The Feasibility of Using Business Process Improvement Approaches to Improve an Academic Department

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Business Process Improvement (BPI) has been used in a variety of areas including higher education to improve performance and processes. This paper focuses on the potential applicability of different BPI techniques to improve a small academic department. Business process improvement techniques include, among others, Total Quality Management (TQM), Six Sigma, Business Process Reengineering (BPR), Kaizen, and Lean Manufacturing. The goal of the paper is to provide a brief but wide ranging introduction to members of the academic community regarding various modern approaches to systemic change and analytical tools to analyze, plan, execute and manage this change to obtain desired results.

INTRODUCTION: SCENARIO FOR ACADEMIC DEPARTMENT TRANSITION

As universities, their individual colleges, and their academic departments feel a need to change to meet new challenges or to accomplish a changed goal set, it is imperative that they properly manage this change. These changes can be voluntary or forced upon them due to increased competition for enrolments from peer institutions, declining enrolments due to the economy or lack of financial support for prospective students, greatly increased enrolments, competition for external funding, a desire to obtain accreditation from prestigious bodies, or simply to attain a higher level of excellence, among a multiplicity of other reasons. There are a number of often overwhelming factors in academic institutions that are barriers to change. These include academic inertia, tenured faculty that is resistant to change and which can only be convinced through moral suasion, an ineffective reward-penalty system, and "holy cows" in institutional missions and practices that are counter-productive but sacrosanct. For obvious reasons, the majority in any academic population likes, or is unwilling to make drastic changes to, the status quo. The normal belief is: there is already so much to be done, life is already so busy, things are fairly all right if not exemplary, things have already changed so much in recent years in academia, why add the manifold increased burden of even more fundamental change?

Business Process Improvement (BPI) has been used in a variety of areas including higher education to improve performance and processes. This paper focuses on the potential applicability of different BPI techniques to improve a small academic accounting department. The goal is to improve the performance and processes of an accounting department to accomplish the departmental goals of enhancing the quality of faculty and students, better deployment of existing and new faculty in critical courses, increasing the enrollment in the accounting program, providing increased opportunities for student employment by

professional firms, supplying quality graduates to employers, increasing the CPA pass rate, and playing an appropriate and proactive part in the college of business Association for the Advancement of Schools of Business (AACSB) accreditation effort.

Business process improvement approaches enable organizations to create a process rather than a functional enterprise. A process enterprise is based on processes and not on traditional departmental silo separations. The main goal behind a process enterprise is to measure and standardize processes in order to develop reusable processes that can be networked. Standardized and measured processes also help organizations to measure the value created which can be used for maximizing value (Chang, 2006).

Business process improvement techniques include, among others, Total Quality Management (TQM), Six Sigma, Business Process Reengineering (BPR), Kaizen, and Lean Manufacturing. The TQM approach focuses on small, incremental change in the entire business process while Six Sigma concentrates on fundamental change in bottle neck processes to redesign them by using statistical tools. The practical steps involved in a Six Sigma project are DMAIC (Define, Measure, Analyze, Improve, and Control). BPR deals with entire business processes by focusing on customer expectations to improve the processes and redesign them if necessary by using statistical tools and Information Technologies (IT). The main goal of Kaizen is continuous improvement. The Lean Manufacturing approach focuses on eliminating the waste associated with manufacturing. This paper is an effort to establish if any, some, or all of these approaches can be used to accomplish the diverse goals of an academic department in transition as it aims to achieve excellence in academic quality.

This paper strives to present a framework for change management for an academic department that aims to achieve excellence in academic quality. It provides one sequence in which change is executed and accomplished. The paper also briefly discusses different fundamental business improvement approaches and their potential applicability to academic departments, different analytical tools used by businesses and their applicability, and other relevant issues. The accounting department in a college of business in a small university was chosen because of the authors' familiarity with one. It should be noted that the strengths and weaknesses, and other assumptions, are generic in nature in order to provide fairly exhaustive lists that are commonplace in smaller academic departments. The situation is completely hypothetical.

PLANNING STEPS FOR ACADEMIC DEPARTMENT CHANGE

A straightforward, yet effective, sequence of steps to execute and manage fundamental change in a small academic department attempting to achieve excellence in academic quality is presented below:

Select goals
Develop quantitative measures of success
Perform a SWOT Analysis
Choose applicable and feasible BPI approaches
Choose applicable and feasible analytical tools
Collect and analyze quantitative data
Quantitatively measure success or failure
Revisit all previous steps and make required changes needed at any or all stages

Selected Goals

For brevity, only two major goals are mentioned. Realistically, there would be numerous goals, though the list should be manageable for successful attainment. Two very crucial goals for a small accounting department striving for sustainability and academic excellence are:

A) Creating a viable and highly visible quality undergraduate accounting major. Some measures used to evaluate the accomplishment of this goal could be:
   - Improved CPA pass rate
   - Increased accounting enrollment
   - Increased retention of accounting majors

- Improved quality of faculty
- Improved quality of accounting majors
- Increased job placement of accounting majors
- Increased job placement of accounting majors in prestigious firms
- Increased number of advanced accounting courses in preparation for the CPA course
- Existence of an effective and sought after 150-hour academic program
- Existence of a Master's program for students with undergraduate accounting degrees
- Existence of strong service learning projects for accounting majors
- Participation and winning in academic competitions for accounting majors

B) Aiding in a college Association for Advancement of Collegiate Schools of Business (AACSB) accreditation effort. Accomplishment of this goal could be evidenced by:
   - Increased external field exam and internal field exam scores
   - Increased faculty research productivity to meet AACSB Academically Qualified (AQ) standards
   - Increased number of faculty with proper terminal degrees to meet AACSB AQ standards

Develop Quantitative Measures of Success

A study should be undertaken to establish the baselines for the following quantitative measures, among many others needed by specific academic departments, to enable evaluation of goal accomplishment with the passage of time. These quantitative measures are chosen because they have a direct relationship to the goal measures listed above.

- Accounting undergraduate enrolment
- Accounting undergraduate retention rates
- CPA pass rates
- Terminal degrees of accounting faculty
- PRJ publications by accounting faculty
- Research prizes and awards won by accounting faculty
- Research grants won by accounting faculty
- Other intellectual contributions by accounting faculty
- Teaching awards won by accounting faculty
- Teaching innovations created by accounting faculty
- Adaptation and usage of appropriate IT by accounting faculty
- ACT/SAT scores of accounting majors
- Overall and major GPAs for accounting students
- Prizes and awards won by accounting majors
- Number of accounting majors in honors program
- Number of accounting majors on Dean's List
- Internal Field Exam scores of accounting majors
- External field Exam scores of accounting majors
- Job statistics at graduation and after 5, 10, 15, 20, 21+ years
- Number of paid meaningful internships for accounting majors
- Advanced and professional degrees obtained by accounting alumni
- Number of accounting courses offered
- Accounting academic programs offered

Perform a SWOT Analysis

A SWOT analysis should be undertaken for the accounting department to clearly understand what process changes would be needed to accomplish the selected goals. Some strengths and weaknesses that are common to most such departments are enumerated below.

Strengths

- Faculty deeply embraces the value of caring and is very student-focused
- Faculty enthusiastically mentors students
- Faculty is available outside classroom
- Extraordinary collegiality among faculty, administration, and staff
- Small class sizes
- Students are exceptionally nice
- Campus looks and location
- Manageable size of campus
- Highly supportive and active college and university top management
- A diverse student body regarding ethnicity and nationality, socio-economic status, gender, religion, sexual orientation
- Non-AQ tenured faculty member and adjuncts completing requirements to achieve AQ status
- Financial aid available for all admitted students
- Effective IT capabilities
- Availability of needed software and learning management systems for faculty and students
- Effective reward-penalty system
- Adequate funding available to effect desired changes
- Strong alumni network to provide funds and networking opportunities to students

Weaknesses

- Paucity of budget resources to fund major changes
- High student tuition compared to geographic competitors
- Location leads to fierce geographical competition from already AACSB accredited institutions
- Minimal external funds
- Weak alumni network and participation
- Lack of a merit-based economic reward system
- Moral suasion only available tool to force tenured faculty to publish
- Faculty asked to perform too many time consuming and different tasks
- Inadequate staff support for faculty duties to free faculty time for value added activities
- Multiple teaching preparations each semester and year
- Uncertainty in faculty teaching schedules
- Faculty has to pay out of its pocket to publish peer reviewed journal articles or attend conferences
- Not enough tenured and tenure track faculty to offer all needed classes to adequately prepare an average student for CPA exam
- Some highly beneficial courses, from a CPA perspective, are not offered
- Faculty only recently started project to improve program
- Challenges in student academic preparation for college and accounting program
- Weak writing, verbal, and quantitative reasoning abilities in significant number of business and accounting undergraduates
- Inadequate student exposure to real world business demands
- Number of students who have to work substantial number of hours to meet financial necessities
- Number of students who are commuters
- Bimodal distribution in student academic accomplishments
- Very few firms come on campus to recruit, especially prestigious ones
- Lack of effective internship and career programs
- Awkward administrative structure regarding student internships and recruitment

Opportunities

- College AACSB accreditation will be very attractive to potential students in the future and may increase enrollment and tuition revenues
- I Improved external reputation of department and college may increase alumni contributions and stronger networking opportunities
- Improved reputation and quality of students may result in more and better job placement
- Improved reputation and quality of students may result in more and better internship opportunities
- Improved reputation and quality of students may result in more external scholarships
- Improved reputation and quality of faculty and program may result in greater external funding

Threats

- Alumni and other external funding may not be available if accounting program fails to improve
- Weak program reputation may hinder job, internship, and scholarship opportunities for accounting majors
- Intense competition for students in geographic location, especially from already AACSB accredited institutions
- Volatile business atmosphere and weak employment market may dampen already low enrolment

Feasibility Analysis for Application of BPI Methodologies to Education: Which Approach can be Applicable?

As mentioned in the previous part of this study there are many different business process improvement approaches that can be used in a higher education. Of these, TQM, BPR, Six Sigma, and Lean Manufacturing are the ones most commonly used. Each approach has its advantages and disadvantages. This study focuses on only one academic department, which is a small accounting department in a smaller college of business.

Total Quality Management (TQM)

TQM is a management philosophy that has been successfully applied to education for a number of years. As far back as 1994, Chizmar (1994) explored the use of TQM in the classroom. He believed that TQM-based practices could be used as a tool for active modes of learning and teaching. It "focuses attention on the management function that transforms teacher and student effort into learning" (Chizmar, 1994, p 179). Chizmar has cited the Coate (1990) ten step problem-solving program. These steps are:

1. Identify and select the most important opportunities for improvement. Select team members empowered to make improvements.
2. Determine key customers. Survey customers and analyze data.
3. Select the most important issue and write a clear issue statement.
4. Identify and flowchart the key processes to recognize opportunities for improvement.
5. Agree on aspects of performance to be measured. Along with customers, set goals for continuous improvement in meeting or exceeding their expectations. It is vital to realistically evaluate current performance and set obtainable goals.
6. Start exploring probable causes of the problems and barriers to improvement.
7. Gather data on the probable causes. This provides a benchmark against which to measure future progress.
8. Evaluate the data and exhibit in pictorial charts and graphs.
9. Brainstorm and develop permanent solutions. Implement solutions, monitor performance and adopt them if they work.
10. If the problem is solved, standardize the fixes as normal operating procedures.

This is a common sense approach that clearly lends itself for use in improving academic departments. The six key attributes of TQM are listed below (Chizmar, 1994, p. 182). These attributes and this paper's authors' suggestions in the brackets for use in an academic department are:

- Asks customers what they want and satisfies their requirements [Survey students and potential employers. Develop educational policies, methodological approaches, and practices to obtain desired results].
- Attacks processes, not employees [Create new promising programs or activities and eliminate practices that do not work, change teaching processes and curricula, impose a taboo on blaming individuals, provide nurturing support for team members in need of improvement].
- Instills teamwork and creates an atmosphere for innovation and continuous improvement [Create collegiality, recognize all major and minor accomplishments, and institute group or team evaluation as well as individual evaluation].
- Empowers people [Help team members undertake new approaches and programs, make students more responsible for their own learning].
- Strives for continuous organization-wide improvement [Study the extant literature on best practices and pitfalls to avoid, learn from colleagues across campus and other institutions, share successful experiences with professional colleagues, keep the goals of other academic units and the university in mind so that they are not negatively impacted by your actions].

TQM incorporates Quality Assurance and can be successfully used to enhance educational quality only if the three conditions of Quality Assurance are met, resulting in continuous improvement. The three conditions are: the evaluation is carried out in a systematic (quality assurance is applied to all educational aspects) and structural fashion (evaluations are done at regular intervals and standards against which data can be compared and judged) and are integrated in the organizational regular work patterns (Dolmans, Wolfhagen and Scherpbier, 2003, p. 211).

TQM applies to the entire organization, including all members of the organization as well as nonhuman elements such as machines, equipment, and Information Technologies (IT). For TQM to be successfully implemented, every member of the organization should be involved, should clearly understand, and should follow the selected practices of the TQM strategy (Ramasamy, 2005).

This study focuses on just a small part of the entire organization, which is an accounting department. Hence, though a full blown TQM project is not feasible, some TQM precepts can be utilized to accomplish the desired departmental goals. For example, it is crucial to determine what the accounting teachers and students wish to accomplish academically and how their satisfaction will be measured. Similarly, it should be determined what the university and college administration desire as the outputs of accounting faculty. The creation of an excellent academic program fundamentally rests on successful learning by students. The One Minute Paper and Student Quality Circles are two, among several, effective TQM practices that enhance student learning and teacher effectiveness (Chizmar 1994). One of the authors has used these tools successfully in the past in accounting courses.

Business Process Reengineering (BPR)

Business Process Reengineering (BPR) focuses on the entire organization by creating processes from the zero base level. In order to create the best processes that can achieve the objective of the organization, BPR takes a fresh look at all the processes of an organization and completely ignores the existing processes, ([Harrington, 1997). Furthermore, BPR is an IT intensive approach. Ahmad, Francis and Zairi [2007] have compiled a list of failure factors in implementing BPR from various studies. The authors have refined this list by grouping various failure factors into people problems, organizational problems, and management problems. An initial analysis was undertaken to determine the existence, if any, and the depth of the problem in the case of this academic department. These failure factors are:

People problems

- Managers' arrogance – not a problem
- People resistance – faculty members want small changes and not radical transformation
- Not involving employees in decision making – not a problem
- Having a weak team – not certain of commitment of faculty members to extensive change
- Problems in communication – too much politeness, people reluctant to criticize others
- Lack of support from organization members – difficult to assess currently
- Lack of champion – coordinator lacks organizational skills and attention to detail

Organizational problems

- Lack of strategic vision – only BSB Dean knows the answer, faculty in the dark
- Inflexible organizational structure - institution is fairly inflexible due to devotion to tradition
- Failure to have a process perspective – institution, college, and departments are silos
- Focus on cost reduction and downsizing – not a problem
- Lack of financial and human resources – very critical problem
- Inadequate IT capabilities – not a problem
- Crisis mode – not a problem

Management problems

- Lack of support from top management – management supportive but its own hands tied financially
- Lack of project management – coordinator will have to get training or professional help
- Lack of expertise in solving critical problems – very critical problem

The analysis shows that there are a number of critical failure factors that are present in this situation. Overall, since the accounting department is a very small part of the entire organization and also cannot eliminate or solve important critical failure factors, BPR is not a valid approach to transforming it.

Six Sigma

Bandyopadhyay and Lichtman ([2007) concluded that the Six Sigma approach to program design and process improvement is feasible for implementing continuous quality and productivity improvement schemes by institutions of higher learning globally. They did not provide any empirical data and just voiced a reasoned opinion.

Six Sigma is a breakthrough approach that can be applied to an academic accounting department with some adjustments. It focuses on improving customer satisfaction, reducing cycle time, and reducing defects (Pande and Holpe, 2002). Kukreja, Ricks, and Meyer (2009) have published a case study about using Six Sigma to improve the CPA pass rate in an academic accounting department. In this case study they came up with the following disadvantages of using Six Sigma:

1. The data collection cycle is too long
2. The great deal of time necessary to complete the project

Furthermore, Six Sigma uses very detailed statistical tools to find the critical processes and causes of defects. This study researched some other approaches that can be applied to an academic department without consuming too much time and using complex statistical tools. This research led to the conclusion that a Lean Six Sigma approach may be feasible. The Lean Six Sigma approach is a combination of Six Sigma and Lean Manufacturing. Lean manufacturing (LM) is defined as lean thinking that creates faster cycle time, less waste, and more efficiency. It provides a vision and tools for reducing variability and cutting down on waste by being efficient and running a smooth and competitive operation [Womack, 1997]. Lean Six Sigma combines a simple application of Six Sigma (using not very complex statistical tools) with Lean Manufacturing principles, such as short cycle time and elimination of waste by employing value-added versus not-value- added analysis (Carreira and Trudell 2006).

Some Six Sigma Tools	Some Lean Manufacturing Tools
1. DMAIC Process	1. Process maps
2. Pareto Analysis	2. Eliminating waste
3. Statistical Analysis	3. Value stream mapping
4. Hyper geometric distributions	4. Spaghetti diagrams
5. Analysis of variance	5. Time studies
6. Brainstorming	6. Kaizen events

If it is assumed that creating a viable high quality undergraduate accounting major is a critical goal, a combined Lean Six Sigma approach can be used. In order to apply Lean Six Sigma, the DMAIC and Pareto Analysis tools can be taken from Six Sigma and Eliminating Waste and the Kaizen Events from Lean Manufacturing. DMAIC (Define, Measure, Analyze, Improve, and Control) is a project management approach to organize the layers of the entire project. In the Define phase customers (students and employers) have to be identified. Next, the measurements that are critical to customer satisfaction (CTQ) and the requisite data also have to be selected. In the Measurement phase, data about the measures that affect the improvement is collected. In the Analysis stage, these measurements are used to perform a Pareto Analysis. The analysis attempts to use the collected data and metrics to find the critical elements or causes of the defects. Pareto Analysis and other statistical analyses are part of the Analysis phase. In the Improve step, the critical and root causes detected in the analysis phase by using Pareto Analysis are either fixed or solutions are suggested. In the Control phase, the improved processes are standardized and performed.

SOME ANALYTICAL TOOLS

Some of the analytical tools used in BPI are briefly described below. This is a potpourri from which each academic department can choose the ones that relevant and feasible for it.

Pareto Analysis

The Pareto Principle suggests that 80 percent of problems (or the outputs) are due to 20 percent of the causes (or the inputs). It can result in Waste Elimination by focusing on the critical 20 percent of causes (80 percent of the problems) rather than wasting time and other resources to eliminate the remaining small percentage of the problems. It helps in finding those problems in the processes or in the systems that cause the greatest loss of efficiency or profit (Ramasmy, 2005). In an academic accounting department, Pareto analysis can be used to identify the most important causes of failure in the teaching process, the research process, and faculty improvement process. Ramasmy (2005) lists the steps involved in Pareto diagram as:

1. Calculate the share of each cause as a percentage of the total
2. Then arrange the causes in descending order
3. If there are too many small causes contributing too little to the total, group them as part of "miscellaneous causes"
4. Draw a column graph for each cause equal to its contribution
5. Plot the cumulative Pareto chart by arranging the data in descending order, calculate the percentage of the total of each datum, then calculate the total percentage

Process Flow Diagram

Ramasmy (2005) states that a process flow chart diagrammatically represents the different process steps to be performed, in sequential order, in an organization. It is used to understand how any job or process is carried out. It should document in one diagram all the sub-processes and their inputs and outputs. This procedure is of value not only to the employees involved, but also the quality system auditors in understanding how the processes are functioning in the organization. The standard symbols

used for drawing the process flow chart consist of an ellipse for the start/end of process, a parallelogram for input/output giving or taking, a diamond for inspection/decision making, a rectangle for activities/tasks, lines to connect portions of the chart, arrows to show the direction of flow, circles with a letter inside to indicate the chart is continued at another place with the same symbol to show the connection. After the process flow chart is created, it should be analyzed in light of the following questions:

1. Are all the steps necessary?
2. Is any step missing?
3. Which are the points of delay?
4. Can the process be simplified?

In order to apply business process improvement to an academic accounting program, its processes, sub-processes, activities, and tasks should be clearly defined as well as the relationship between them. The teaching process, the faculty research processes, and the faculty hiring and training processes should be broken down to the level of sub-processes and tasks. These demarcations are crucial for properly defining the processes, which is the initial step of the DMAIC approach.

After the process flow chart has been created, the questions listed above should be asked in order to select the best possible processes. For example, if we just consider the Faculty Research Process, an important contributor to the quality of an academic program, the process' efficacy can be analyzed in light of these questions. This analysis can result in the elimination of unnecessary and non-value added activities performed by faculty to publish and clarify additional process and resource constraints. The outcome is a more effective yet simpler process. An analysis may suggest the following: Assign more graduate assistants to professors to help them with mundane tasks like initial internet and journal research, tabulation of data, running of routine tests and software programs, checking of facts, crafting the research papers according to editorial guidelines, among other tasks: and providing administrative and secretarial support for completion of paper work that is related to the research funding.

Statistical Process Control Charts

Control charts are the most widely used tool in statistical process control. The underlying principle of control charts is that the variations in any process can be divided into two types: (1) random variations, which are the only variations present if the process is in statistical control, and (2) assignable variations, which indicate a departure or deviation from statistical control. The purpose of a control chart is to identify when the process has gone out of statistical control, thus signaling the need for remedial action. A control chart is a graphical technique in which statistics computed from measured values of a certain process characteristic are plotted over time to determine if the process remains in statistical control. The centerline of the graph represents the mean of outputs; the Upper control limit (UCL) and the Lower control limit (LCL) are the boundaries of the allowed outputs (Groover, 2008).

Statistical process control charts and run charts can be very helpful tools for a large amount of outputs such as in manufacturing processes. Taking samples from finished or work in process (WIP) units can help understand the problems related to these processes. An academic program with faculty research process, faculty service process, and faculty teaching process has only small amounts of outputs and WIPs. Hence using statistical process control charts may not be as helpful in administering academic departments as they are in manufacturing processes.

Run Chart

Stapenhurst (2005) defines a run chart as a plot of a process characteristic, usually over time. Like the histogram, it is able to help identify the maximum and minimum values and the average of the measured characteristic. Unlike the histogram, it can also help to identify non-random patterns including trends, seasonality and process jumps. Run charts are a part of the control chart methodology. The control chart is a logical extension of the run chart because it is simply a run chart with control limits, which are the UCL and the LCL.

Check Sheets

A check sheet is a device for recording data systematically about the probable causes of a problem. These probable causes could be the main causes identified in a cause-and-effect (Fish-Bone) diagram discussed below. There are no specific requirements for constructing a check sheet. It can be developed in whatever format is most useful for the analyst. Check sheets provide an immediate breakdown of the data into different categories and allow for quicker and better information recording than other data gathering tools like sequential logs. As with most tools, there are some interpretation pitfalls related to check sheets also. These can be:

- Exclusion bias: giving biased results because data has not been collected from a certain place, time or under certain conditions.
- Interaction bias: where the performance of the process is affecting the process of collecting data.
- Estimation bias: where the formulas and methods use to calculate statistics from the data might introduce different types of bias (Rolstades, 1995).

Brainstorming

Brainstorming is accomplished by gathering all process participants with the purpose of developing as many ideas as possible in an unrestricted manner regarding a particular issue. It has numerous benefits including stimulating creativity, encouraging joint problem solving, making it possible for participants to build on one another's ideas, minimizing the tendency to prematurely evaluate ideas, and appreciating thinking that expands the traditional boundaries of the solution space. One procedure for brainstorming is as follows (Andersen, 2007):

1. Clearly define the topic of the brainstorming and write it at the top of an idea tracking device, like a flip chart or whiteboard.
2. Let the participants create ideas according to the approach used (structured or unstructured). Encourage every single participant to develop ideas, no matter how silly they might seem at first blush.
3. Write down every idea mentioned, preferably using the same wording as the original proposition.
4. Do not allow participants to discuss, criticize, or evaluate ideas during brainstorming. If an idea is not clear enough to be understood further explanation can be solicited.
5. Allow one break period when the flow of ideas stagnates. Usually the pace will pick up again. When the ideas seem to become reformulations of previously discussed ideas or when the frequency of new ideas decreases for the second time, end the idea formulation process.
6. At the end of the brainstorming process, evaluate the ideas. Start by picking the obviously good ideas, the "stars." The rest of the ideas can be sorted into groups, either by theme or by decreasing potential."

Nominal Group Technique

In brainstorming, it is possible that one person or a small group will dominate the process. This occurrence can have two deleterious effects: (1) the full potential of various ideas may not be realized, and (2) those participants who feel they have been overlooked will not commit to the conclusions reached later on. The purpose of the nominal group technique (NGT) is to create a brainstorming session where all participants have the same vote when selecting solutions. To use NGT, the following steps are recommended:

1. As in the activity of "brain writing", the first step is written idea production, where each person generates ideas and writes these on idea cards, one idea per card.
2. All the generated ideas are recorded on a flip chart and are briefly discussed. The basic purpose of this step is to clarify the content of each idea and to eliminate similar ideas. At the end of this stage, each idea is assigned a letter, starting with "A".
3. The third step is another individual activity, where participants rank the ideas. From the compiled list of ideas, each participant selects up to five ideas recording them on the ranking card. Each idea is identified by its assigned letter from the list on the flip chart. When ranking ideas,

participants assign points to the ideas from 5 (for the most important or best idea) down to 1 (for the least important or worst idea).

4. The process leader collects the ranking cards and records the assigned points on the flip chart or whiteboard. The points are summarized to total scores are calculated for each idea. The idea achieving the highest total score is the group's prioritized idea or solution (Andersen, 2007).

Affinity Diagram

This analytical device helps to organize a large group of intractable and seemingly chaotic facts or thoughts into smaller chunks that are easier to understand and work with. Affinity diagrams are used to break down complex and complicated issues into easy-to-understand categories. This deconstruction allows teams to take ideas that seem unconnected and establish an inherent organization and pattern. For example, after conducting a brainstorming session or NGT exercise, an affinity diagram helps to organize the resulting ideas. This often leads to group consensus. Christensen (2007) suggests the following steps: (1) Each group member records their ideas on sticky notes (one idea per note), (2) without talking, the group members sort all the ideas generated by the group into related groupings or categories, and (3) once the grouping of the ideas is completed, discussion resumes and a heading is selected for each group. The resulting pattern is called an affinity diagram. This device promotes a more effective discussion of the situation being analyzed because it eradicates complexity, vagueness, redundancy and chaos.

Interrelationships Digraph (Relationship Diagrams)

Christensen (2007) describes the interrelationships digraph as a tool that displays cause-and-effect relationships between factors, problems, and ideas in a complex situation using a "node and arrow" pictorial format. Also called relationship diagrams, interrelationship digraphs enable a group to analyze the natural links between different aspects of a complex situation. This tool is very useful when relationships are difficult to determine due to the complexity and magnitude of a problem situation. The arrows in the interrelationship digraph designate cause and effect. If an idea causes or influences another idea, an arrow is drawn from that idea to those it causes or influences. This step is performed for each idea. For each idea, the arrows in and the arrows out are counted and displayed below its rectangle. Ideas having primarily outgoing arrows are the key ones. In most cases, the root cause or the driver of a problem has the highest number of outgoing arrows. Key outcomes or final effects usually display a high number of incoming arrows .It is critical to resolve the key root problems and causes before the desired outcomes can be obtained.

Scatter Diagram or Scattergraph

Scatter diagrams help in analyzing the relationship between two variables. The x-axis is used for the independent variables (causes) and the y-axis is used for the dependent variables (effects). Scatter diagrams are a quick and dirty method for gaining an understanding of the relationship between two variables. A visual fit method is used to draw a line among the observations and the slope of the line represents the relationship between the two variables. This method suffers from the following problems: (1) the fitted line, and thus the relationship, is based on individual judgment, (2) there is no objective test of the goodness-of-fit, and (3) outliers, or pathological observations, can distort the estimated relationship.

Fish-Bone (Cause-and-Effect Diagram or Ishikawa Diagram)

This tool was developed in 1943 by Professor Ishikawa at the University of Tokyo. Hence, it is also known as Ishikawa diagram. Since the diagram is drawn in the shape of a fish skeleton, it is also called fish-bone diagram. The tip of the fish-bone is the effect to be achieved. The effect can be the problem to be resolved, for example, improving customer satisfaction, reducing schedules, bringing down the cost of production, or reducing defects. It involves a group of employees and helps them to organize their discussions to arrive at all possible causes creating the problem. Each main or major cause of the problem is assigned Level One. Each level one cause can have a number of level two causes and so on (Ramasmy,

2005).This tool can be very helpful for analyzing the processes and tasks. It also can be used for the Measure phase of the DMAIC approach.

For example, the Faculty Research Process fish-bone diagram can be constructed as:

Problem statement: Inadequate research publication.

First level causes: (1) Faculty, (2) Administration, and (3) Budget.

Second level causes for Faculty: Faculty training, faculty experience, and research cooperation among faculty members of academic program.

Second level causes for Administration: Faculty reward system does not provide motivation for faculty to publish, unclear faculty goals and objectives, and insufficient management focus on research.

Second level causes for Budget: Not enough research funding, inadequate faculty compensation.

Force Field Analysis

Force field analysis is an analytical tool based on the idea that organizational change occurs after a struggle between restrainers (forces that impede change) and drivers (forces that facilitate the change). Effective organizational change can be aided and accelerated by exploiting the drivers and suppressing the restrainers. The use force field analysis forces the company to identify all facets of desired change. It identifies which course of action will be the best one to implement by highlighting the most powerful driving forces as well as the least resistant forces. This knowledge can be utilized to devise a plan that will manage the forces that restrain progress, and concurrently exploit the forces that propel in the desired direction. Gupta (2005) has noted that force field analysis is widely used in change management and can be used to help understand most change processes in organizations. He has also pointed out that force field analysis is mainly used in the early stages of planning for the following purposes:

- To understand and strengthen the driving forces for change (drivers)
- To identify the obstacles or restraining forces to change and manage them toward the desired state (restrainers)
- To improve the ratio of drivers to restrainers to implement the desired change

CONCLUSION

The study concluded that TQM was highly suited to improving the departmental processes to effect a transition to excellence, Lean Six Sigma provided a few but highly effective methods for departmental improvement, and that BPR was not feasible because the departmental conditions did not satisfy a large number of critical success factors. The paper presented numerous techniques used by business enterprises in creating and managing change. Academic department change managers should familiarize themselves with these analytical techniques, devices, and tools to determine which ones are applicable and feasible in their particular circumstances. It should be noted that a transition to excellence will require a culture change, often a drastic one, and will be questioned and opposed by at least some participants at least tacitly. There will be failures along the way, at least initially. The trick is to persist and/or to change course as data is collected and analyzed, and problems are detected in the change process. Without the whole hearted support of the department, college, and university management it will not succeed.

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