Implementation of Strategic Structure By Integrating Flexible Manufacturing System With Green Technology for Enhancement of Productivity And Quality Of Product

Kanchan Ganvir¹*, Rakeshkumar Jain²

¹Research Scholar, Mechanical Engineering Department, Himalayan University, Itanagar, Arunachal Pradesh, India
²Professor, Mechanical Engineering Department, Himalayan University, Itanagar, Arunachal Pradesh, India

* kanchan.ganvir100@gmail.com

Abstract. The worldwide advancements of new innovations are developing at a touchy rate, yet associations are embracing more gradually henceforth, serious promoting society and incorporated supervisory crews are required in an organization to exploit new advances. Adaptable assembling innovations are seen by organizations to be a significant component Exceeding competitiveness and seriousness. Notwithstanding, dominating in the present market isn't easy and straightforward like the procurement of fresh improvement. So as to accomplish more of advantages, the structural framework associations will combine to ensure that the execution of innovation should lead to the normal benefits. Hence, a structure that encourages flexible manufacturing system companies deciding the prerequisites of the FMS reception, with the correct blend of green technology and vital components is required. The study examines particular dimensions of green manufacturing Index Applicability and FMS such as Information technology, planning, flexible automation techniques. The outcome will determine the major substantiate to establish and strengthen the value of product with superior performance. Using the findings the research will suggests the implication and adoption for further research. It would definitely enhance the performance in any industrial organisation with economic growth. This Research aims to report the findings of an exploratory work by integrating Green Manufacturing and flexible Manufacturing system techniques to generate new strategies which can be further administered in an industrial organization and sectors such as component manufacturing, automobile parts and processing sectors.

1. Introduction

The prerequisite of assets and cost of energy are continually expanding due to rising demand and restricted supply. Besides, value patterns regarding price fluctuations can barely be forecasted, so organizations expect to effectively create inside huge value scopes of energy and resources. One procedure to oblige value vacillations comprises of passing mark ups to the client. Notwithstanding, a value mark up may require that improvements be made to the item. On the other hand, stable costs might be encouraged with expanded creation effectiveness, which can be accomplished by lessening asset utilization and improving the association of the assembling framework [2]. This paper presents a methodology for the reception of structure in FMS with green strategies in assembling frameworks. An ideal blend of systems relies upon the business and pertinent cycles. For occurrence, the impacts of
decreasing batch size and dissolvable consumption contrasts between a paint shop and a mechanical production system in the car industry. In this way, arrangements must be custom fitted to oblige explicit applications to augment sway. Applying and receiving new advances show up more extensive subject which must be taken into consideration. Managerial sections of firms should think about the selection of flexible manufacturing system [6]. It needs to perceive, comprehend and address these problems to survive or bypass the issues of past establishments. However for having a fruitful execution, the inquiries like "what are the authoritative and key components which make a firm more serious and adroit at utilizing flexible manufacturing systems in improving its presentation?" and "Is sway on organization execution more articulated whenever related with a viable hierarchical plan and human asset rehearses?" should be replied [9] The high speculation needed for a FMS and the capability of FMS as a vital serious apparatus make it appealing to participate in research here, the extensive manuscript is a pathway for developing the structural framework with integration of strategy and significant elements leading to competent usage of of FMS with green technology in enhancing the company performance.

2. Approach

After a deep and detailed investigation of Flexible manufacturing system various characteristics and related dynamics in an industrial firm has intended to give an approach, Hence An itemized structure of the FMS critical thinking measure has been built up. It incorporates:

• A methodical breakdown of significant FMS execution issues into crude issues and main drivers;
• An orderly disintegration of significant FMS factors into their fundamental FMS control boundaries and relating crude activities to adjust their qualities; and
• A rundown of rules connecting issues at different levels

![Figure 1. Approach for framework](image)

3. Framework Aspects

Adaptable assembling innovations are an incorporated frameworks which can be delegated a separate Systems like, for example such as , PC supported system i.e computer aided design, Computer aided process planning involving generation of updated plan of product, also sub terminal Systems like mechanized guided automobile or Automated guided vehicle, and robotized capacity and recovery frameworks. The major key advantages are the advances from expanded adaptability to stimulate the response, empowering association for improvising considerably its intensity confining commercial centre. In actuality Flexible manufacturing system changes the outside danger penchant of the firm from hazard disinclined to chance inclined. That is, firms utilizing by making a progression of various choices to enter new business sectors and enterprises later on despite the fact that the reception of these innovations are costly and hard to legitimize , hence main and prominent framework aspects are to be focused on [7]. The figure 2 shows the main parameters to work on the research. It gives an approximate calculation of the degree of structure. Framework aspects mainly consists of

• Work machines, an automated system i.e CNC machines.
• A system to optimize parts flow, ie material Handling.
• A system to control the movements and machine flow, i.e central control computer.
3.1. Organizational framework

By arising cutting edge innovations, mechanical associations have significantly changed their assembling measures through the appropriation of modernized advancements. This advancement is regularly seen as the premise for another modern transformation of the industrial facility of things to come with emerging type of authoritative framework [8]. Generally, structure of integrated association with proper arrangement of working connections tends both separation, also facilitates the undertakings of different individuals as well as community to fill a typical need. Following are some measurements utilized in exploration for practice to portray structure, those are centralization, formalization and unpredictability. Substance of administrative control centralization advert ads the assignment with high intensity between the positions in an association. Here, Formalization brings up to the degree in which assumptions about the objectives, finished jobs are determined and composed. Intricacy advertises to the quantity of unmistakably extraordinary occupation titles or word related units and the quantity of unquestionably disparate divisions, in system of organization. Framework components should coordinate according to cycle of viable usage of emerging advancements [9]. The association's innovation affects the structure of operational and regulatory levels and subsequently has impact on performance. It is believed that the right authoritative structures are set up, in an organization. It will be more fruitful in executing the progressed innovations [10]. Authoritative design for flexible, computer aided advances are natural, feasible, complimented with reduced levelled structure and needs change of present scenario from the various complex structures, high level pyramid to a greater extent with a precious stone shape, and more centre skilled supervisors. In any case, the best test of accomplishing this kind of structure will be the requirement for more prominent sharing of data, which is one of the advantage of flexible manufacturing techniques (more noteworthy dissemination and accessibility of data) and one of the test of FMS since the data is the substance of administrative control.

3.2. Organizational Environment

Authoritative culture has been utilized as an encompassing development that portray the unpredictable arrangement of information structures, which association units gives mission based performance for showcasing social conduct, is influenced by numerous parts of association including structure, job assumptions and set of working responsibilities, the proper behaviour at work, how to tackle issues, and who settles on choice in different circumstances [11]. The most well-known conceptualization of hierarchical culture is along two way reflections and a distinctive worth in directions. These two way structured model of significant work considering frameworks having an alternate methods significantly in every entity. Another hub is a Flexibility-Control measurement reflecting inclinations about authoritative organizing. Adaptability situated worth frameworks stress decentralization and separation whereas control arranged worth frameworks underlines centralization and combination. The subsequent pivot is an Internal-External centre measurement that reflects whether associations worth frameworks stress the maintenance of an association's socio-specialized framework or the

**Figure 2**: Framework of GMI And FMS
improvement of its serious situation inside the climate [12]. Organizational attributes or capacities are probably going to influence the accomplishment of the execution, in light of the fact that these technologies are genuinely not the same as the hardware they might be replacing. Hierarchical culture is a factor that may eventually sway the exhibition with which a firm actualizes FMS. The control-arranged methodology may well prompt expanded profitability; however it can prevent FMS usage, since centralization of responsibilities decreases openings for authoritative realisation which thus, can make it harder to get an FMS fully operational dependably. An adaptable culture improve the probability that embraces associations and will acquire FMS adaptability benefits, on the grounds that these methodologies endeavour to compartmentalize the vulnerabilities related with FMS activities so issues are settled at where they happen.

Suggestion: The association with adaptability situated culture, regardless of whether inner or outer arranged accomplished better in actualizing FMS.

3.3. Strategy Of an Organization

Procedure is indicated as an activities or examples of activities planned for the accomplishment of objectives [9]. There is general agreement that an association's activities/producing technique is included four key serious needs: cost, quality, adaptability, and reliability/conveyance. Cost includes assembling various and essential parts as a serious tool in the commercial centre. Quality parameter is variable related with a company's capacity to give superior products. Reliability leading delivery is the system of giving on-time conveyance of end product. Adaptability is a demonstration in reaction to changes underway, changes in item blend, alterations in plan, vacillations in materials, and changes in grouping. The level of fit between an association's serious needs and its key choices with respect to its investments provides the way to building up the maximum capacity of tasks as a serious weapon that lead to quality, cost efficiency, and adaptability simultaneously [9]. This is no place more really than for FMS, which fits inside the realm of "blocks and mortar" underlying speculations. It has been noticed that despite the fact that FMS makes a world of opportunities, these chances won't be changed over to preferences except if the receiving firm uses a key arranging approach. Nonetheless, there are some various thoughts in setting needs among these procedures. For example, Investments in FMS in some exploration fitted best with a technique which underlines the serious needs of adaptability, conveyance and quality [12]. While different analysts announced that FMS most noteworthy bit of leeway over more conventional advancements are viewed as in the combination of adaptability, conveyance, quality, and cost and to radically upgrade their creation execution, these innovations reliably consolidated each of the four systems. In this way, highlighting on one measurement doesn't relate straight forwards to FMS execution. Suggestion: Performance of the organizations executing FMS that all the while zeroed in on adaptability, conveyance, quality and cost techniques will be higher contrasted and different organizations which centre around one of the techniques as it were.

3.4. Human Resource Management

Alongside innovation advancements human assets are the best resource for any organization, without it the utilization and improvement of innovation is not possible [6]. In FMS implementation, the specialist's carefulness and extent of obligation is required to increment. Clearly furnishing labourers with occasions to improve their inborn inspiration and occupation fulfilment by implies of employee-contribution practices could be considered a satisfactory strategy to adjust the objectives of representatives to the organizations utilizing FMS [7]. Human resource can furnish the firm with a wellspring of upper hand with respect to its rivals. On the highest point of that, viable administration of individuals is basic to the fruitful execution and utilization of new innovative frameworks. In approach terms there is again a developing acknowledgment that the primary issues in technology transfer are not in the innovation itself but rather in the administrative abilities of firms. The effect of the board individual qualities, experience, style and foundation on their choices they make is significant. Generally, adopting viable administration rehearses, fit for staying up with the changing innovative climate, is especially critical to achievement in worldwide business sectors.

Suggestion: Firms emphasizing on human asset and the executives rehearses have higher Execution in applying FMS contrasted and others.
4. Proposed Research work

This examination intends to investigate and dissect the presentation proportions of GM practice executed in Indian assembling enterprises. The primary commitment of this investigation is to perceive the presentation proportions of GM execution in assembling industry from an ecological viewpoint, which can help endeavours in relieving hazard, decreasing expense what's more, embracing techniques because of client and authoritative requirements. Likewise, the presentation proportions of GM licenses supervisors to get a superior comprehension of GM rehearses and follow scholarly analysts to proceed with the errand with creating and testing hypotheses of GM. The exhibition estimates created in this examination empowers leaders to evaluate the view of GM in their association. Additionally, the execution proportions of GM practice in this investigation can help different partners like government guidelines, legislators, local area, providers, exchange organizations, shareholders, representative concerns, purchasers, market, ecological promotion groups to distinguish those territories of GM that require acknowledgment and upgrades.
5. Benefits of the system

1. By applying the integrated system of Green manufacturing and FMS definitly the system will be Automated framework.
2. With the implemented system, there will be flexibility in production of change in volume and also change in design with Organised structure.
3. Of course the green manufacturing goal is to reduce scrap, with the application there will be Less Environmental pollution.
4. Lesser production of scrap with best use of resources is one of the most significant benefit.
5. Ozone layer depletion is major problem, the main reason is global warming and generation of hazardous gases, with the help of the applied system, less emanation of harmful gases expected.
6. Another major advantage is Improved productivity with the implementation of the system.
7. As preliminary blueprint is eliminated, the system with CNC perform complex task easily hence it will have higher efficiency with higher productivity.
8. An increase amount of goods and services produced will definitly give Economic growth.
9. Global performance based customer acquisition can be looked forward with better Business.

6. Results and Discussion

A design of the structure of Industrial Framework of FMS with green technology, is a modification done with the formation of a system to implement and prioritize with production industries in India, it summarizes a strategy for enhancement of product, productivity and its quality with the following comparison shown in the below table.

|                     | Existing system elaborations                                      | Integrated system elaborations                      |
|---------------------|------------------------------------------------------------------|-----------------------------------------------------|
| 1.                  | Automated structure but complicated.                             | Computer automation system simplified               |
| 2.                  | Scrap Emanations are high.                                       | Less Emanation of scrap, due to green,              |
| 3.                  | Utilization of resources to a particular extent.                 | Utilization of resources to full extent             |
| 4.                  | Accuracy, machining centre is with full accuracy, as the work is to complete within tolerances. | High accuracy with strict tolerance.                |
| 5.                  | No green concept involvement                                     | Green technology is totally involved                |
| 6.                  | Versatility adequate                                             | Versatility Increased                               |
| 7.                  | Lean Manufacturing                                               | Enhanced Lean Manufacturing                         |
| 8.                  | System Reliability moderate                                      | Higher system Reliability                           |
| 9.                  | Not much environmental benefits.                                 | Greater environmental benefits                      |
| 10.                 | Product, and Productivity is average                             | Product, productivity highly increased.             |

Integrated innovation system is a structural framework that analyses to implement the techniques in manufacturing area, the main outcome of the research intends to competitiveness especially focusing on product, productivity and quality. It will also substantiate to produce and strengthen the product value with high and extremely superior performance. The findings will give a path for implicating the adoption of further research. Also, the effective integration of green manufacturing and FMS in order to raise the potential possibilities for enhanced system. The process for low working expenses and better production system has constrained an enormous number of assembling firms to set out on
cutting edge fabricating innovation of different kinds. Additionally environmental impacts likely to improve to greater extent, preventing pollution and conserving energy.

7. Conclusion and Future Scope

Today, innovative capacities can be deliberately used to accomplish practical upper hand, henceforth execution of such advances can be authoritative, through which significant outcome, culture of an organisation, rivalry methodology, and competitiveness of individuals will tend to change to remarkable extent. The direction to the effective flexible manufacturing system execution with green idea has all the earmarks of being the cooperation of proper components and their joining that will offer greatest advantages from FMS usage. However, there is minimal reasonable work done to show the idea of the connections between affecting elements and their effect on organization execution. In specific, the model proposes the collaboration of FMS with a few authoritative and vital components, and the similarity between them as a pointer of a company's exhibition and benefit. As such, the focus of this investigation is to propose most basic hierarchical and vital components which can improve a firm ready to utilize FMS in upgrading execution. All in all, the proposed system can be utilized as a rule for chiefs in improving their FMS strategies usage measure. The benefit of the integrated system proposes the framework that can be implemented in any manufacturing industries including small medium and large scale industries with the aim of meeting the need and minimizing the excess.

The offered structure will definitely simulate the exact experimental proof on which solid theory can be constructed. For future investigation, inspection of the system experimentally is to be done. Testing the suggestion observationally, will empower the plan and arrangement of technology, organization, and execution of the project and characterize and the design for separation. It may enhance smart technology, digitalisation of production process of Industry 4.0 though it is still visionary; however a practical idea which incorporates Internet of Things, Industrial Internet, Smart Manufacturing and Cloud based Manufacturing.

References

[1] Chang, P.L. and S.S.C. Lung, "Organizational changes for advanced manufacturing technology infusion: An empirical study". International Journal of Management. 19(2): p. 206-217, 2002
[2] Hui, I. K., A. H. S Chan, and K. F. Pun. “A Study of the Environmental Management System Implementation Practices.” Journal of cleaner Production 9: 269-279, 2001
[3] Cordero, R., S.T. Walsh, and B.A. Kirchhoff, "Organization technologies, AMT and competent workers: Exploring relationships with manufacturing performance". Journal of Manufacturing Technology Management. 20(3): p. 298-309, 2009.
[4] Dornfield, D. A. “Moving towards Green and Sustainable Manufacturing,” Int. J. Precis.Eng. Manuf-Green Tech, Vol. 1, No.1, pp. 63-66, 2014.
[5] Khazanchi, S., M.W. Lewis, and K.K. Boyer, "Innovation-supportive culture: The impact of Organizational values on process innovation". Journal of Operations Management. 25(4): p.871-884, 2007.
[6] Stock, G.N. and C.M. Mcdermott, "Implementing advanced manufacturing technology: the role of organizational culture". Production & Inventory Management Journal. 41(1): p.66-75, 2000.
[7] Small, M.H., 2007, "Planning, justifying and installing advanced manufacturing technology: a managerial framework". Journal of Manufacturing Technology Management. 18 (5): p. 513-537, 2007.
[8] Belassi, W. and A. Fadlalla, "An integrative framework for FMS diffusion". Omega. 26: p. 699-713, 1998.
[9] Abdin MF Solution of scheduling problems of job shop type FMS with alternative machine tools. Comput Ind Eng 11(1):19–21 (1986).
[10] Rezaie K, Ostadi BA Mathematical model for optimal and phased implementation of flexible manufacturing systems. *Appl Math Comput* 184(2):729–736, (2007).

[11] Pant, S., Ruff, L., Issues in economic justification for flexible manufacturing systems and some guidelines for managers. *Information Resources Management Journal* 8 (1), 26–34, 1995.

[12] Meredith, J.R., Hill, M.M., Justifying new manufacturing systems: a managerial approach. *Sloan Management Review* 28 (4), 49–61, 1987.

[13] Parsaei, H.R., Karwowski, W., Wilhelm, M.R., Walsh, A.J., 1988. A methodology for economic justification of flexible manufacturing systems. *Computers and Industrial Engineering* 15 (1–4), 117–122.

[14] Mohanty, R.P., Venkataraman, S. Use of the analytic hierarchy process for selecting automated manufacturing systems. *International Journal of Operations and Production Management* 13 (8), 45–57, 1993.

[15] Mulvaney, N., Development of a justification tool for advanced manufacturing technologies: system wide benefits value analysis. Master’s thesis, Kansas State University, 1998.

[16] Wisner, J.D. and S. Fawcett, Linking firm strategy to operating decisions through performance measurement, *Production and Inventory Management Journal*, Vol. 32, No. 3, 1991.

[17] K.D.Ganvir, J.V.Chopade, N.D.Pachkawade, Green manufacturing Index applicability, An Approach to Acquire Industrial Gain., *Journal of Physics :Conference Series*, 2020, 1644 012050

[18] S. Islam, S. G. Ponnambalama and H. L. Lam, "An Overview on Life Cycle Inventory Leads to Green Manufacturing: Methods and Modifications," *Chemical Engineering Transaction*, pp. 847-852, 2015.

[19] M. Rüßmann, M. Lorenz, P. Gerbert, M. Waldner, Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries, (April 09, 2015) 1-14.

[20] K.D. Thoben, S. Wiesner, T. Wuest, Industrie 4.0 and Smart Manufacturing- A Review of Research Issues and Application Examples, *International Journal of Automation and Technology*Vol.11 No.1, 2017 4-1 .