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Six Sigma Pilot Project Selections Using an MCDM Approach

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Abstract
Six sigma as a quality management tool is a useful method for achieving competitive advantage over rival companies in the competitive environment of both manufacturing and service enterprises. So successful implementation of six sigma project is very important for top managers, because many companies could not achieve expected results and even completely failed. In this article, we present a model for aiding top managers in selecting the most important appropriate business units for pilot testing of six sigma. For the evaluation of projects, reviewing the literature and decision team's opinion, we defined six main criteria and relevant sub criteria for use in a MCDM project selection. Projects with maximum co-ordination with business strategic goals and maximum probability of success are prioritized and ranked by an AHP saaty method. Finally we applied the proposed model in a real-life scenario in one of the leading service companies in Iran to show the applicability of the model.

Key words: Six Sigma; Analytical hierarchy process (AHP); MCDM

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INTRODUCTION
Quality management has been considered as an important strategy for achieving competitive advantage over rival companies. Many quality initiatives such as total quality management, zero defects and statistical quality control has been used for many years, but six sigma is a recent quality improvement initiative that has gained popularity and success in many industries and even in service organizations across the world (Nonthaleerak and Hendry, 2005). With the success stories from motorolla and GE the use of this quality improvement tool spreads rashly in all over the world, but many companies miss one important point six sigma is a long term improvement process which has to be taken very seriously and every person in the company most commit themselves to the philosophy of six sigma. Unfortunately, many of the new followers of six sigma philosophy have not successfully implement the six sigma paradigm. Lots of possible reasons have been mentioned for this failure such as no real assessment on where Six Sigma should be deployed and why the management should be directing their efforts to a particular area or Selection of too many projects without taking into account the availability of current resources and existing capabilities (Pande *et al.,* 2000). But the most important of them is the lack of top management commitment and also lack of appropriate human resource management. This reason usually emerges because of the former reason, a company with lower top management commitment show a lack of co-ordination of human resource management and overall quality efforts. In these companies, responsibility of quality is relegated to the middle and lower level managers and finally to shop floor employees. Since top management and other levels of employees sincerely believes in viewing six sigma as a process rather than a specialist function there is no real emphasis on long term and organizational wide quality improvement. It is not surprising that these companies lose interest in six sigma implementation in a short time.

Selecting of the right Six Sigma project is one of the most sensitive elements in the deployment of Six Sigma (Antony, Antony,Kumar, 2007; Gijo & Rao, 2005;

Pandey, 2007; Snee & Rodeb-augh, 2002). Like any new approach, six sigma long term implementation depends on its initial successful impact on the company, the more impressive results in the six sigma pilot project, the more acceptance and motivation emerge among employees. This phenomenon has been demonstrated by the failure of many quality circle programs in the mid-1980s in the USA and Europe [9, 10].

Results of the study made by ISixSigma Magazine (2005) showed that companies at any stage of deployment prioritize Six Sigma projects that have high financial savings. Survey findings also showed that the existence of formal project selection processes, process documentation, and rigorous requirements for project approval are all elements of a highly successful program. Here we define a procedure which helps top managers to choose the most appropriate business units for applying six sigma project by using MCDM model. This unit could be a process such as admissions in a college or could be an operational unit like assembly section of a company. Here the problem is which department or unit is the best choice (best here means the most merit unit with respect to our problem criterions) for managers to implement six sigma pilot project in it. So we define a method for top managers in order to find the best way of starting their six sigma project and provide a wave of interest and acceptance among the employees by a successful implementation of first step of six sigma project.

LITERATURE REVIEW

The Six Sigma method utilizes a well-disciplined approach. The unique features of the Six-Sigma approach are as follows: (1) sequences and links improvement-tools into an overall approach (known as DMAIC), (2) integration of the human and process elements for improvement using a belt-based organization (Champion, Black Belt, and Green Belt), (3) attention to bottom-line results and the sustaining of gains over time (Su, Chiang, & Chiao, 2005).

Six sigma is already successfully applied in individual activities and industries such as witnessed by the improvement in the automobile industry's manufacturing flow (Kalamdani & Khalaf, 2006), and in quality of integrated circuit design (Su *et al.*, 2005). Das (2005) applied Six-Sigma to reduce procurement delay. Six Sigma is applied using a project management, under resource constraints. The project selection-decision, to maximize the financial outcomes, is often challenging for a company. Breygogle (1999) suggested that companies can consider four dimensions of the balanced score card, namely financial, customer, internal business process and learning, and growth as the criteria for project selection. Snee and Rodebaugh (2002) identified that projects need to link with the strategic goal. Mark (2001) stated that projects should focus on activities critical to quality (CTQ) and financial performances. Brue (2002) considers that project selection should acknowledge resources and time. George, Row- lands, Price, and Maxey (2006) argues for recognition of the business voice, customer voice, and process voice for project selection. Przekop (2006) argued that Six Sigma has the same content with that of the American national quality award criteria. Seetharaman, Sreenivasan, and Boon (2006) found that a national quality award winner also showed improved performance in both sales and revenue. Thus, national quality award criteria should be a potential framework for the Six-Sigma project selection criteria. The project criteria evaluation is a FMCDM problem where fuzzy assessments and multiple expert opinions can be considered. Human opinions are often in conflict because of group decision making in a fuzzy environment. Various approaches to different aspects of decision problems with vague data have been published, and a significant amount of literature is available on FMCDM, such as: Chang, Wang, and Wang (2006), Chou, Chang, and Shen (2008), Coffin and Taylor (1996), Greco, Matarazzo, and Slowinski (2002), Ölcer and Odabasi (2005), Wang and Lin (2003), Wang (2008), Xu and Chen (2007), Yang and Chou (2005), and Yang and Hung(2007).

Recent development has extended the FMCDM to a group decision-making problem, as investigated by Chang, Tasuhiro, and Tozawa (1995), Chang *et al.* (2000), Chang and Wang (2006), Chang, Wu, and Chen (2008), Cheng and Lin (2002), Liu and Chen (2007), Yeh, Cheng, and Chi (2007), and Zeng, An, and Smith(2007). Cheng and Lin (2002) utilized a fuzzy Delphi method to adjust the fuzzy rating of every expert, and so achieve the consensus condition. The experts' opinions are described by linguistic terms which are expressed in trapezoidal fuzzy numbers. It then took the operation of fuzzy numbers to calculate the mean of fuzzy ratings and the mean of weight. The aggregated fuzzy numbers were solved by multiplying the fuzzy decision matrix with the corresponding fuzzy attribute weightings.

Zeng *et al*. (2007) used standardized trapezoidal fuzzy number (STFN) to capture and convert experts' fuzzy information and subjective judgment for the group FMCDM problem. The experts' opinions can be expressed by a precise numerical value, a range of numerical values, a linguistic term or fuzzy number. In other words, the members of the decision-making team have the flexibility to use different evaluation measures depending on their individual knowledge and condense. The STFN is employed to convert these experts' judgments into a universal format for the composition of group references. The fuzzy aggregation is used to create group decisions, and then defuzzification is employed to transform the STFN scales into numerical scales for the computation of priority weights.

THE MCDM METHOD

MCDM is a mathematical approach for solving decision problems, which evaluates various criteria in order to find the best alternative according to a certain goal. Each of the criteria should be weighted with respect to its impact on the problem's goal. Any MCDM model consists of three steps: indentifying the decision hierarchy by defining the goal, criteria and sub-criteria, etc (if exists); defining the importance weight of the criteria with respect to the problem's goal; determine the priority of each alternative by comparing them along these criteria.

MCDM models have been used in a wide variety of practical applications such as resource allocation, employee evaluation, marketing strategies, engineering design evaluations, supplier evaluation, credit analysis, and urban and community planning, etc[16,17].

six sigma pilot project selection could be considered as a goal for MCDM modeling. In project selection problems we often have to evaluate a combination of qualitative and quantitative criteria so researchers found MCDM models suitable for this class of problems. It has been reported through several studies on project management that methods like MCDM, which provide for the measurement and aggregation of the various project selection criteria, seem most appropriate for prioritizing and ranking projects.

Once such rankings are obtained, standard methods, such as cost-benefit analysis or mathematical programming, can be applied to determine the final allocation of resources to highly ranked projects [18]. Both these findings are valid for the six sigma pilot-project selection problem.

ANALYTICAL HIERARCHY PROCESS (AHP)

The analytic hierarchy process (AHP), developed by Saaty [32], is the most widely used MCDM model. It has been applied to problems such as strategy formulation, decision analysis, voter behavior prediction, R&D project selection, and school admissions [16, 18, 20, and 21]. Assume the decision problem of selecting the best production facility for company and three criterions like price, capacity, and production process. Assume that there are three alternatives A,B and C. Some of the criteria are subjective. AHP can be used to derive numerical relative weights for a set of such subjective and objective criteria. AHP's major application has been in the multi-attribute judgmental problems in which subjective criteria or intangibles play a prominent decision-making role [32]. In some cases when we add a new alternative to the problem, the rank of the previous alternatives alters. Assume alternative A was better than B and after adding new option to problem B get better rank from A. This problem was solved by Belton and Gear modified AHP method. The referenced AHP method uses the pair wise comparisons of the total of scores of all alternatives on various criteria (adjusted to a common dimension through a scaling factor) in order to determine the relative importance weights of these criteria. On the other hand, the Belton and Gear Modified AHP method uses pair wise comparisons of the relative preferences of the maximum scores on various criteria in order to determine the relative importance weights of these criteria. The Belton and Gear modified AHP method is employed here to develop

the Six Sigma pilot-projects selection model because of its ease of implementation and logical approach[26]. In this method, the criteria weights are established by paired comparison of the relative importance of values represented by the largest valued options under each attribute.

AHP MODEL FOR SIX SIGMA PROJECT SELECTION

The suggested AHP model for selecting the six sigma pilot project consists of three important steps: determining decision hierarchy; identifying the weights of relative importance of criteria; ranking the alternatives with respect to each criterion. In order to determine the relative weights of importance, it is necessary to make a cross-functional advisory group or committee for developing the model structure. This committee should consist of members from different management levels for having precise information along the process.

Decision Hierarchy

According to Antony *et al*. (2007) the selection of the right project is a vital factor for gaining early and long-term acceptance of the Six Sigma program among the managers and the employees in any organization. The project must be chosen in accordance with the organization's goals and strategies (Gijo & Rao, 2005). In order to find the most appropriate six sigma pilot project, the advisory committee should make a very detailed analysis on the criteria and factors which may affect the chance of success in implementing the project. After making a long literature survey we defined a detailed and comprehensive set of factors for assuring the successful implementation of six sigma pilot project in any organization. The analysis of relative merits of various six sigma project must be done by comparison of 6 criteria in level 1 and 14 sub-criteria in level 2 which are shown in figure 1 as the decision hierarchy.

Financial Impact

One of the most important considerations for trying out six sigma in any organizational unit should be the financial impact that the success or failure of six sigma in this unit would have on the entire organization in the short and long run. Here we define financial impact under

tow categories: cost of implementation and financial benefits. There are two sub sub-criteria for each of the categories: (cost of training,cost of human resource and cost reduction, financial payback). The project cost is an important input for the six sigma project selection. Six sigma implementations may require a significant investment of capital. For example, General Electric invested about $1.6 billion between 1996 and 1999 on six sigma (Waxer, 2007). Cost of training is the cost utilized in instructional Six Sigma process for employees and workers of the company. Regarding the aspects of project, cost of training is commonly related with the duration of training period. The training involves a particular period of time, for the Black Belt this period is about four months, whereas the Green Belt training sessions take two months time (Nonthaleerak & Hendry, 2008). Cost of human resources refers to the number of managers and departments involved for implementing six sigma initiative project. Degree of managerial skills and authorization, whether a Green Belt, Black Belt or a Master Black Belt also plays a significant role in budgeting the human resources (Fundin & Cronemyr, 2003). It is already a proven fact that the benefits obtained from Six Sigma implementation outweigh the investment costs (Antony, 2007). Cost reduction, is one of the most important strategies for extending market share. One of the main objectives of six sigma project is to minimize the cost of poor quality.six sigma projects can reduce the total cost of the company by Improving the process capabilities and reliability and eliminating the COPQ. Any improvement in sigma level is likely to reduce the cost of poor quality. The COPQ as a result of manufacturing defects is a function of rework cost, excessive use of material, warranty related costs and unnecessary use of resources. Obviously, the potential financial payback a unit could have the more desirable unit it can be for six sigma implementation.

Human Resource

With respect to six sigma emphasis on the human-resource productivity, the human-resource impact of six sigma project is considered as a key to successful impact of six sigma strategies on an organization. So we have defined three sub-criteria as: employee competency, employee productivity and employee satisfaction. Employees' competency is the ability of employees' to perform a specific task, action or function successfully and it is one of the major intentions of implementing Six Sigma in an organization (Lynch & Soloy, 2003). By visualizing the strengths and weaknesses of each team member and worker leads to refine their skills for their highest level of performance (Gijo & Rao, 2005). A six sigma program could not be regarded as successful if it simply leads to improved morale and satisfaction of employees, without translating that into better on-the-job performance. It would only be an excellent public relations program. At the other extreme, it is a well known fact that emphasis on increased productivity, without regard to commensurate supporting programs such as individual and group incentives, and training, and other morale-boosting schemes, may lead to decreased employee satisfaction leading to decreased long-term productivity and increased turnover.

Organizational Benefits

Process excellence can simply regard to the methodical development of business process which is one of the main targets of the Six Sigma projects (Antony *et al*.,2007; De Koning & De Mast, 2006). Process excellence requires the ensemble of activities of planning and monitoring the performance of a process which can be possible with an accurate process management. It is a systematic approach in the Six Sigma projects to help any organization optimize its underlying processes to achieve more efficient results (Snee & Rodebaugh, 2002). Customer satisfaction is a measure of how products and services supplied by a company meet or surpass customer expectation. As a major objective of Six Sigma program, it is seen a key differentiator and increasingly has become a primary element of business strategy (Anderson-Cook *et al*., 2005; Fundin & Cronemyr, 2003; Harry & Schroeder, 2000). Therefore, projects, which have an impressive impact on customer satisfaction and improving competitiveness, are desirable. The final sub factor of benefits is learning and growth. It is a perspective that includes employee training and corporate cultural attitudes related to both individual and corporate self-improvement. Learning and growth refers to implementation of Six Sigma process in company and adaptation of employees and knowledge-workers (Antony, 2004; Banuelas *et al*., 2006).

Positioning of the Project

We have defined positioning of the project under three sub criterion: functional autonomy, functional impact and visibility. Functional autonomy identifies the scope of six sigma project by determining the extent to which we can define the functional independence of the business unit for which the six sigma project is to be implemented. Obviously as the functional autonomy gets higher, the conclusions derive from six sigma implementation gets clearer. The functional impact sub criterion shows the impact of project on its parallel or downstream operational efficiency. And the last sub criterion "visibility" indicates the physical and operational visibility of the selected business unit from internal and external observation perspective (Sanjay L. Ahire & Dharam S. Rana 1994).

Risks

Under the factor of risks, we have defined three sub-criteria as: budget overrun, Time delay and Project related risks. Budget overrun can be defined as excess of actual budget which plays a very important role for decision making in any project applied Six Sigma (Pande *et al*.,

2000). Through the financial year turn if the expected revenues and expenses instead of coming close diverge wildly from the budget, this sends an out of control signal and as a result comes out with a suffering share price (Kumar, Nowicki, Marquez, & Verma, 2008). Time delay is the shift of time to a forward date which directly affects the budget and the business process (Harry & Schroeder,2000). It is a risk that requires a corrective action, taken care of earlier than the final point without impacting the Six Sigma project schedule (Antony, 2006). Project related risks can be any risk that would affect the ongoing Six Sigma project negatively (Antony, 2004). Political situation, laws and regulations, permits and approvals, working conditions, financial status, competence of project team, approval methodology and timing, technical know-how, staffing, suppliers, etc can be some of the key reasons of any project. The Six Sigma is directly related with risk involved in the project (Antony *et al*., 2007; Pande *et al*., 2000).

Project Duration

One of the most important reasons of six sigma project failure is Selection of too big and complex project at the start that has high probability of getting delayed and abandoned. The Six Sigma team should start with a meaningful and manageable project that can keep the assignment small and focused to enhance the probability of success, i.e. the project may be delivered within four to six months (Antony, 2004; Pande *et al*., 2000; Pyzdek, 2003; Goldstein, 2001; Davies-Catalani and Vieth, 2000).

The next step in developing AHP model is to determine potential projects that have the most strategic relation with business goals. The advisory committee should create a brainstorming session to select pilot projects, which have high probability to success, and reaches project goals. The selected pilot projects are used as alternatives in analytical hierarchy process.

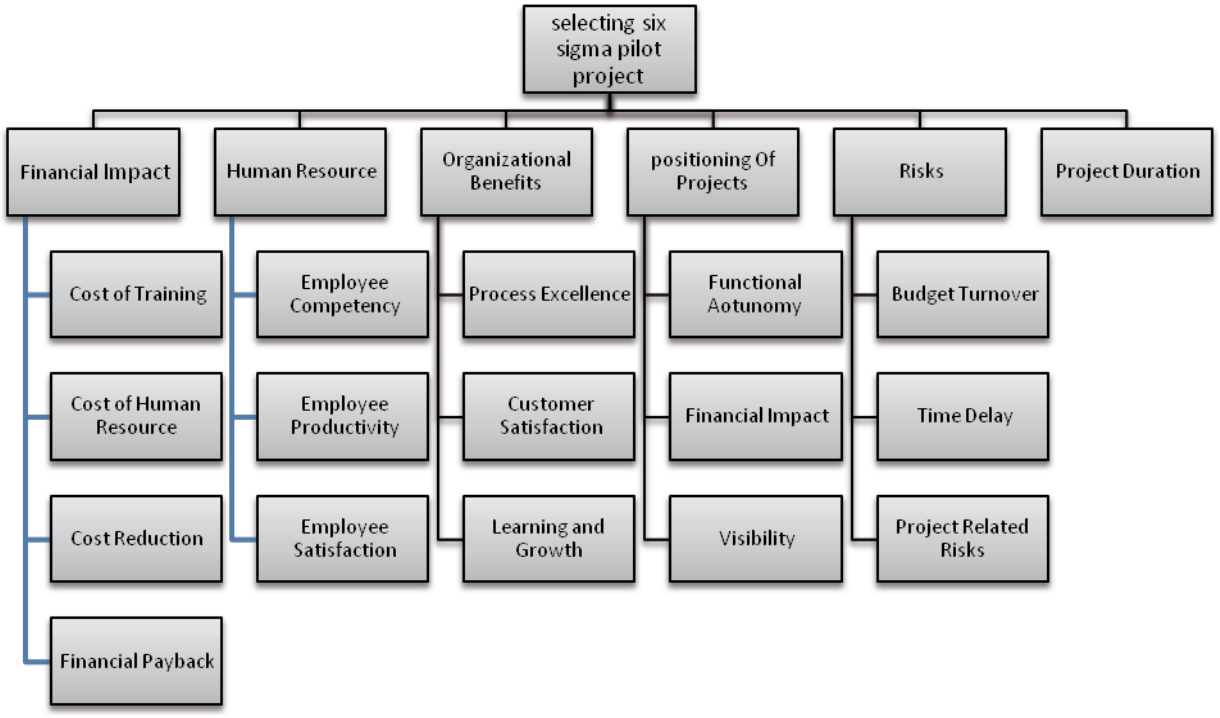

Figure 1
Decision Hierarchy

The next step is the determination of the relative importance weights of various criteria of the hierarchy using the standard pair wise comparison of the criteria, these weights can be derived with the help of the Belton and Gear modified AHP method. For example, suppose the advisory committee wants to determine the weights of the three sub criteria of human resource(employee competency, employee productivity and employee satisfaction). It would rank all six sigma pilot projects under consideration along these three sub criteria. Then, it would select four projects, A, B C and D from the pool such that A has received the highest ranking on the employee satisfaction sub criterion, D has received the highest ranking on the employee competency ranking, and C has received the highest ranking on the employee productivity criterion. Then it would compare these projects in pairs and assign its preference in terms of the verbal scale shown in Table I. It has been demonstrated

that a scale of an order of magnitude (about 10 to 1) is reasonable and reflects the extent to which we can discriminate the intensity of relationships among attributes [33]. Thus, if the advisory committee assigns its judgments according to Table II, then following the Eigen value method, normalized relative importance weights could be derived for these three sub criteria. The inconsistency index indicates how inconsistent the decision maker's judgments about the relative weights of criteria are According to the AHP theory an inconsistency index of 0.1 or less reflects a high level of consistency [32, 33]. An inconsistency index exceeding 0.4 warrants a review of the judgments.

Table 1
Relative Judgments for Determining Criteria Weights of Any Two Criteria

Judgment	Verbal Scale	Equivalent Numerical Scale
1	The best alternative on attributes I and II are equally preferred	1.0
3	The best alternative on attribute I is moderately preferred over the best alternative on attribute II	3.0
5	The best alternative on attribute I is strongly preferred over the best alternative on attribute II	5.0
7	The best alternative on attribute I is very strongly preferred over the best alternative on attribute II	7.0
9	The best alternative on attribute I is extremely strongly preferred over the best alternative on attribute II	9.0
2,4,6,8	Intermediate judgments between judgments 1, 3, 5, 7 and 9	2.0,4.0,6.0,8.0

Table 2
Six Sigma Pilot Projects with Best Rating

Number	Sub-criteria	Candidate with best rating
I	employee satisfaction	A
II	employee competency	D
III	the employee productivity	C

The same procedure is followed to determine the relative importance weights of other, sub criteria and criteria. The results of these pair wise comparison in analytical hierarchy process are compatible with Expert Choice software results.

APPLICATION OF PROPOSED METHODOLOGY IN REAL-LIFE SCENARIO

In this case study, the authors and three members from the senior management team, along with quality manager in the company, formed a cross-functional advisory committee for identifying the decision hierarchy; deriving the weights of relative importance of criteria and sub criteria and also performing the pair wise comparison. After a through brainstorm session, the advisory committee finds four projects which have a high potential to success in implementing six sigma pilot project. In the next step they perform a pair wise comparison for all criteria which are shown below.

Table 3

Weight Incon:0.01	D	C	B	A	Financial payback	Weights Incon:0.08	D	C	B	A	cost reduction	Weights Incon:0.02	D	C	B	A	cost of HR	Weights Incon:0.02	D	C	B	A	cost of training
0.538	6	5	2	1	A	0.474	4	1	5	1	A	0.324	5	4	1/2	1	A	0.063	1/6	1/7	1	1	A
0.253	3	2	1	1/2	B	0.209	2	2	1	1/5	B	0.508	6	5	1	2	B	0.059	1/7	1/8	1	1	B
0.130	2	1	1/2	1/5	C	0.221	2	1	1/2	1	C	0.103	2	1	1/5	1/4	C	0.53	2	1	8	1/2	C
0.079	1	1/2	1/3	1/6	D	0.096	1	1/2	1/2	1/4	D	0.066	1	1/2	1/6	1/5	D	0.348	1	1/2	7	6	D
Weights Incon:0.03	D	C	B	A	Process excellence	Weights Incon:0.02	D	C	B	A	Employee satisfaction	Weights Incon:0.08	D	C	B	A	Employee productivity	Weights Incon:0.07	D	C	B	A	Employee competency
0.156	2	1/6	2	1	A	0.436	7	6	1	1	A	0.098	1/3	1/4	1/2	1	A	0.317	1/2	5	3	1	A
0.097	1	1/5	1	1/2	B	0.422	6	6	1	1	B	0.276	2	1/2	1	2	B	0.087	1/4	1/2	1	1/3	B
0.660	7	1	5	6	C	0.084	2	1	1/6	1/6	C	0.374	1	1	2	4	C	0.100	1/6	1	2	1/5	C
0.087	1	1/7	1	1/2	D	0.057	1	1/2	1/6	1/7	D	0.252	1	1	1/2	3	D	0.496	1	6	4	2	D
Weights Incon:0.09	D	C	B	A	visibility	Weights Incon:0.05	D	C	B	A	Functional impact	Weights Incon:0.10	D	C	B	A	Functional autonomy	Weights Incon:0.09	D	C	B	A	Learning &growth
0.575	5	4	5	1	A	0.516	2	5	7	1	A	0.423	1	4	4	1	A	0.206	1	4	1/2	1	A
0.086	1	1/3	1	1/5	B	0.060	1/4	1/3	1	1/7	B	0.064	1/6	1/4	1	1/4	B	0.584	7	7	1	2	B
0.264	6	1	3	1/4	C	0.116	1/4	1	3	1/5	C	0.205	1	1	4	1/4	C	0.054	1/4	1	1/7	1/4	C
0.076	1	1/6	1	1/5	D	0.308	1	4	4	1/2	D	0.309	1	1	6	1	D	0.584	1	4	1/7	1	D
WEIGHTS Incon:0.02	D	C	B	A	Customer satisfaction	Weights Incon:0.09	D	C	B	A	Project related risks	Weights Incon:0.07	D	C	B	A	Time delay	Weights Incon:0.07	D	C	B	A	Budget turn-over
0.104	1/5	1/3	1	1	A	0.154	1	1/5	2	1	A	0.125	1/2	1	1/3	1	A	0.170	4	1/4	1	1	A
0.110	1/3	1/4	1	1	B	0.101	1/3	1/3	1	1/2	B	0.471	2	6	1	3	B	0.157	4	1/6	1	1	B
0.381	1	1	4	3	C	0.561	4	1	3	5	C	0.079	1/7	1	1/6	1	C	0.616	6	1	6	4	C
0.405	1	1	3	4	D	0.185	1	1/4	3	1	D	0.326	1	7	1/2	2	D	0.058	1	1/6	1/4	1/4	D

Project duration	A	B	C	D	Weights Incon:0.07	Human resource	Employee competency	Employee productivity	Employee satisfaction	Weights Incon:0.10	Organizational benefits	Process excellence	Customer satisfaction	Learning and growth	Weights Incon:0.02
A	1	2	1	1	0.298	Employee competency	1	1/3	1/2	0.151	Process excellence	1	1/2	4	0.333
B	1/2	1	1	2	0.245	Employee productivity	3	1	4	0.630	Customer satisfaction	2	1	5	0.570
C	1	1	1	2	0.281	Employee satisfaction	2	1/4	1	0.218	Learning and growth	1/4	1/5	1	0.097
D	1	1/2	1/2	1	0.176										

Positioning of project	Functional autonomy	Financial impact	visibility	Weights Incon:0.00	Risks	Budget turn over	Time delay	Project related risks	Weights Incon:0.01	Financial impact	Cost of training	Cost of human resource	Cost reduction	Cost reduction	Weights Incon:0.04
Functional autonomy	1	1	1/3	0.200	Budget turn over	1	3	2	0.540	Cost of training	1	1/3	2	5	0.259
Financial impact	1	1	1/3	0.200	Time delay	1/3	1	1/2	0.163	Cost of human resource	3	1	4	5	0.537
visibility	3	3	1	0.600	Project related risks	1/2	2	1	0.297	Cost reduction	1/2	1/4	1	2	0.132
										Cost reduction	1/5	1/5	1/2	1	0.072

Table 4

Six Sigma Project Selection	Financial Impact	Human Resource	Organizational Benefits	Positioning of Project	Risks	Project Duration	Weights Incon:0.07
Financial impact	1	2	1/3	1/2	1/2	1	0.113
Human resource	1/2	1	1/2	1/3	1/2	1	0.094
Organizational benefits	3	2	1	2	2	3	0.306
Positioning of project	2	3	1/2	1	1	1/2	0.164
Risks	2	2	1/2	1	1	1/2	0.150
Project duration	1	1	1/3	2	2	1	0.172

And final ranking of the projects A to D are: (A: 0.253, B: 0.201, C: 0.332, D: 0.214).The results are calculated by Expert Choice software program. Project C has the highest points among other projects, so we can select this unit for applying six sigma pilot project with highest probability of success.

Table 5
Final Rank of the Projects

Projects	Change
A	0.253
B	0.201
C	0.332
D	0.214

CONCLUSION

Six sigma has attracted significant attention over the last few years as a critical competitive strategy for the companies. However, it has also been observed that six sigma needs to be introduced into an organization with caution and in phases, to increase its credibility and acceptance as a strategy by the entire organization. Pilot implementation of six sigma in one or more appropriate units of the organization is gradually becoming the preferred approach to six sigma implementation. In this article, we have presented an objective, rational approach to comparison of various six sigma pilot projects. The general framework of the MCDM model formulation and execution will remain the same for any organization, which wants to use this approach for identifying the most appropriate six sigma pilot projects. The model could be and will be customized to individual organizations based on the relative importance it places on different dimensions of six sigma projects. Thus, the general model presented here could form a rational basis for selecting projects, therefore resulting in a better first experience of six sigma implementation in the organization. This, in turn, could help demonstrate the utility of the six sigma as a performance improvement strategy, and lead to a more sincere, dedicated and motivated long-term six sigma efforts in the organization. Thus, this rational approach will accrue both immediate and longer term benefits to the organization. In this sense, the article provides a vital decision tool to organizations interested in confirming the utility of six sigma philosophy for subsequent organization-wide adoption. It could, of course, be used as a decision framework for ongoing six sigma implementation.

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