

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization, Volume 2, Special Issue 1, December 2013

Proceedings of International Conference on Energy and Environment-2013 (ICEE 2013)

On 12th to 14th December Organized by

Department of Civil Engineering and Mechanical Engineering of Rajiv Gandhi Institute of Technology, Kottayam, Kerala, India

**MEASURING AGILITY OF A PROCESS PLANT USING
COMPREHENSIVE AGILITY MEASUREMENT TOOL (CAMT)**

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ABSTRACT

In present scenario, market trends are changing rapidly due to need for product varieties based on customer demands. So the industries must enable agility to respond quickly to customer needs and market changes while still controlling costs and quality. Agility of an organization or plant depends on various enablers or attributes which are difficult to describe because of its multidimensionality and vagueness of the concept of agility. The problem of measurement of agility is limited to three questions: what to measure, how to measure it and how to evaluate the results. Agility attributes can be measured using various measurement tools. In this study, ten agility attributes are measured using Comprehensive Agility Measurement Tool (CAMT). A sample survey was conducted in a process plant and these attributes are ranked based on CAMT. Finally the least agile areas were explored which will indicate certain efforts needed to improve agility in that particular field.

Keywords: Agile Manufacturing, CAMT, TAKT time.

1.INTRODUCTION

In this 21st century the customer demands have become more customized and keeps on varying to a large extend. Today's enterprises, industries or manufacturing plant operate in the extremely competitive environment. The main problem, how organizations can successfully dealwith an unpredictable and constantly changing environment, has been a prevailing subject both in industry and academies for a few decades.

Many different solutions were proposed: networking, re-engineering, modular organizations, virtual corporations, high performing organizations, employee empowerment, flexible manufacturing, just-in-time, etc. for meeting market trends. Among many proposals of how to deal with the uncertain and

unpredictable environment, the concept of agility is derived. The term agility was initially introduced by the Iacocca Institute in 1991. This concept was proposed to describe a new approach in manufacturing and enterprise management that is necessary to achieve success in a modern turbulent market. Although, many different definitions of "agility" and "agile manufacturing" exist in the literature, those terms are mainly understood as ability to quickly respond and adapt in response to continuous and unpredictable changes of competitive market environments. The successful and fast response to changes requires that an agile organization is able to adapt all enterprise elements such as goals, technology, organization and people to the unexpected changes [1].

The agility driver means satisfying customer demands, follow market change and innovation. Because of globalization, technology, and outsourcing contributing to uncertainty and unpredictability in all sectors, the ability of an organization to adapt to unexpected changes is critical to achieving and maintaining a competitive advantage. There has been much research in recent years focusing on the benefits to manufacturing of an agile production process.

The main aim of agility is to achieve organizational flexibility to satisfy the employees and its regular customers. The qualities which makes an industry agile includes responsiveness towards uncertain changes, competitive in achieving desired goal, adaptive towards different goals with same facilities and ability to carry out the task in short time period.

2. PROBLEM DESCRIPTION

There has been much research in recent years focusing on the benefits from agile manufacturing in a production process. The aim of this present work is to study the performance of a process manufacturing plant on agility perspective by considering some common attributes. The main problem is that now products need to available in wide variety and in different ranges in quantity for satisfying customer needs.

The main objective of the study is to measure agility of a process plant, as a case and to point out least and highly agile areas using CAMT scale.

3. LITERATURE SURVEY

Various research works has been done where agility and attaining agility is defined, expressed in different ways. Ameya S. E. and Alok K. V. (2008) explained about comprehensive agility measurement tool (CAMT) which is used to measure agility on the scale of 1-5. This tool captures agility using 10 agility enablers and thus also points out areas lacking agility. This paper describes methodology used to develop comprehensive agility measurement tool. CAMT considers most important parameters responsible for maintaining agility in an organization. This tool suggests the area to be focused in order to improve agility based on the responds to the questionnaires formulated for the survey.

Bodhana S. et. al. (2007) gave a review on enterprise agility, considering global characteristics of agility which can be applied to all aspects of enterprise. They also identified a range of attributes that are believed to be associated with work force agility. The attributes like flexibility, responsiveness, speed, culture of change, integration and low complexity, high quality and customized products and mobilization of core competencies based on empirical research on workforce.

Agnieszka S. and Marek F. (2004), in their literature explained that being agile means “having a quick adaptable character and resourceful”, so it is basically being adaptive, enable the manufacturing system to adjust to changing situation. To achieve expected performance, agility-driven level of responsiveness,

flexibility and adaptability is essential for the company to understand and use all the information coming from the customers, competitors, partners, suppliers and, last but not least, information flows in the company.

According to A. Ganguly et. al. (2009), the two major variables speed and time is taken as primary drivers of agility into consideration for responsiveness of agility and along with cost effectiveness. There by resulting in the enterprise to be agile.

3.1 Need to Measure Agility

Agility, since its inception in 1991, has been the buzzword for all the industries in today's globally competitive dynamic market. Companies try hard to achieve an upper edge over competitors in this continuously changing and unpredictable market [2].

- Agility is very important to stay competitive in the market.
- Measurement of agility gives enterprise measure of its competitiveness and readiness for changes in the market.
- Measuring agility identifies "less agile" areas in an enterprise and thus it can plan for improvements.

4. METHODOLOGY

4.1 Agility Attributes

The following are the ten attributes considered to measure agility of a manufacturing plant. Using CAMT scale, these ten attributes were measured with the help of questionnaire. [2]

- 1) TAKT time
- 2) Overload capacity
- 3) Inventory turnover
- 4) Critical problem solved
- 5) E- Manufacturing
- 6) Skill development programs
- 7) Operational flexibility
- 8) Attrition of experienced personals
- 9) Internal customer satisfaction
- 10) Increase in profit percentage

4.2 Instruments

CAMT scales are used to measure the agility of this plant. CAMT scales are 1-5, 1 – being least agile and 5 - being highly agile. Based on CAMT scale, questionnaires were prepared for ten attributes. All attributes are expressed in five intervals. First interval was given agility score 1, second interval was given score as 2 and so on.

4.3 Data Collection

Questionnaires were prepared to conduct a sample survey, consisting of 40 respondents, in evaluating performance of a process plant on agility perspective. The questionnaire were designed to assess the level at which parameters are affecting the agility of this organization. Each individual from the sample was asked to respond by filling the questionnaire. The filled questionnaires were collected and the data are tabulated separately for different attributes. In the questionnaire, different options were made based on which the agility of the manufacturing plant can be decided.

4.4 Analysis

Responses were collected from different employees and analyzed separately for different parameters. Respondents specify their level of assessment on a 1-5 CAMT scale for a series of statements. Thus, the range captures their assessment for a given agility enablers or attributes which gives an interpretation effectively.

4.4.1. Descriptive statistics and ranking of attributes

The most important parameters associated with the performance of the organization are prioritized below. If these parameters are controlled and maintained then, agility of the organization can be improved.

The ranks are calculated using CAMT score. For each attributes, the sum of 40 responses was calculated to get total CAMT score. On the basis of total CAMT score the ranks for the agility attributes were distributed. The descriptive statistics and ranking of agility attributes were shown below.

TABLE 1.Descriptive statistics and ranking of agility attributes

SL No	Attributes	CAMT score	Mean	Standard Deviation	Mode	Rank
1	Customer Satisfaction	172	4.3	0.464	4	I
2	Inventory Turnover	152	3.8	0.405	4	II
3	TAKT Time	148	3.7	0.648	4	III
4	Overload Capacity	108	2.7	0.464	3	IV
5	Skill Development Programs	72	1.8	0.608	2	V
6	E-Manufacturing	56	1.4	0.496	1	VI
7	Operational Flexibility	52	1.3	0.464	1	VII
8	Increase in Profit	44	1.1	0.304	1	VIII
9	Attrition of Employees	40	1	0	1	IX
10	Critical Problems Solved	40	1	0	1	IX

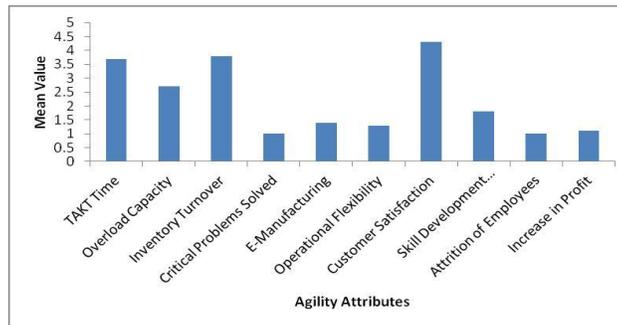


FIGURE 1. Agility attributes vs. its mean value

4.5 Result

Based on the analysis, the agility attributes were ranked on CAMT score. Customer satisfaction got the highest score about 172 and attrition of employees & number of critical problems solved in past year got least score of about 40. Also the mean value of responses of each attributes was calculated. From the mean value, least and highly agile attributes of the process plant were pointed out. Least agile attributes were attrition of employees and number of critical problems solved in past year with mean value of 1. The highly agility attribute was found to be customer satisfaction with mean value of 4.3. The mode and standard deviation of attributes were also tabulated.

5. CONCLUSION

Comprehensive Agility Measurement Tool (CAMT) are used for evaluating performance of a manufacturing plant on agility perspective, 1- being least agile and 5-being highly agile. A sample survey was conducted in a process plant. Based on data collected, it has been found that least agile attributes were the number of critical problem solved and attrition of employees. That is the number of problems solved related during the process in the past one year is inadequate and the reduction in the number of employees that occurs when people leave due to resign, retire etc is high. Also highly agile attribute is found to be customer satisfaction. In case of attrition of employees, agility can be increased by recruiting people and giving proper training to them or giving incentives/salary increment for employees to stay in the organization. And for the number of critical problems solved, agility can be increased by efficient and good involvement of the management and maintenance department in the organization. Thus concentrate on these least agile areas and other intermediate attributes to improve agility of this process plant. This study can be extended to any other types of manufacturing plant where the agility attributes requires for the improvement may be different.

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