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A conceptual framework for integrating six-sigma and strategic management methodologies to quantify decision making

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Abstract

Purpose – The purpose of this paper is to present a conceptual framework for merging the strategic management process, the managerial decision-making process and the six-sigma process into a single, unified decision model.

Design/methodology/approach – The methodology involves each of the three decision-making processes, noting their similarities and differences, and arguing from the similarities that a single unified model will result in superior decisions.

Findings – The findings were that a single, unified model is possible and the resulting model is presented in the paper.

Research limitations/implications – Since this research results in a conceptual model only, it remains to be tested in actual practice. This testing is intended for a later paper.

Practical implications – If the testing of the model in practice results in superior decisions, the practical implications of the paper would be use of the Friday-Stroud/Sutterfield model in practice for better management decisions.

Originality/value – The paper presents an original model, which results from merging the three-decision-making process.

Keywords Strategic management, Strategic objectives, Decision making, Six sigma, Quantitative methods

Paper type Conceptual paper

Introduction

Over the past few decades, academicians, practitioners and organizational researchers have recognized that the managerial decision-making process, the strategic management process, and the six-sigma process are disciplines that have a powerful potential to affect an organization's ability to compete within an increasingly global and dynamic marketplace (e.g. Falshaw *et al.*, 2006; Johnson, 2006; McAdam and Lafferty, 2004; O'Regan *et al.*, 2005). While the impacts of each of these processes on an organization's ability to compete have been examined independently of one another, no paper has conceptually examined the potential impact of the synergistic effects that might be gained from merging various strategic management principles and those of six-sigma into the managerial decision-making process. (Throughout the body of this paper, the terms managerial decision-making process and decision-making process will be used interchangeably.) Hence, this paper seeks to conceptually delineate and

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merge various principles of the strategic management process, the managerial decision-making process, and the six-sigma process into a single, structured, cohesive decision-making process. This conceptual approach is offered in an effort to provide managers with practical ways to increase the effectiveness of decision making through introducing the quantitative rigor of six-sigma. The result is a newly-proposed, unified, strategic management decision-making model.

While there is no generally accepted agreement as to what constitutes a good decision (Harrison, 1975), it can be argued that a decision can be categorized as good to the extent that it is appropriate, timely, effective, and efficient. It is posited in this paper that combining various strategic management principles with six-sigma principles in the decision-making process can increase the likelihood that managers will make better decisions. If managers' decision-making processes can be improved to provide decisions that are more appropriate, timely, effective, and efficient for their organizations, then those organizations will have a greater chance of realizing increased product/service quality and improved performance, which will ultimately result in greater profitability. Given the intensifying competition in today's global, dynamic, and ambiguous business environment, it is imperative that managers find ways to differentiate their organizations from those of their competitors. One way to do this is to make more effective strategic decisions, that is to say, decisions that are as appropriate and timely as possible, so as to gain and maintain a competitive advantage (O'Regan *et al.*, 2005; Richard, 2000). Ultimately, however, the effectiveness of a strategic decision must be assessed based on the degree to which it enables an organization to accomplish its strategic objectives. Thus, it would be desirable to establish some measures of strategic decision effectiveness, so that the decision might be adjusted over time to ensure that it achieves its desired objective(s). Since this is precisely what is lacking in classical decision methodology, it is posited in this paper that the six-sigma discipline can inform the classical decision methods with just those necessary measures.

Literature review

Managerial decision-making process

The managerial decision-making process is a dynamic process that ultimately involves identifying solutions to problems (Harrison, 1975; 1993). Decision theory, like all of the sub-disciplines of management, is an interdisciplinary field that has drawn from the fields of economics, statistics, sociology, social psychology, law, anthropology, political science, mathematics, psychology, and philosophy (Harrison, 1975, 1993; Patton, 2003). Therefore, in addition to being a dynamic process, it is also an integrative, continuous process that combines both behavioral and quantitative sciences, which makes it both an art and a science.

Researchers have developed various decision-making classification schemes (e.g. Delbecq, 1967; Drucker, 1967; Simon, 1955; Thompson, 1967). The commonalities among the various schemes suggest four things: first, decisions are routine or non-routine; second, decisions are recurring or non-recurring; third, there tends to be either certainty or uncertainty with respect to the decisions to be made; and fourth, decisions tend to be either short-term or long-term in nature (Harrison, 1975). These common features lead to distinctions that can be highlighted between the types of decisions made and the levels of management at which the decisions are made. Typically, decisions made by top level

managers tend to be more non-routine, non-recurring, and long-term in nature with more uncertainty (Harrison, 1975; Parnell, 2005). Lower level managers, on the other hand, tend to make decisions that are routine, recurring, and short-term in nature with more certainty involved (Harrison, 1975; Parnell, 2005). Regardless of the type of decisions being made, the decision-making process is a means to an end (Harrison, 1975). In other words, the desired outcome is the objective of the process, and the decision-making process itself is merely an aid to managers in finding solutions to their problems, so that whatever process is employed, it should enable managers to better accomplish organizational goals.

Strategic management process

Similar to the decision-making process, the strategic management process is also a sub-discipline of the field of management, which has drawn from the various disciplines listed above. Therefore, it too incorporates both behavioral and quantitative sciences, which makes it an art and a science (David, 2005; Parnell, 2005). The main goal of the strategic management process is to aid organizations in competitively distinguishing themselves from other organizations by enabling them to better capitalize on their internal strengths and external opportunities while minimizing their internal weaknesses and external threats (Bryson, 1995; David, 2005; Porter, 1985; Steiner, 1996). Again, similar to the decision-making process, the strategic management process revolves around selecting from among alternative choices (Parnell, 2005; Porter, 1985). There are three generally accepted phases of the strategic management process: strategy formulation; strategy implementation; and strategy evaluation (David, 2005).

Typically, strategy formulation involves developing or reviewing the firm's mission, vision, and long-term goals; conducting internal and external assessments to identify the firm's strengths, weaknesses, opportunities, and threats (SWOTs); identifying selection criteria; and selecting the best competitive strategies (David, 2005, Steiner, 1996). Strategy implementation involves the allocation of appropriate resources necessary to properly execute the selected competitive strategies (David, 2005; Steiner, 1996). Strategy evaluation encompasses identifying appropriate control processes that can be used to continuously review, evaluate, provide continuous feedback, and revise the executed strategies as necessary (David, 2005; Steiner, 1996).

There are three generally accepted levels of strategy: corporate, business, and functional strategies (David, 2005). The corporate level strategy provides the overarching direction for the organization by defining the organization's purpose and the lines of businesses in which it operates. If an organization operates in just one line of business, its corporate-level and business-level strategies are effectively one and the same (David, 2005). A business level strategy is the plan of action that articulates how the organization will compete within each particular line of business (David, 2005). So, if an organization operates within two lines of business, it should have two business level strategies. The third level of strategy is the functional-level strategy. Each functional area within the organization should have a blueprint that tells how its activities will support the organization in accomplishing its business-level and corporate-level strategies (David, 2005). The ultimate objective is that all employees understand and are working toward the achievement of the organization's mission and goals (Harrington, 1995; Plant, 2006).

Six-sigma process

Motorola and General Electric are considered to be pioneers of the six-sigma approach, which is aimed at assessing and improving product and service quality (Harry and Schroeder, 2000: McAdam and Lafferty, 2004). More specifically, the objective of six-sigma is to reduce variability in quality and service so as to exceed customers' requirements (Ramberg, 2000). Over the last ten years or so, the six-sigma approach has evolved into its own sub-discipline within the field of quality management. The field of quality management is itself a sub-discipline of management. Thus, the newly emerging discipline of six-sigma and the existing discipline of quality management have roots in many of the same quantitative and behavioral sciences that have contributed to the fields of decision theory and strategic management (Evans and Lindsay, 2005).

Although very quantitative in nature, six-sigma relies more heavily on the behavioral sciences than some other quality approaches because employee participation and teamwork are integral to its success (Harrison, 1995; Snee, 2000; Evans and Lindsay, 2005). The basic principles of the six-sigma approach, which is ultimately a managerial decision-making tool, include:

- aligning key business processes and customer requirements with the organization's strategic goals;
- identifying corporate sponsors to champion projects, supporting the team, obtaining necessary resources, and helping organizational members to overcome the resistance to change;
- instituting a standard measurement system to be used throughout the organization;
- identifying appropriate metrics that focus on business results and accountability;
- providing extensive six-sigma and project management training;
- deploying appropriately trained teams to improve quality and profitability while reducing time and waste; and
- setting stretch improvement goals (Evan and Lindsay, 2005; Johnson, 2006; McAdam and Lafferty, 2004).

Steps in the decision-making process, the strategic management process, and the six-sigma process

There are seven basic steps in the dynamic, integrative, and continuous managerial decision-making process (Table I). Step one is to set organizational goals (Harrison, 1975, 1993; Patton, 2003). Step two is to search for alternatives (Harrison, 1975, 1993; Patton, 2003). Step three is to compare and evaluate the alternatives (Harrison, 1975, 1993; Patton, 2003). Step four is to choose among the alternatives (Harrison, 1975, 1993). Step five is to execute the chosen alternative (Harrison, 1975, 1993). Step six is to evaluate the executed alternative, and step seven is to monitor the results using continuous feedback (Harrison, 1975, 1993).

There are nine basic steps in the continuous strategic management process, (David, 2005), which are delineated in Table I. Step one includes developing new or reviewing existing mission, vision, and goals of the organization. Step two consists of conducting

Table I. Steps in the managerial decision-making, strategic management, six sigma, and proposed strategic managerial decision-making process

Steps in managerial decision-making process	Steps in strategic management process	Steps in six-sigma process – DMAIC	Steps in proposed strategic managerial decision-making process
1. Set organizational goals	1. Develop the new or reviewing the existing mission, vision, and goals of the organization	1. Define – identify the problem to be addressed and acquire support from various stakeholders to improve the problem	1. Set specific, measurable goals that align with the organization's mission
2. Search for alternatives	2. Conduct internal and external assessments, which is commonly referred to as a SWOT Analysis	2. Measure – collect appropriate and accurate data to determine existing process performance and desired process performance	2. Identification of organizational problem/issue based on synthesis of data generated from SWOT and statistical analyses. (A problem/issue exists when a gap exists between existing and desired performance)
3. Compare and evaluate alternatives	3. Set selection criteria and selecting strategy	3. Analysis – rigorous examination of the process, data, and facts to determine the cause and solution of the problem	3. Set selection criteria and standardized metrics for performance accountability and evaluation
4. Choose among the alternatives	4. Allocate the appropriate resources	4. Improve – select the new or revised improvement process to implement	4. Develop alternative decisions or strategies to close gap between existing and desired performance
5. Execute chosen alternative	5. Execute the selected strategy	5. Control – monitor key performance measures to determine if corrective action is needed	5. Compare, evaluate, and select the best decision
6. Evaluate the executed alternative	6. Identify and set control processes		6. Acquire and allocate the appropriate resources
7. Continuous feedback throughout the process	7. Review and assess the execution of strategy		7. Execute the selected decision
	8. Corrective actions are taken when necessary		8. Evaluate decision based on performance metrics, and take corrective action as necessary
	9. Continuous feedback throughout the process		9. Continuous feedback throughout the process

internal and external assessments, which is commonly referred to as a SWOT analysis. Step three deals with setting selection criteria and selecting a strategy. Step four deals with allocating the appropriate resources. Step five is the execution of the selected strategy. Step six involves identifying and setting control processes. Step seven includes reviewing and assessing the execution of strategy. Step eight is where corrective actions are taken when necessary. Similar to the decision-making process, the ninth and final step is continuous feedback in which the results from the process are constantly monitored to determine the success of the strategy.

The principal problem-solving methodology utilized in six-sigma is a five-step process known as D-M-A-I-C (Evans and Lindsay, 2005; Johnson, 2006), which is described in Table I. This process bears some similarity to Deming's P-D-C-A cycle, but the two are used for different purposes. The P-D-C-A cycle is the basis of *kaizen* or continuous improvement (Sutterfield and Kelly, 2005). Various analytical and statistical tools are used for each of the five steps in the D-M-A-I-C (Stagliano, 2004) (see Table I). Step one in the D-M-A-I-C process is Define, which basically entails identifying the problem to be addressed and gaining support from various stakeholders to rectify the problem. The chief diagnostic tool of choice in the Define step is the flowchart (Stagliano, 2004). Step two is Measure, which involves collecting appropriate and accurate data to determine existing process performance and desired process performance. Some of the analytical tools used in this step are check sheets, Pareto diagrams and histograms (Stagliano, 2004). Also in this stage, an experiment might be designed and executed to acquire the data necessary to establish a measure of the relationship (Analysis step) between one or more control variables, and a response variable of interest. Indeed, as Taguchi (1988) notes, " ... design of experiments is the whole of a general technique by which to heighten the efficiency of acquisition of technical information by experiment."

Step three of the D-M-A-I-C process is Analysis, which focuses on rigorous examination of the process, data, and facts to determine the cause of and solution to the problem. In this step, the results/data from the Define step are analyzed using the conventional statistical tools/approaches such as regression analysis and analysis of variance (Taguchi, 1988; Stagliano, 2004). To re-emphasize, the purpose of this step is to establish some measuring relationship between some response variable, which it is desired to improve (step 4), and one or more control variables, which may be manipulated in order to achieve the desired improvement in the response variable of interest. Step four is Improve, which is more of an art than a science. This involves selecting the new or revised improvement process to implement. In this step, it is desired to make whatever adjustments in the control variable(s) might be necessary to the level that is most cost effective in achieving strategic objectives (Taguchi, 1988). The fifth and final step is Control, in which key performance measures are monitored to determine whether further corrective action may be needed. There is also a control or evaluation step or phase in both the decision-making process and the strategic management process. Control charts and flowcharts tend to be the analytical tools of choice in this step (Stagliano, 2004).

Convergence and divergence among the managerial decision-making, strategic management, and six-sigma processes

There is much convergence among the managerial decision-making process, the strategic management process, and the six-sigma process. They are all sub-disciplines

of the field of management, which makes them all arts as well as sciences because of their reliance on intuition, judgment, and the use of analytical tools. Because they are all sub-disciplines of management, they also draw from many of the same disciplines, such as engineering, economics, social psychology, sociology, anthropology, and political science. Additionally, the three processes contain many of the same or similar steps in their processes. For example, they all contain some variation of a define step, an analysis step, an implementation step, and an evaluation or control step. The managerial decision-making and the strategic management processes both contain a continuous feedback step.

Even though there are many similarities among the three processes, divergences among them do exist. While the divergences among the managerial decision-making process, the strategic management process, and the six-sigma process are few, they are very dramatic. The most dramatic distinction is the extensive use of statistical analysis in the six-sigma process. Although both the managerial decision-making process and the strategic management process utilize some quantitative models within their processes, neither of them uses statistical techniques and quantitative models to the extent that the six-sigma process does. Another significant difference among the three processes is the level of environmental uncertainty, which refers to the uncertainty resulting from the environment or context within which decisions are made. There tends to be much more environmental certainty in the product and service areas of organizations where six-sigma is primarily used. On the other hand, there tends to be much more environmental uncertainty in the top levels of management where managerial decision-making and strategic management processes are typically used (Parnell, 2005).

The proposed strategic managerial decision-making process

An analysis and synthesis of the preceding delineation of the convergences and divergences among the three processes, suggests a unified strategic managerial decision-making process, which will now be presented. The proposed process, which is depicted in Figure 1 and described in Table I, has evolved from the seven-step managerial decision-making process delineated by Harrison (1975) into a nine-step strategic managerial decision-making process. Step one includes setting specific, measurable goals that align with the organization's mission. Step two calls for the identification of organizational problems or issues based on the synthesis of data generated from SWOT, statistical, and gap analyses. An organizational problem or issue exists where there is a gap between existing and desired performance. This requires the use of the elementary diagnostic tools, such as check sheets, histograms, cause-and-effect diagrams, Pareto diagrams and scatter diagrams, to facilitate the analysis of gaps, problems, or issues in performance.

Step three of the strategic managerial decision-making process requires the setting of selection criteria and standardization of metrics for performance accountability and evaluation. Step four involves the developing of alternative decisions or strategies for closing the gap between existing and desired performance. Step five is the comparison, evaluation, and selection of the best decision to implement to correct an identified gap. This is to say that correcting different gaps will almost certainly require different decisions. Step six requires the acquisition and allocation of the appropriate resources needed to implement the selected decision. Step seven is the actual execution of the

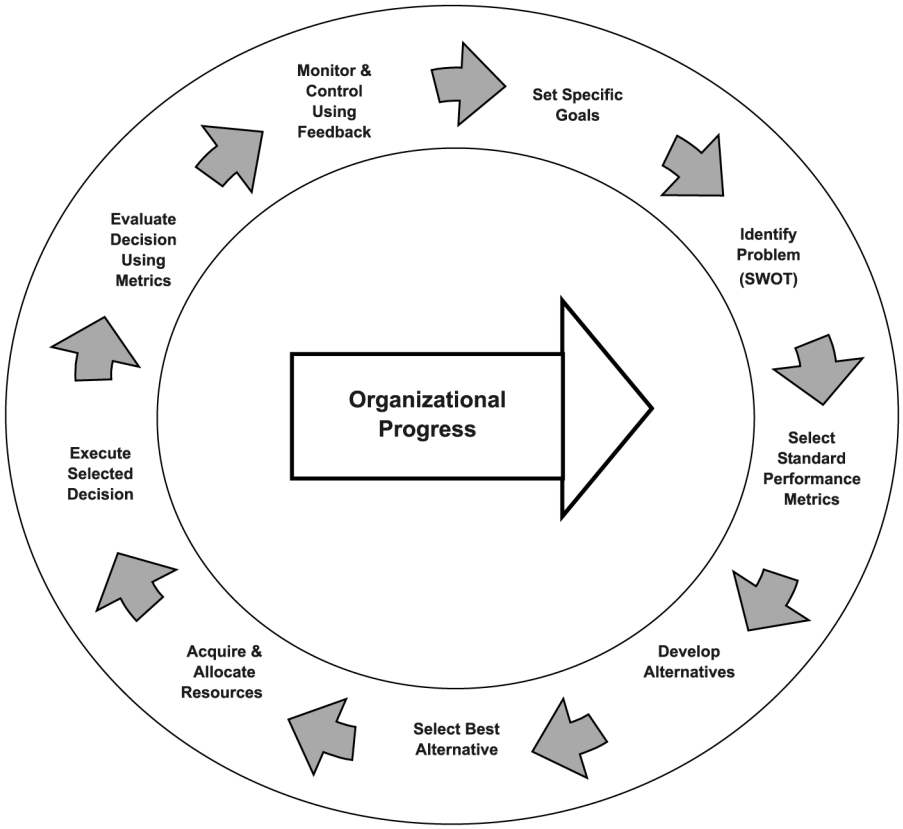

Figure 1.
Strategic managerial decision-making process

selected decision. Step eight is the evaluation of the executed decision based on performance metrics (Step 3) and the implementation of corrective actions as necessary. The ninth and final step requires continuous feedback, viz, monitoring, throughout the process. This proposed nine-step continuous, dynamic, and interrelated strategic decision-making process provides a coherent framework for making the appropriate decisions necessary to resolve identified organizational problems or issues. Research suggests that the use of a process to guide decision making is likely to lead to more effective decisions (Schwarber, 2005).

Practical managerial decision-making implications

Managerial decision making, strategic management and six-sigma are considered to be both arts and sciences because they all draw from many of the same behavioral and quantitative sciences. More specifically, they are considered arts because individuals by nature use their intuition and relevant experience to make judgment calls when making strategic or quality-related decisions. They are all considered sciences because they include the use of various models and quantitative methods to aid individuals in arriving at strategic or quality-related decisions. Knowingly or unknowingly, individuals inherently use the decision-making process when they use the six-sigma process to

enhance process and service quality. Likewise, individuals inherently use the decision-making process when they use the strategic management process to aid their organizations in capitalizing on their internal strengths and external opportunities while minimizing or decreasing their internal weaknesses and external threats.

Harrison (1975) suggested that the merger of technical and human factors into the managerial decision-making process is the key to successful decision making. Therefore, it is argued that by consciously infusing various quantitative and behavioral-oriented steps from the six-sigma process and the strategic management process into the managerial decision-making process, managers can enhance their decision-making capabilities. Their decision-making capabilities can be enhanced by using the proposed strategic managerial decision-making process because they would be using an integrated framework that includes the use of more quantitative techniques as well as the best features of all of the methods.

Many underestimate the role that continuous feedback can play throughout the strategic managerial decision-making process. Continuous feedback enables the decision maker to continuously "take the pulse" of what is going on in the organization's dynamic internal and external environments to determine the immediate effect(s) of a decision, and to make adjustments in the decision variables as necessary to achieve the desired outcome(s). The use of continuous feedback throughout the strategic managerial decision-making process can aid individuals in making timely and appropriate decisions given the organization's situational constraints. Additionally, appropriate and timely data interpretation, and the institutionalization and identification of metrics that focus on business results and accountability are the keys to enhancing the strategic managerial decision-making capability of individuals.

Conclusion

Given that organizations continuously seek ways to differentiate themselves from their competitors, the ability to successfully utilize the strategic, managerial decision-making process proposed in this paper may aid the decision maker in outperforming his/her competitors. While the proposed strategic managerial decision-making process is only a two-step increase over the managerial decision-making process described by Harrison (1975), the changes are significant. The use of the proposed strategic managerial decision-making process requires managers to take a more integrated and quantitative approach to decision making by not only following the steps in the managerial decision-making process, but also by infusing relevant methodologies from the strategic management and six-sigma processes. The proposed strategic managerial decision-making process suggests that decision makers should also do the following:

- ensure that goals are clearly set and aligned with the organization's mission;
- conduct SWOT, statistical, and gap analyses using relevant diagnostic tools;
- identify standardized performance metrics;
- acquire and allocate the appropriate resources necessary to execute the decision; and
- use the metrics to monitor the results of the strategic decision, and to adjust the decision as necessary to ensure that it achieves it desired objectives.

By adopting and executing the strategic managerial decision-making process offered in this paper, it is believed that managers will be able to make more appropriate and informed decisions to enhance organizational performance. If the conceptual approach advanced in this paper can be employed as anticipated, the decision maker should be able to accomplish this through the use of an integrated, strategic, and quantitative decision-making process. The following is a list of other potential benefits that are likely to result from implementing the strategic managerial decision-making framework proposed in this paper:

- individuals will develop an increased knowledge of internal and external factors impacting the organizational issue/problem identified and his or her decision;
- individuals will learn to utilize and appropriately interpret the results of SWOT, statistical, and gap analyses;
- individuals above and below them in their chain of command will be more likely to respect their decisions; and
- increased organizational performance and individual productivity.

Finally, this proactive strategic managerial decision-making process is proposed in the hope of assisting managers in gaining and sustaining a competitive advantage in today's dynamic, global, and ambiguous marketplace. Given that this proposed model is conceptual in nature, future research is necessary to empirically test it in various organizational settings.

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