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## BUSINESS EXCELLENCE MODELS: QUANTIFYING THE IMPLEMENTATION AND MATURITY LEVEL – A STATISTICAL APPROACH

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### ABSTRACT

*It is of utmost importance to quantify the results of any theory that is applied practically to an industry. There are numerous quality techniques which are in practice in the industry from more than half a century. Business Excellence Models for each firm encompasses the set of relevant quality and production improvement techniques. In many of the cases, after the application of these concepts, the results are either not measured at all and if inspected the grading depends heavily on the perception of the audit inspector. This paper aims at studying the concept of Business Excellence Models and proposes a systematic approach to quantify the level of implementation and the level of maturity it has achieved using the statistical tools. Further it also suggests a new approach for getting data and feedback which is not based on perception and gives more real and transparent figures. This paper aims at developing a methodology and a structure which helps in pinning a number to actual implementation level of the model or a degree to which the model has been followed. Also, the analysis will show which of the category or parameter is critical for rapid and holistic overall improvement of the organization. Thus, this methodology will help the companies conduct internal audits without the need of an audit inspector, highlight the key focus areas and aid improve the status of their firm vis-a-vis their business excellence model.*

### KEYWORDS

ANOVA, Business Excellence Models, Quantification, Non-Perspective based Questionnaire.

### BUSINESS EXCELLENCE MODELS

Business excellence is the systematic use of quality management principles and tools in business management, with the goal of improving performance based on the principles of customer focus, stakeholder value, and process management. There are many excellence models in existence and thousands of companies have adopted these models or its various according to its needs [1]. The following are some of the prevailing frameworks available globally:

1. Malcolm Baldrige Criteria for Performance Excellence
2. European Foundation for Quality Management (EFQM) Excellence Model
3. Singapore Quality Award Framework
4. Canadian Framework for Business Excellence
5. Australian Business Excellence Framework
6. Business Performance Improvement Resource Model
7. Corporate World Class Manufacturing

#### IN INDIA

8. Ram Krishna National Quality Award
9. Indira Gandhi National Quality Award
10. Rajiv Gandhi National Quality Award

Business excellence, as described by the European Foundation for Quality Management (EFQM), refers to "outstanding practices in managing the organization and achieving results, all based on a set of eight fundamental concepts." These concepts are "results orientation, customer focus, leadership and constancy of purpose, management by processes and facts, people development and involvement, continuous learning, innovation and improvement; partnership development, and public responsibility."

All the prevailing excellence models provide the framework to achieve business excellence. They provide guidelines which are to be followed by companies in order to achieve excellence in business. The guidelines are generally broadly divided into the above mentioned categories and teams or committees are specially given responsibility for the each specific category [5].

We therefore, propose to represent a methodology which based on the business excellence model adopted by the organization will help it to find out the present implementation value and the maturity level of the organization.

### THE METHODOLOGY

Any company adopting the Business Excellence Model has a certain roadmap to follow. The company takes all steps in its control to follow the guidelines as closely as possible generally by dedicating a separate department which will look after the smooth and proper implementation of the practices. This Quality Assurance or Business Excellence department oversees the overall working of the company and tries to keep the working in line with the company's vision and mission or according to the pre-decided benchmark [4]. Also continuous monitoring for validation of the implemented techniques and quality initiatives reaping expected benefits needs to be carried out for which the proposed methodology will be of utmost use.

### OBJECTIVES OF THE METHODOLOGY

The purpose of the exercise is to evaluate the organisation, measure its performance and to indicate the scope of improvement. The methodology is so designed that it can be adapted to any model with a slight modification in the questionnaire to make it more relevant to the model. Objectives of the methodology are:

1. To determine the implementation level of the model as per the guidelines mentioned in the framework provided by the Business Excellence Model that is adopted by the company.
2. To determine the maturity level of the implemented model.
3. Criterion wise implementation and maturity level.

This methodology will help the organization to highlight the key areas where improvements are required, focus on these improvements and maximize the efforts to optimize the outputs.

**METHODOLOGY FOR QUANTIFICATION**

The roadmap of the company should be studied and after its rigorous analysis, a questionnaire is to be prepared in such a way that it covers all the criterions for the Enablers and Processes. Enablers are criterion which deal with visionary leadership and strategic planning and set the goals for the organization. Processes are the means by which these aims can be achieved. Further the questions should be designed after exhaustive consultancy with the unit representative so that justified weight-age is given to all the aspects and criterions of the model. A pilot test is first conducted with feedback from 20% of the total sample size. The pilot test is used to validate the questions and it is important to include the background information of the respondents according to the analysis required. After this, more data has to be collected with an appropriate sample size.

The feedback collected is then carefully organized, measured and analyzed [2]. Based on the feedback and due consultations with the respective heads and the unit representative improvement measures are suggested which may help the organization achieve higher outputs and better quality.

**A CASE STUDY**

A company has been trying to improve its business processes in lieu with its Business Excellence Model for the growth of its business. It has taken few steps to improve along the lines as suggested by the model. In order to find the areas which critically need improvement it needs to check the present status of the implementation of its business excellence model. The following questionnaire is created and data was collected. Table 1 exhibits a sample of a conventional questionnaire which is currently being employed in industries for auditing purposes.

In this kind of a questionnaire, the respondent is asked to tick mark on any one of the options against a question according to his preference.

All the employees are asked to fill up the form like the one mentioned in table 1 and data is collected. For analysing this data, background details of the employees are also collected. Background details may include number of years of work experience, educational qualifications, designation, committee it belongs to, gender, age, etc. An appropriate sample size is very important for reliable analysis. All the responses are to be given a value. In this case, 'strongly disagree' is assigned a rating of one, 'disagree' is assigned a rating of two, 'agree' with three and 'strongly agree' with four. No response can be assigned with zero and is not to be taken for analysis as it may be either due to lack of sufficient knowledge or because of a special cause. After collecting and assimilating the data, analysis is carried out.

| Sr. No. | Question                                                                    | Strongly disagree | Disagree | Agree | Strongly agree | No comments |
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| 1       | Transparency in knowledge sharing                                           |                   |          |       | Yes            |             |
| 2       | Practice of housekeeping techniques as a culture and everyday practice      |                   |          | Yes   |                |             |
| 3       | Identifying Value added / Non-value added (NVA) activities                  |                   |          | Yes   |                |             |
| 4       | Preventive maintenance for the upkeep of equipments                         |                   | Yes      |       |                |             |
| 5       | Providing regular training and monitoring to improve employees' performance |                   |          |       | Yes            |             |

Statistical tests need to be carried out on the data to give the necessary quantification for exercise and gives the underlying trends and patterns. The ANOVA (analysis of variance) and t-test are the most important tools used to determine the co-relationship between the background information and the rating (for instance, relation between respondents of a particular department and the rating). This is helpful in identifying the departments or categories which require the maximum focus for improvement [3].

**INTERPRETATION OF GRAPHS AND TABLE**

The data summarized in the above table has been assumed for the purpose of illustration. The Table 2 shows the outcome of ANOVA analysis which shows the significance values for the change in the value of a particular criterion with the required background information. Figure 1 and Figure 2 shows two examples where mean of the values given by respondents in the criterions of Work Environment and Information Technology are shown varying with change in the number of work experience in the firm. While figure 1 clearly indicates an upward trend which shows that the anticipated implementation value of the Business Excellence Model in the criterion of Work Experience improves with the number of work experience (in years). Though, the significance value in the ANOVA chart is 0.615 (greater than 0.05 for 95% confidence level) which means that though the variation is visible through graphs it is not of statistical significance.

**TABLE 2: TOTAL WORK EXPERIENCE - ANOVA**

| Sr. No. | Criterion               |                | Sum of Squares | df | Mean Square | F     | Sig.  |
|---------|-------------------------|----------------|----------------|----|-------------|-------|-------|
| 1       | Strategic Leadership    | Between Groups | 1.786          | 4  | .446        | 2.000 | 0.110 |
|         |                         | Within Groups  | 10.490         | 47 | .223        |       |       |
|         |                         | Total          | 12.275         | 51 |             |       |       |
| 2       | Work Environment        | Between Groups | 1.449          | 4  | .362        | 0.671 | 0.615 |
|         |                         | Within Groups  | 24.843         | 46 | .540        |       |       |
|         |                         | Total          | 26.292         | 50 |             |       |       |
| 3       | Information Technology  | Between Groups | 1.441          | 4  | .360        | 0.692 | 0.601 |
|         |                         | Within Groups  | 24.459         | 47 | .520        |       |       |
|         |                         | Total          | 25.901         | 51 |             |       |       |
| 4       | Supply Chain Management | Between Groups | 1.028          | 4  | .257        | 0.562 | 0.692 |
|         |                         | Within Groups  | 20.128         | 44 | .457        |       |       |
|         |                         | Total          | 21.156         | 48 |             |       |       |
| 5       | Customer Focus          | Between Groups | 2.233          | 4  | .558        | 0.837 | 0.509 |
|         |                         | Within Groups  | 30.019         | 45 | .667        |       |       |
|         |                         | Total          | 32.251         | 49 |             |       |       |

FIG. 1

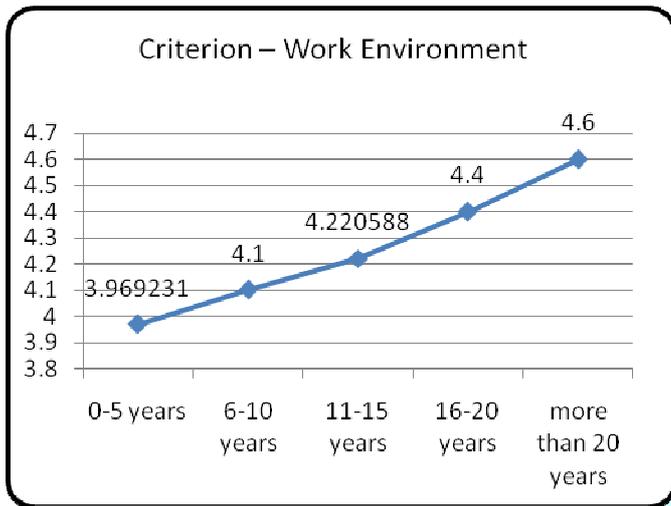
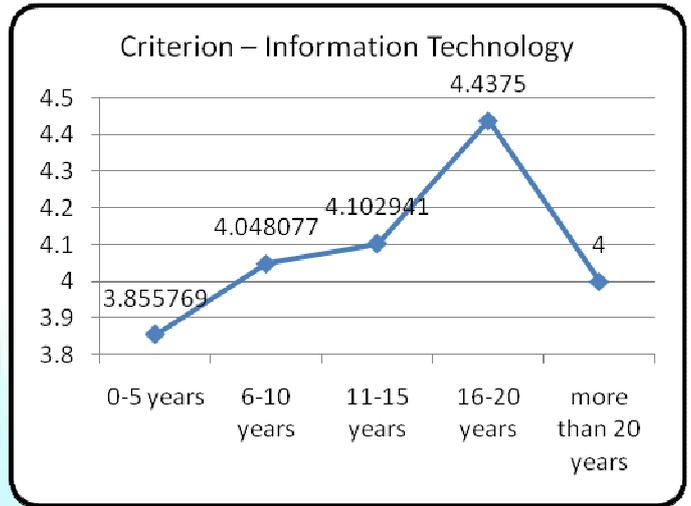


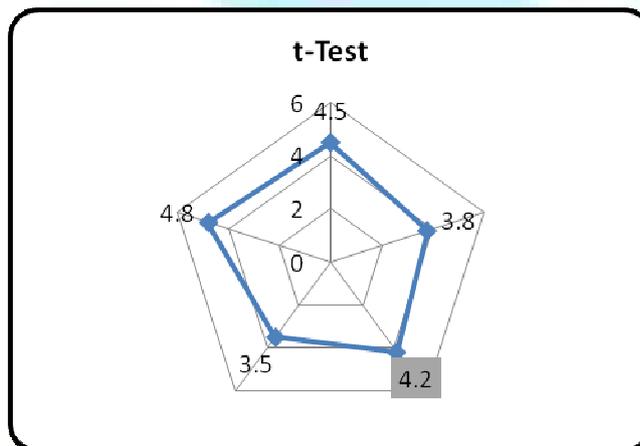
FIG. 2



**THE BASIS BEHIND THESE TESTS**

Both of these tests, namely, t-Test and ANOVA (analysis of variance) are used to find out a relationship between means of groups. The difference being the t-Test can be used to compare means of two groups while ANOVA can be used to compare means of multiple groups. This name is derived from the fact that in order to test for statistical significance between means, we are actually comparing (i.e., analyzing) variances. The variance is used as a measure of how far a set of numbers are spread out from each other. It is one of several descriptors of a probability distribution, describing how far the numbers lie from the mean (expected value).

The table and figure exhibit the results of ANOVA and t-Test. Table shows the relationship or trend with respect to the age groups. The respondents were divided into groups according to their age and the test determines whether there exists a relationship between the age of the respondent and their responses. In the case sighted above, the significant or the p-value in each of the case is above 0.05 (tolerance is 95%) and hence the null hypothesis is accepted. Figure shows the trend for two of the criterion (namely criteria 2 and 3) pictorially. There is a trend when the graphs are visualized but the tests show that this trend is not statistically significant and hence no conclusion about the relationship can be drawn.



The figure shows the result of a t-Test. It tells what one of the age-group thinks about the criterion or what were the criteria-wise responses of one of the age-groups.

**QUANTIFICATION**

Carrying out this exercise for all the various background information collected a clear idea about the mean implementation value pertaining to different criterions and different background information can be found out. Taking a mean of all these values will give one value of the implementation level. A better method is to find the weighted mean average giving due weight-age to responses from a particular committee while calculating the mean value for the department related to it. For this the t-test may be used. If the entire questionnaire is divided into various criterions like for example, work environment, preventive maintenance, innovation and technology, etc. then after carrying out the t-test a high weight-age must be given to values pertaining to the work environment department for the responses given by the work environment department. The highlighted part in the above radar representation of the t-test shows the same. The final implementation value calculated from this way will be a weighted mean average and will be more authentic than the overall mean.

The maturity level can be found out by asking the respondents in the questionnaire 'the scope for improvement'. Higher the scope for improvement would mean lesser maturity level. Hence, by inverting the scale and calculating in the above manner will give the maturity level.

This kind of a questionnaire has a few pitfalls which this paper aims at filling up. The limitations of the prevalent exercise:

- This questionnaire doesn't have a well-defined scheme for drawing conclusions from a specific rating. While measuring the same parameter, if two respondents have the same views but still it might be possible that one of the respondent marks 'agree' while the other marks 'strongly agree'. The limitation arises from the fact that both the respondents have different baselines or reference points which they set up in their minds.
- There might be difficulty in associating the language in the options with respect to the question.
- The result sometimes may differ from the actual situation. It is an approximate result and the reality may be different.

TABLE 3: NEW REVISED NON-PERSPECTIVE BASED QUESTIONNAIRE

| Sr. No. | Question                                                 | Options          |                |                |               |                |
|---------|----------------------------------------------------------|------------------|----------------|----------------|---------------|----------------|
|         |                                                          |                  |                |                |               |                |
| 1       | Knowledge Sharing                                        | Training Modules | Interaction    | LAN Servers    | Self Learning | No sharing     |
|         |                                                          | ✓                | ✓              |                |               |                |
| 2       | Housekeeping Tools                                       | Just a Program   | In the Culture | Full knowledge | Necessary     | Not Necessary  |
|         |                                                          |                  |                | ✓              | ✓             |                |
| 3       | Identification of Value Added/Non Value Added activities | Satisfactory     | Profitable     | Frequent       | Can be Better | Don't Know     |
|         |                                                          |                  | ✓              |                | ✓             |                |
| 4       | Preventative Equipment maintainance                      | Weekly           | Monthly        | Bi-annually    | Annually      | No Maintenance |
|         |                                                          |                  |                | ✓              |               |                |
| 5       | Training Programs                                        | Relevant         | ✓ Effective    | No use         | Can be Better | Don't Know     |
|         |                                                          |                  |                |                |               |                |

**THE NEW METHODOLOGY PROPOSED**

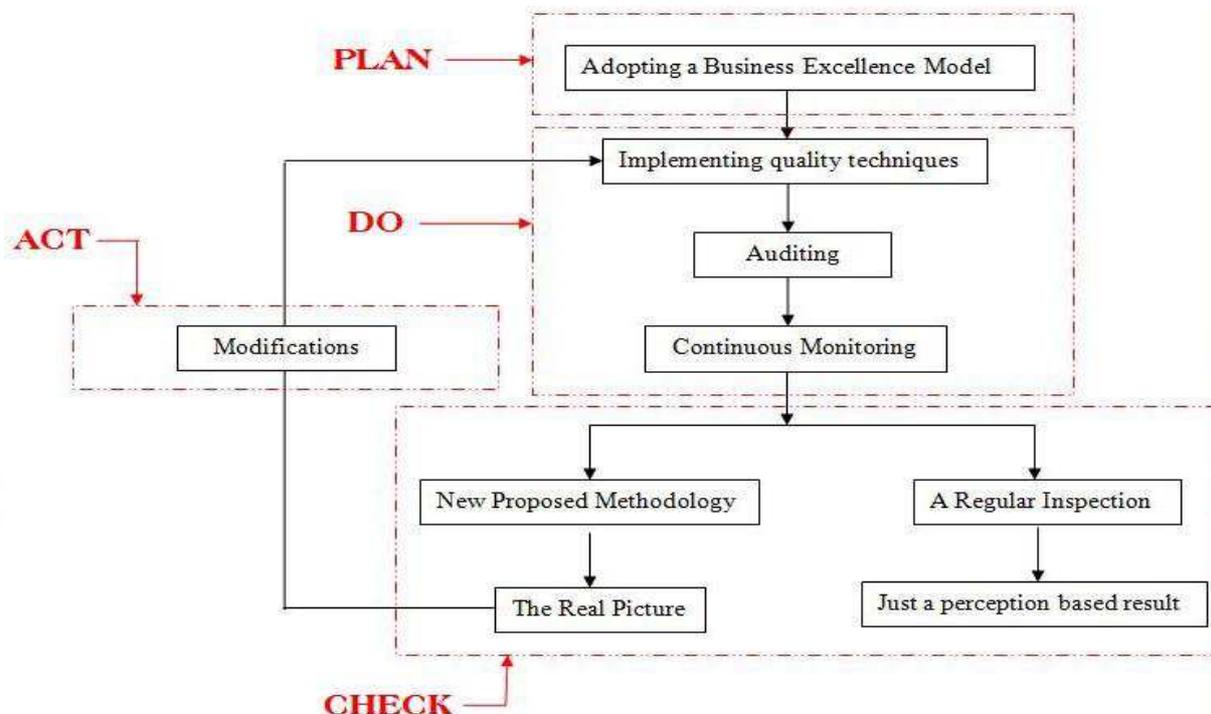
Questionnaires should be prepared with a more substantial basis. The reference line should be the same for all the respondents which will provide more accurate results. Instead of lengthy questionnaires, lesser number of questions may be included but the questions should have customized answers. Each of the answer should have a reference to it with which the respondent can relate to and mark accordingly.

**THE NEW METHODOLOGY EXPLAINED**

Multiple answers are allowed for this type of a questionnaire (sample given in table 3) and each box has a predefined weight-age. For example, for the question based on knowledge sharing if the organization has been trying to improve knowledge sharing through the use of Information Technology and if a respondent marks knowledge sharing through LAN Servers, then it is a positive sign for improvement. If majority of respondents mark training modules or interaction, then it means that even if knowledge sharing is prevalent, it is not through the desired channel. Moreover, it gives an indication to the firm to improve their modules and also organize more seminars for better interaction. Self Learning or No knowledge sharing would become a sign of concern for the firm, which represents that the maturity of the implemented model is not yet achieved. Similar analysis can be done using these types of options for the revised and re-designed questionnaire sample. It may be noted that though table 1 and table 3 primarily ask the same questions, much detailed information may be collected through table 3. Moreover as it asks objective questions, the possibility of perception ruling a choice is nullified.

A few questions can be included which should ideally elicit the same response. This will help in validating the authenticity of the data. If the respondent is filling up the questionnaire without reading, he'll be giving different responses to these basically same questions.

**THE FLOW CHART DEPICTION OF THE PROCESS INTEGRATED WITH THE PDCA FLOW**



**CONCLUSIONS**

The paper has demonstrated a unique, simple and easily executable methodology of using statistical tools to review any system based on a fixed business approach. The statistical tools used, thus can aid the reviewer with an overall analysis of the current standing of any organization based on its vision, mission and other strategic plans. It will also help in highlighting the key focus areas by providing regions where there are maximum opportunities for improvement alongside showing the dependencies of different parameters on the background information collected of the respondents.

Further in the case study segment of the paper two issues have been identified which drove the analysis in this paper.

Firstly, most of the companies adopting Business Excellence Models have a weak review system despite the fact that the methodologies implemented need to be rigorously evaluated to find out their actual worth to the organization.

Secondly, the prevalent method of analysing data through questionnaires is based on perception and hence a modification is needed here. This is one of the major draw-back with the current review system because each respondent has his/her own reference system. The data thus collected does not represent the actual system in an authenticated manner.

The paper meets these issues by pointing out the importance of quality checks and providing a methodology (and also suggests the modification in the methodology) for the review system. The methodology assigns a true value to the model implementation through questionnaires based on quantitative guidelines and not just on perception. This helps in arriving at a real standing of the company from where it can set its benchmark and work its way towards achieving Business Excellence. The best way of doing this is by taking feedback in the format as demonstrated in Table 3. Each respondent can select one or more than one of the given options and a pre-defined weight-age can be given to each of the option. This can further boost the analysis and its accuracy.

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