

Ranking of Various Factors affecting Cellular Manufacturing System

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Abstract- The cellular manufacturing (CM) is promising manufacturing philosophy that integrates the productivity and flexibility by employing the effective utilization of various available resources. Cellular Manufacturing system combines the merit of process and product layout at same interface. Cellular manufacturing system is proficient to meet the requirements of modern manufacturing industries to satisfy the ever changing needs of the customer. This study targets to examine and investigation on the factors that affects the performance of Cellular Manufacturing System. This paper subsidizes to the literature on CMS by recognize the factors for acceptance of CMS. The main objective of this paper is to identify these factors. In the present work 18 factors are identified from the literature review. Questionnaire based survey was conducted to get the simulation of data from the respondents. Mean score and ranking has been derived for the various factors affecting cellular manufacturing system. Organization structure and employee training achieves the top ranking depending on their mean score and relative profit got the last position.

Keywords- CMS: factors; Manufacturing; Processes; System.

I. INTRODUCTION

Cellular manufacturing system is a concept of utilizing the benefits of both process type of layout and product type of layout. In cellular manufacturing system machines are grouped into machine cells with similar in type of operation and parts are classified into part family by segregating similar processing. The cells are designed in such a way that the flexibility and productivity level of system are maintained up to the level. The floor space in this type of manufacturing system utilizes the minimum possible area and the machines are closed to each other results in to minimum movements of materials within the machine. Generally the cells layouts are circular in nature that ensures the effective control over the entire process. The inventory as well as setup time is also minimum for the cellular manufacturing system. Cellular manufacturing system regulates the quality standards as per meet of customer satisfaction. A better employee coordination and satisfaction is obtained throughout the process to remain in competitive production. [2].

The modern customers demand not only varieties, high degree of quality and low price, but also new varieties to suit different tastes [3]. This implies that modern customers are demanding new innovative products and services even without hesitating to pay high prices. The continuous changing demands of the customers forces the organizations to modify the old manufacturing systems into smart manufacturing system. It is

a challenge to the organizations to transform into the newer manufacturing system without compromising with the quality of the product [14].

Cellular manufacturing system is the best manufacturing system in terms of flexibility along with the adequate level of production. But adoption of cellular manufacturing system to change over already existed manufacturing system is not an easy task it need a careful study and knowledge of various elements affecting the cellular manufacturing system [5].

Objectives of the study

1. To explore the cellular manufacturing system and the various factors affecting the implementation of CMS
2. To find the mean score and ranking of various factors of CMS.

andrms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

1.2 Factors affecting the CMS

“Cellular manufacturing” is a well-organized kind of production system that takes the advantage of both product type and production type of manufacturing system but it is very hard to convert into the cellular manufacturing system from old-style or conservative manufacturing system to CMS. There are numerous components in the manufacturing system that not only affects the system but also influence the system. Thus it is very important to conduct the research related about various elements of cellular manufacturing system. So that for application of CMS in any organization there is necessity to recognize and examining the elements which can affect application of CMS

Factors affecting the implementation of CMS have been found from the literature review and from the questionnaire survey. The factors identified are as follows:

• Organizational construction

From the long time structure of management has been found in such a way that its impact on shop floor workers and staff is very low [11]. Organizations that are having flat hierarchy provide a concept of activities of management; increase incoordination, less administration, better infrastructures, and support from workers. Management support with clear organization structure always aids in application of cellular manufacturing system.

• Employee Training

Employee training plays a crucial part in incorporation of manufacturing systems in organizations. Statistics of newer technologies and methods incorporate the organizations when there is a need to redesign the present manufacturing system.

The numerous determinations those cannot support by documentation work have to be excluded and then to be incorporated using training of employees. Thus the successfully achievement of cellular manufacturing system employee training plays a very governing role.

- **Support from workers**

Role of worker is an important factor which plays a dominant role in CMS. When knowledge and procedures are not available, organization shall be selected to import the techniques to continue the production [12]. Cellular manufacturing system (CMS) shall be fabricated in such a manner that new products or modifications can be introduced with lesser efforts. So for attaining the desired product at the lowest possible budget, support from workers can be a factor of CMS.

- **Support from management**

Mishra [10] emphasized in getting flexibility in production scenario with a vibrant change on the shop floor. This kind of change in any industry requires a stipulated support of management in respect of availing minimum required fund and various related task. This is a very important factor to withstand the various parameters in the cellular manufacturing system. This factor reacts as a strong gismo for obtaining flexibility in any manufacturing system.

- **Long term planning**

Planning is required to understand the complexity of the system and validation for the existing system is also important [4]. In cellular manufacturing system long term planning comprises improvement of a formal and incorporated depiction arrangement. Long term planning in CMS is an important task so that it becomes a significant element of the system.

- **Improved supplier relationship**

For getting the maximum utilization of space and time a healthy interaction with the suppliers is needed in the CMS [9]. Improved supplier relationship is useful for the various proficiency in cost cutting and reduction in lead times [13].

- **Flexible manpower**

Cellular manufacturing is operated with flexible workforce with a greater efficiency and productivity. It is a potential factor to enhance the productivity and quality of any manufacturing system. In terms of flexible the workers have multi skill to develop more methodologies and coordination's. Factors required for Cellular concert include the facility to manufacture the parts with adequate proficiency and minimum time [6].

- **Support from Government**

Customer demands are changing continuously in the market. In order to survive the range of products and with high flexibility in the system are required so that change over can be their for the newer features of the product [7]. This type of system can be tailored with competency is directed as a result from the support from the government. Therefore, this can be taken as an important factor of CMS.

- **Multi-Tasking**

Gunasekaran [6] experienced that multi-tasking is important factor related with flexible work force. Multitasking workers are having multi skilling to have a greater interface towards the production they are also multifunctional, self-motivated etc. So that multi-tasking is a key factor in implementation of cellular manufacturing system.

- **Organization plans**

Mishra [10] emphasized in getting flexibility in production scenario with a vibrant change on the shop floor. This kind of change in any industry requires stipulated plans in respect of availing minimum required fund and various related task. This is a very important factor to withstand the various parameters in the cellular manufacturing system. This factor reacts as a strong gismo for obtaining flexibility in any manufacturing system.

- **Availability of funds**

The funds in an organization play a vital role in any kind of manufacturing system. It is a factor which influences the parameters of an industry. The workers are motivated and being empowered up to level so that maximum efficiency and productivity can be taken to strengthen the forward momentum of an organization by providing the necessary incentives and bonus. In this way it can be treated as a potential factor of cellular manufacturing system.

- **Improved lead time**

Improved lead time means the minimum time to start the production after any kind of breakdown. Organizations are always remaining in completion to provide the products in shortest time and minimum cost. With the help of reduction in lead time organizations can increase the productivity [5].

- **Reduced defect**

Minimum defect is the fitness of the manufacturing system to adjust efficiently the production volumes minimum price and in minimum period towards a enormous range of manufacturing. Designing manufacturing systems with the features of minimized defect allows management to increase and decrease production capacity quickly and cost effectively in response to market demand [1]. So that reduced defect is an important factor in implementation of CMS.

- **Reduced set up time**

Reduction in set up time is the fitness of the manufacturing system to respond in higher productivity with effective utilization of resources. Manufacturing systems with the features of minimized set up time ensures high production volumes with minimum time [1]. So that reduced set up time is an important factor in implementation of CMS.

- **Floor space utilization**

The floor space is utilized properly in a cellular manufacturing system providing the effective use of available area in the factory. In some of organization it becomes a challenge to utilize the space in an effective manner [8]. so that it becomes a important factor of CMS.

- **Increased safety**

Safety in an organization must be analyzed in regular span of time to ensure the proper liability of the workers. Safety is the first concerned for every industry to ensure the proper working environment to increase the productivity with adequate level of safety [5].

- **Improved quality**

Quality in an organization develops the competency and level of faith in the mind of customers. To satisfy the customer's quality standards must be followed by the manufacturer [9]. Quality policies are framed to develop better working environment for the workers as well as the end users of the product.

- **Relative profit**

The organizations are continuously struggling in the dynamic competitive environment to earn more and more profit. Profit is the topmost and last important factor for any kind of organization which plays important role during all phases of manufacturing.

1.3 Analysis of Factors

The factors affecting CMS have been identified from the past literature and a questionnaire based survey conducted for the data collection regarding impact of above explained factors. More than 150 questionnaires were distributed to fill the required fields of factors affecting cellular manufacturing system. Only 90 questionnaires are considered for the research and the mean score for each factor has been illustrated in the table 1.1.

Table 1.1 CMS Factors

S. No.	CMS Factors		
	CMS Factor	Mean Score	Rank
1.	Organizational structure	4.15	1
2.	Employee Training	4.08	2
3.	Support from Workers	3.98	3
4.	Management Support	3.90	4
5.	Long Term Planning	3.58	5
6.	Improved Supplier Relationship	3.42	6
7.	Flexible Manpower	3.34	7
8.	Support from Govt.	3.23	8
9.	Multi-Tasking	3.15	9
10.	Organization Plans	2.97	10
11.	Availability of Funds	2.91	11
12.	Improved Lead Time	2.88	12
13.	Reduced Deffect	2.82	13

S. No.	CMS Factors		
	CMS Factor	Mean Score	Rank
14.	Reduced Set up Time	2.79	14
15.	Floor Space Utilization	2.72	15
16.	Increased Safety	2.68	16
17.	Improved Quality	2.58	17
18.	Relative Profit	2.52	18

II. CONCLUSION

It is concluded from the survey that from the eighteen identified factors Organizational structure achieves the first ranking with a mean score of 4.15. Employee Training and Support from workers comes at second and third ranking with their mean scores 4.08 and 3.98 respectively. From the table 1.1 it can be seen that Relative Profit comes at the last ranking with a mean score of 2.52.

a. Future Scope

The result of the survey can be used for finding the impact of various factors and the interrelationship among them.

III. References

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