical methodology, the critique might be if the application of parametric statistical data is appropriate. For a discussion for using this statistical methodology refer to the work of Babakus et.al.[3]

The standpoint in this paper is to apply the parametric methods to ordinal scale (Likert-scale) data to support the exploratory study. It is not to statistically prove relationships between variables which can be then applied for the whole population

The sample size is quite small to prove relationships, that can then be used for a conclusion to the whole population. This was not the objective of this paper. The project was to examine reengineering practices in companies using a structured interview and to gather data, using a standardized scheme to minimize the bias. Of course, the reader should appreciate that, the structured interviews on a personal basis cost time and it was not always a matter of the time for guiding the interview, but to arrange them. The project faced a time limitation, due to the fact that it is based on a one term effort. This does not mean that the results are not thoroughly researched and interpreted. The base of the research is without doubt fundamental and a guide for exploring the issue reengineering further.

Another limitations which can reduce the reliability are organizations of difference size, the use of parametric statistical methods on ordinal data, and not randomly chosen companies.

Results

Analysis revealed a positive relationship between customer oriented reengineering and success. Companies seem to recognize its importance for reengineering projects, but this finding is still not overwhelming due to the scant support for the customer satisfaction as a key success factor (see question 22 of the questionnaire and Appendix L).

Additionally there is a lack of continuity in the perceived key success factors, as suggested by the literature and indicated in the interviews. The complexity of issues involved in the determination of the success of a project make the research of this issue difficult.

This study lays emphasis on factors which influence the outcome of the success of a reengineering project based on literature research. These factors were then scrutinized by the interviews.

Future Research Comments

From Literature Research and Study a checklist of items that have to be considered while doing reengineering may be developed.

The first key to future research should be to enlarge the sample size and randomize the selection of companies. Problems would likely arise while using mailed questionnaires: reengineering is a complex topic and the respondents will certainly respond to the questions from their own interpretations, which can be avoided, by the use of personal interviews. Subjectivism must be emphasized in obtaining responses from the respondents. Pre-testing of the questionnaire is extremely important. This result is drawn from the experience of the authors of this paper.

Research in this field is only possible if respondents are known as participants in reengineering projects. An open communication on this issue with each respondent needs to be followed to ensure proper understanding and scope of the questions.

Discussion

An overview of research by others and an examination of the topic general of reengineering was used to define the interview questions as well as the KSFs. Due to the fact that there is scant research evidence, and that other authors base key success factors primarily from their own experience, this paper is an attempt to examine reengineering practices in 14 companies

and relate them to KSFs. The statistical analysis given should not lead to the conclusion that one can claim the findings applicable for the whole population, as this is not the authors intent. The authors found that key success factors mentioned in the literature are often different, and emphasize multidimensional factors, which might easily be confused with other sources.

The quality and depth of the data gathered in this study actually increased the difficulty of analysis. At every turn suggestions of new or different correlation's and directions appeared. Each one which can lead to the formulation of new ideas, hypothesis and theories. It is this very dynamic nature of the data which lead the authors to include the completed surveys. This inclusion will allow others to more readily use the data and build upon it for further studies.

A critical aspect of any study is the methodology and sources for data collection. This area was one which provided it's own surprises in conducting this study. The first difficulty encountered dealt with the respondents not recognizing or being aware of reengineering. Actually many of the interviewees associated reengineering with negative connotations such as lay-offs, etc. This common reaction leads the authors to agree with Mark Klein who suggests the term "reengineering" should not even be used. Frequently in-depth discussions and descriptions were required to determine that certain projects were, in fact, reengineering. In a few cases potential interviewees responded "we don't do any reengineering here", when their companies actually had reengineering groups and such projects were indicated to be quite common according to others in the business and division. As indicated this was primarily a problem of most businesses not using the term reengineering and of not recognizing when it is, in fact, reengineering.

The best way to mitigate this phenomenon seemed to be to get the individual involved in discussing various projects in which processes were being drastically changed. This type of discussion would then regularly reveal the existence of reengineering projects, though not by

name. This type of in-depth work favored the interview format, but would make a traditional "mail-out" or "blind" survey associated with quantitative studies quite difficult. It is the authors opinion that for that type of methodology the group chosen to sample would need to very carefully selected to get a reasonable response. Even then extreme care would be required to prevent bias in the respondent sample.

One of the surveys included in the failure group, Company C, was of interest. The indicated success measures were "the same" on 5 items and only marginally improved in one dimension. This lack of dramatic improvement relegated this project to the failure group as a reengineering project. This project may have actually been a success as a less ambitious directive. During the interview it was indicated that there were actually open discussions early in the project as to whether it truly was reengineering. The consultant, however, insisted that it was reengineering. This insistence actually seemed to cause the participants to be somewhat disappointed with the results due to the over ambitious expectations. This seems to indicate the importance of recognizing the type of projects being undertaken.

The study by Grover.et.al., which was researched in the course of this study puported to identify and rank 64 problem areas associated with reengineering projects.[23] It is interesting to note that of these 64 problem areas 16 are directly addressed by the author KSFs and 5 of the 7 highest ranked problems are among those addressed.(see Appendix P) The results of this previous study lend validation to the results of this work.

An interesting analysis situation was revealed when reviewing at the data associated with question 8. This question indicated negative a correlation with success. If one actually looks at the data, however, it shows that all interviewees rated this quite high. It is possible this question

may be biased by the data gathering process, only implemented projects were allowed, and a low score here may have meant implementation was unlikely.

While the authors recognize the limitations of the small sample size. The actual quality and depth of the data is quite high. In fact, the actual strength of this study is in the use of such a qualitative approach to data gathering. This type of data is particularly useful when trying to determine the needs of future studies.

The difficulty in this field of study is probably that the success or outcome of a project is not merely the product of the exclusive causes, but an outcome of a "meta" situation within the company. Of course this study does not claim to have looked at all possible influences of success of such projects. The objective was to explore claims in literature according to measured success factors and what can be observed in the industry.

Conclusion

The authors initial intent was to determine the key factors of successful reengineering. An extensive literature search was conducted, a questionnaire developed, interviews conducted, and finally a variety if statistical and content based analysis techniques were performed on the data.

Reengineering is much more prevalent than the literature would lead to believe. Literature sources indicated that about 50 to 80 percent of organizations had attempted reengineering.[4][42] During the authors research, however, it was found that virtually all respondents had been involved in reengineering when it was possible to converse directly with them. Frequently the respondents, however, were not aware of these projects as being reengineering.

The authors concluded that support for reengineering is predominately coming from top management. In both the successful and unsuccessful reengineering attempts the respondents indicated that the effort was driven by top management. In all 14 interviews this dimension was rated as a 4 or 5. This factor indicates that management recognizes the benefits of reengineering and the importance of these initiatives.

The authors propose that there are, in fact, more than five factors to successful reengineering. This is based upon the open question asking the individuals to indicate their thoughts as to the key success factors of reengineering. Though this question brought many comments virtually all of the respondents answers were different, with little duplication. Additionally, there was scant support among the answers for the chosen five KSFs. Leading to a conclusion of the presence of many KSFs.

The analysis leads to the conclusion that of the five key factors to successful reengineering, consultants/training, focusing on the customer, and sponsorship/resistance emerged as the most directly linked to effecting successful reengineering. The primary basis of this conclusion is the statistically significant positive correlation of questions 2, 6, and 14. The data did not provide clear evidence of the effects of strategic and implementation/authority as KSFs. These questions pose intriguing possibilities for future research. Additionally it is concluded that making a ranking of the criteria is difficult as each are interdependent upon the others to some degree.

REFERENCES

1. D.C. Andrews,and S.K. Stalick, Business Reengineering, The Survival Guide, Yourdon Press, 1994.

2. V. Arnold, "Organizational development; Making Teams Work", HR Focus, Feb 1996, pp. 12.

3. E. Babakus, and C.E. Ferguson, Jr., "On Choosing the Appropriate Measure of Association When Analyzing Rating Scale Data", Journal of the Academy of Marketing Science, Spring, 1988, pp. 95-102.

4. J.R. Caron, S.C. Jarrenpa, and D.B. Stodard, "Business Reengineering at Cigna Corporation: Experiences and Lessons Learned form the first five years", Management Information Systems Quarterly, Sept. 1994.

5. C. Carter, and R. Duboff, "Reengineering from the Outside In", Management Review, Nov. 1995, pp. 42.

6. E. Clemens, M.E. Thatcher, and M.C. Row, "Identifying Sources of Reengineering Failures: A study of the Behavioral Factors Contributing to Reengineering Risks" Journal of Management Information Systems, Fall 1995, Vol 12, No.2, pp. 9-36.

7. J. Clemmer, "Process Re-engineering and Process Improvement: not an either/or choice", CMA Magazine, 1 June 1994, pp. 36.

8. C.C. Cole, M.L. Clark, and C. Neme, "Reengineering Information Systems at Cincinnati Milacron", Planning Review, May/June 1993, pp. 22-26.

9. P.A. Compton, "Process Reengineering Formula for Success for the Future", Public Personnel Management, Summer 1996, pp. 257.

10. G.E. Cook, "Seven Really Obvious Truths About Reengineering. (reengineering at Albemarle Corp.)", Journal of Business Strategy, May-June 1996, p.14.

11. H. Cooper, and L.V. Hedges, The Handbook of Research Synthesis, Russel Sage Foundation, NY 1994.

12. T.H. Davenport, and D.B. Stoddard, "Reengineering: Business Change of Mythic Proportions?", MIS Quarterly, June 1994, pp.112-127.

13. W.H. Davidson, "Beyond Re-engineering: The three phases of business transformation", IBM Systems Journal, 1993.

14. G. Dickhoff, Statistics for the Social and Behavioral Sciences, WM.C. Brown Publ. 1992.

15. S. Drew, "BPR in Financial Services: Factors for Success", Long Range Planning, Vol. 23, No. 5, pp. 25-41.

16. M.J. Earl, J.L. Sampler, and J.E. Short, "Strategies for Business Process Reengineering: Evidence from field Studies" Journal of Management Information Systems Summer 1995, pp. 31-56.

17. T.R. Furey, and S.G. Diorio, "Making Reengineering Strategic", Planning Review, July, August 1994.

18. B.T. Gale, "Quality Profiling: The First Step in Reengineering and Benchmarking", Planning Review May/June 1995 pp.37-38.

19. R.C. Garver, "Integrating Strategy and Operations", Industrial Management, July/August 1994, pp. 30.

20. S.W. Gellerman, and R.J. Potter, "The ultimate strategic question: stay, go, or change? Strategic redirection can provide an answer to the question every company must ask", Business Horizons, March-April, 1996, p. 5.

21. J. Gilmore, "How to Make Reengineering Truly Effective", Planning Review May/June 1995, p. 39.

22. A.K. Graham, "Get the Right Start When Reengineering Engineering", Electronic Design, Sep. 18, 1995, p. 85.

23. V. Grover, S.R. Jeong, W.J. Kettinger, and J.T.C. Teng, "The Implementation of Business Process Reengineering", Journal of Management Information Systems, Summer 95, pp. 109-144.

24. L.H. Hales, and B.J. Sowoie, "Building a Foundation for Successful Business Process Reengineering", Industrial Engineering, Sept. 1994, p. 17.

25. M. Hammer, Beyond Reengineering, Harper Business 1996.

26. M. Hammer, and J. Champy; Reengineering the Corporation, Haprer Collins, New York, 1993, p. 46.

27. M. Hammer, and S. Stanton, The Reengineering Revolution, Harper Business, 1995.

28. W.L. Harkness, W.J. Kettinger, and A.H. Segars, "Sustaining Process Improvement and Innovation in the Information Services Function: Lessons Learned at the Bose Corporation", MIS Quarterly, September 1996, pp. 349-367.

29. Heering et. al., http.//www.hbs.edu/mis/reengineer/projects/team_1/ reeng.htm#agenda20.

30. Holand, W.E, K. Sanjiv, "Getting past the obstacles to successful reengineering", Business Horizon, May-June 1995, pp. 79.

31. A.C. Hyde, "A Primer on Process Reengineering", The Public Manger: The New Bureaucrat, Spring, 1995, p. 55.

32. Internet, "BCG identifies twelve principals that guide reengineering success", BCG, 1996, http://www.hbs.edu/mis/reengineer/projcet/team1/reeng.htm#agenda2.

33. Internet, "BPR Online Learning Center", http://www.prosci.com.

34. Internet, "Eighth Annual Deloitte & Touche Survey of 431 CIO's", Deloitte & Touche Consulting Group, 1996, http://www.dttus.com/dttus/publish/ciosurv.htm..

35. T.B. Kinni, "Engage the customer", Industry Week, July 18, 1994, pp. 43.

36. D. Limerick, and B. Cunnington, Managing the New Organization, Jossey-Bass Publishers - San Francisco, 1993.

37. J.N. Lowenthal, Reengineering the Organization: A Step-by-Step Approach to Corporate Revitalization, ASQC Quarterly Press, 1994.

38. R.L. Manganelli, and S.P. Raspa, "Why Reengineering has Failed", Vol. 84, Management Review, 1 Jul 1995, pp. 39.

39. J.E. McCann, and M. Buckner, "Redesign Work: Motivations, Challenges and Practices in 181 Companies", Human Resources Planning, Vol. 17, No. 4, pp. 23-41.

40. J. McCloud, "Changing customer demands serve as impetus for BPR at Schlage Lock Co.", Industrial Engineering, June 1994, pp. 30.

41. C. McElroy, "Ten tips for successfully reengineering manufacturing", Fairfield County Business Journal, 16 Jan 1995, pp. 12.

42. J. Moad, "Does Reengineering really work?", Datamation, August 1, 1993, pp. 22-28.

43. D. Morris and J. Brandon Reengineering Your Business McGraw-Hill, Inc., 1993.

44. P. Newbold, Statistics for Business and Economics 3rd Edition, Prentic Hall, Englewood Cliffs.

45. A. Ovans, "Should you take the reengineering risk?", Datamation, Sep. 15, 1995, pp. 38.

46. G.M. Scott, "Downsizing, Business Process Reengineering, and Quality Improvement Plans: How are they related?", Information Strategy: The Executive's Journal, Spring 1995, pp. 18-34.

47. P. Scott-Morgan, "Human aspect is key to successful reengineering", Boston Business Journal, 26 May 1995, pp. 13.

48. D.B. Stoddard, and S.L. Jarvenpara, "Business Process Redesign: Tactics for Managing Radical Change", Journal of Management Information Systems, Summer 1995, Vol. 12, No.1, pp. 81-107.

49. R.P. Stow, "Reengineering by Objectives", Planning Review, May/June 1993.

50. R. Terlaga, "Minimizing the Risk in Reengineering: A Socio-Technical Approach", Information Strategy: The Executive's Journal, Fall 1994, pp. 6-11.

51. The Price Waterhouse Change Integration Team, The Paradox Principles, IRWIN Professional Publishing, 1996.

52. Truxillo; Job Analysis; PSU School of Business, Portland, 1997.

53. J. Vitiello, "It's totally Radical", Journal of Business Strategy, Nov/Dec 1993, pp. 44-47.

54. J. Vitiello, "Setting a Course for Radical Change", Journal of Business Strategy, Nov/Dec 1993, pp. 55-57.

55. A.J. Vogl, "Growing pains.(reengineering)(Panel Discussion)", Across the Board, Feb 1997, pp. 43.

56. J.H. Want, Managing Radical Change, John Wiley & Sons, Inc., 1995.

57. C. William, Research Papers, 4th ed., Bohhs-Merrill Company, Indianapolis, 1977, p. 43.