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# Feasibility Study of Agile Manufacturing in Automobile Industry

## ABSTRACT

Manufacturing industry may well be on the verge of a major paradigm shift. The emergence of firms producing at low-wage economies has quashed low price strategies for most European and American manufacturers. US manufacturing industries are realizing that global prominence in manufacturing can be achieved only through innovation and thus resulted in the birth of 'Agile Manufacturing System' in the 21<sup>st</sup> century. Agile manufacturing is the process of accomplishing the ability to successfully market low-cost, high quality products with short lead times that provide enhanced customer value through customization. A customer has to be treated as an individual asset. They expect low volume, high quality and require small quantities of highly custom, design-to-order products, and where additional services and value-added benefits like product upgrades and future reconfigurations are as important as the product itself. Ford, the leading automobile industry is paving a new dimension to Agile Manufacturing system. This paper throws light on feasibility of agile especially in automobile manufacturing sector. Key words : Agile, Customer, Value-added, Automobile manufacturing.

## 1. INTRODUCTION

Since the mid-1990s, manufacturing competitiveness has been closely linked to the concept of agility [Burgess (1994), Kidd (1994)]. In a highly connected and competitive environment the expectation is not for trade-offs (i.e., quality vs. price, or delivery reliability vs. variety, etc.), but rather for bundles of order winning factors. The situation has evolved to the point where strong demand together with widespread and globally available supply means that markets can demand not only this bundling of advantage but also the ability to change and reconfigure the bundle of offerings [Bessant et al. (2001)]. Companies have responded by developing Agile Manufacturing capabilities.

Agile Manufacturing is a term applied to an organization that has created the processes, tools and training to enable it to respond quickly to customer needs and market changes while still controlling costs and quality. An enabling factor in becoming an agile manufacturer has been the development of manufacturing support technology that allows the marketers, the

designers and the production personnel to share a common database of parts and products, to share data on production capacities and problems - particularly where small initial problems may have larger downstream effects. It is a general proposition of manufacturing that the cost of correcting quality issues increases as the problem moves downstream, so that it is cheaper to correct quality problems at the earliest possible point in the process.

The swift trend towards a multiplicity of finished products with short development and production lead times have lead many companies into problems with inventories, overheads, and inefficiencies. They are trying to apply the traditional mass-production approach without realizing that the whole environment has changed. Mass production does not apply to products where the customers require small quantities of highly custom, design-to-order products, and where additional services and value-added benefits like product upgrades and future reconfigurations are as important as the product itself. Approaches such as Rapid prototyping (RP), rapid tooling (RT), and

reverse engineering are helping to solve some of these problems. Goldman et al. suggest that Agility has four underlying components: delivering value to the customer; being ready for change; valuing human knowledge and skills; forming virtual partnerships. The emergence of firms producing in low-wage economies has quashed low price strategies for most European and American manufacturers. US manufacturing industry is realizing that global preeminence in manufacturing can only be achieved through innovation and thus resulted in the birth of 'Agile Manufacturing System'. Agile Manufacturing is the process of accomplishing the ability to successfully market low-cost, high quality products with short lead times that provide enhanced customer value through customization. Companies strictly adhering to a customer- driven strategy will face strong competition. Focusing that it should manage change as a matter of routine achieved through internal and external initiatives. Here are a few of the reasons that the manufacturing paradigm is changing from mass production to Agile Manufacturing:

- Global competition is intensifying.
- Mass markets are fragmenting into niche markets.
- Cooperation among companies is becoming necessary, including companies who are in direct competition with each other.
- Customers expect low volume, high quality, custom products.
- Very short product life-cycles, development time, and production lead times are required.
- Customers have to be treated as individuals.

**2. REVIEW OF LITERATURE**

As the 21<sup>st</sup> century approaches, the main focus of companies is to develop products and penetrate markets quickly, in order to acquire a high percentage of

customers and dominate the market with little competition. This allows them to then charge premium prices. This approach becomes especially prevalent when a product with new technology is marketed. (Shamil F. Daghestani Dec1, 1998)

The manufacturing perspective of agility centers on how operations can respond to a changing environment. Flexibility is important but it is the potential for companies to be effective and timely in affecting change which elevates agile companies from other companies. To be timely and flexible, agile manufacturers are supported by an adaptable organizational structure, innovative staff, and an integrated network of suppliers, customer relations, and knowledge base organizations According to Kidd (1994), agility is achieved through the integration of these resources into a coordinated, interdependent system.

Agility may be defined as, 'an organization's capacity to gain competitive advantage by intelligently, rapidly and proactively seizing opportunities and reacting to threats,' [Bessant et al. (2001)]. Embedded in this definition are sixteen organizational capabilities which are grouped under the four themes: strategy, people, processes, and structure. These agile capabilities, which include organizational development (OD) attributes, the effective use of technologies, networking, and partnerships.

Several authors have highlighted the contribution agility has made to the successful implementation of value strategies. Some of the more familiar strategies include the following: product variety [Macduffie et al. (1996), Kahn 1998, Da Silveira et al. (2001)], new product development [Bowen et al. (1995), Bessant and Caffyn (1997)], speed of response [Stalk (1988)], flexibility [Hill and Chambers (1991), Gerwin (1993)], customization [Pine (1993), Anderson (1997), Da Silveira et al. (2001)], location [Levitt (1980)], seasonality [Radas

and Shugan (1998)], and marketing [Keller (1993)]. The pressing issue for agile manufacturers is to know which value strategy to follow. Strategists have proposed two strategy frameworks. The first type, articulated by Porter (1985), sees value strategies shaped by external forces, including barriers to entry, competition, and buyer and supplier power. Agile manufacturers are particularly deft at reacting to current and future needs of buyers [Burgess (1994)]. It is customer preferences which provide information on the nature and scope of appropriate responsive value agility. Companies configure their production processes and supply chains to meet this customer focus [Skinner (1974)].

Developing agile manufacturing capabilities is not effortless and companies require leadership from senior managers. New structures and responsibilities will stretch current human resources; consequently, a corresponding incentive program should also be introduced. Companies have to continue to invest in new technologies and training; it is important to become lead users with computer and capital equipment manufacturers to get an inside track on the generation of new technology. Finally, companies have to view suppliers as partners in the agile process: new ideas and leads can arise from a supportive supply chain [Bessant et al. (2003)].

An automotive firm, or any business which manufactures large volumes of highly engineered products, can attempt to substantially strengthen its product development activities and competitive positioning. It proposes setting up a dedicated product design and manufacturing environment geared towards early adoption and market introduction of advanced product and process technologies and techniques. By testing, refining, and routinizing advanced methods under the pressure to produce large,

yet sub-normal (for a major automaker) volumes of saleable products, a firm applies a racing philosophy to the production environment.

Ford's investment of \$350 million in Agile Manufacturing system. They are world leading car and four wheeler manufacturer. At the same time they are investing the bulk amount to the agile manufacturing. In this situation we must know about whether any feasibility of implementing agile manufacturing in automobile industry. Here we focus the feasibility and possibility and acceptability of the agile manufacturing to the manufacturer, customer and employee for the auto mobile industry.

### 3. OBJECTIVES

The following are the objectives of the study. The primary objective & are:

- To understand the feasibility of Agile Manufacturing system especially in automobile industry.
- To know the response of employees and customers for adoption of new Agile Manufacturing system
- To evaluate the possibility of adaptation of Agile Manufacturing system in automobile industry.
- To study about the financial status of the organization to get into new manufacturing system.
- To study the opinion about the companies change to current system to Agile Manufacturing System.

### 4. METHODOLOGY

Descriptive research design is used with 100 respondents. The respondents are working in the automobile industry in Chennai, Bangalore, Coimbatore and Hosur. The primary data and secondary data are collected from the respondents. Primary data collected from Open end and close end questionnaires are used to collect the primary data. The secondary data are collected from

the articles, newspaper and internet. Five point scale was used in measuring feasibility and possibility. The percentage method is used to measure their feasibility and acceptability. The focus is only on agile manufacturing and not on the other manufacturing systems like Lean, Flexible and Digital Manufacturing. Also time was not sufficient. Hence, these two factors are the limitations of the study. The scope of the study is to know whether the respondents are aware about the Agile Manufacturing System or not. And also to measure the feasibility of agile manufacturing system to the automobile industry.

**5. ANALYSIS**

All the respondents are male, 50 % of the respondents come under the age group of below 30 years. 40% of the respondents have 6-10 years work experience in automobile industry. 70% Of the automobile companies are following lean manufacturing system for their companies. All the respondents have an awareness about the Agile Manufacturing in the way of internet (40%), External training (30%), Books, internal training, discussion (10%). 100 % of the respondents have advised to go for new Agile Manufacturing

system during recession period.

From the table 5.1 60% of the respondent say that Agile Manufacturing is feasible to the automobile industry. 90 % of the respondents feel that their financial status might be viable to invest in the Agile Manufacturing system. 50% of the respondents feel that the adaptation process might be feasible, 30% say it is feasible and 20% say it is highly feasible for the automobile industry.

From the table 5.2 100% respondents are accepting the possibility to adopt new Agile Manufacturing System in automobile industry. 80 % of the respondents feel the employees resist initially in adopting the new system accepte later. The employees need some training to have an awareness about agile, 20% are accept. 70% of the respondents are feeling the customer response is good through the changes in Agile Manufacturing changes and 30% are customer accepting immediately.

**Opinion about implementation of Agile Manufacturing system :** Based on our study the opinion about implementation of Agile Manufacturing system “At present vehicles are produced based on customer

**Table 5.1 Table showing the Feasibility of Agile Manufacturing in automobile industry**

Feasibility	Highly feasible	%	Feasible	%	Might to be Feasible	%
Agile Manufacturing system in automobile industry	30	30	60	60	10	10
Financial status to invest in Agile Manufacturing system	0	0	10	10	90	90
Adaptation process of Agile Manufacturing system in Indian companies	20	20	30	30	50	50

Source Primary data

**Table 5.2 Table Showing the Possibility of Agile and Employee, Customer Acceptability**

Feasibility	Highly feasible	%	Feasible	%	Might to be Feasible	%
Possibility to adopt new Agile Manufacturing system	0	0	10	100	0	0
Resistance of change held by employees for adopting new system	0	0	20	20	80	80
Customers response to change in organization’s manufacturing system	30	30	70	70	0	0

Source Primary data

requirements and JIT is advisable to meet customer requirement as per plan.” (Ashok Leyland) “Agile can be used in any manufacturing company” (Auto live) “Agile Manufacturing system should be implemented soon to effectively overcome recession. Though it is expensive and real difficulties in implementation, a strategic plan has to be developed” (Federal Mogul) “It is good for automobile industry where we have more number of variants (Models) with varying demands, with reduced lead time” (LG) “Agile Manufacturing System has an ability to accomplish rapid change between the manufactures of different assemblies utilizing essentially with the same work cell” (Madras Engineering Industries Pvt Ltd.,) “Will make automotive industries highly competitive. Can expect new innovative models in less time” (Pricol Limited, Coimbatore) “Will reduce overheads while being flexible to customer’s new requirements.” ( Sandhar Locks) “Break the dependency on the scale & economic of scale – ability to increase or decrease the production volume as per the Customer Requirement. Produce vehicles in low volumes at reasonable rates, stable unit cost (with low variability) no matter what the volume is. Streamlining the ordering systems, Reduces the inventory cost.” (TAFE) “Very good system to understand customer requirement and to translate them to product design. Supports with the new philosophy of Cost=S.P-Profit against the old philosophy of cost+profit=S.P” (TVS) “It is good for meeting multiple customer needs with optimized overheads. But the initial investments are high” (Wipro)

#### **Opinion about Ford’s investment of \$350 million in Agile manufacturing system:**

Based on our study we list out the Opinion about Ford’s investment of \$350 million in Agile Manufacturing system.”The investment may be one time but usage of system will be regular. Area of maintaining stores in a company and inventory carrying cost will get stopped.If process is taken as a kit system it

will be success.” (Ashok Leyland) “It’s a necessary tool for current market situation” (Auto live) “It is highly appreciable, that they have initiated to implement the new system” (Federal Mogul) “To sustain in competitive environment we have to take chances of new system.”(Lg) “An Affordable investment expecting to meet the Unpredictable Market demands” (Madras Engineering Industries Pvt Ltd.,) “To be highly competitive and be flexible with customers new demands” (Pricol Limited, Coimbatore)”They will gain more than this investment while using this agile tool. May not be immediately, but in due course they will” ( Sandhar Locks) “It confirms that the tool is worth & it will make sound change in our Automobile industry. Will create a great awareness about the system in down the level” (TAFE) “Other companies will also this system very soon. Definitely, it is expected to give good results, though investment seems to be high” (TVS) “It’s an optimistic approach taken by Ford for future requirements and to sustain in this competitive world” (WIPRO)

#### **New system adopted exclusively to**

**overcome recession:** From the primary data we are listing out the following techniques or systems to overcome the recession. The system or techniques are “Inventory control, Supply chain of material in time, Kanban system, Just in time” (Ashok Leyland) “Autolive has begun to establish “sequence centers” inside or in direct vicinity of a customer’s car factory” (Auto live) “Diversification, New product development and Investment in FMG to drive sustainable global” (Federal Mogul) “No new tools adopted, but streaming or tightening the existing tools will help us to overcome the recession”(LG) “Minimized Overhead cost” (Pricol Limited, Coimbatore)”Reduce inventory, Adopt more of “Just in Time” concept for more components” ( Sandhar Locks) “Continual improvement in reducing Cycle time.Minimized Overhead cost”(TF) “Value engineering for cost reduction, Value

addition(enhancement), HOQ-House Of Quality, QFD-Quality functional deployment, Effective application of DFMEA(Design FMEA) and PFMEA(Production FMEA)” (TVS)

**Core competency of your organization’s manufacturing system :** From the primary data the respondents are pointing out their core competency of their organization. They are “Inventory control, Not allowing material inside the company if it is not required. Only required quantity of material inwarded” (Ashok Leyland) “Final products are typically delivered “just-in-time”, sometimes several times a day, to a vehicle manufacturer’s plants. Autolive’s production lines and equipments are typically developed and manufactured by Autolive itself at its manufacturing machinery company Autolive Automation” (Auto live)”Diversified product portfolio, world-class quality products, Strong worldwide presence and Steady sales growth” (Federal Mogul) “Most Improved Suppliers, Reduced Inventory Cost” (LG) “Ordering Systems, Certified Suppliers, QC tools” (Madras Engineering Industries Pvt Ltd.,) “Effective utilization of Just in Time concept” (Pricol Limited, Coimbatore)”Cellular Production line, Effective utilization of 5-S concepts” (Sandhar Locks) “Cellular Production line ,Using Business Excellence tools, Self Certified Suppliers & Just In time, 5-S Working culture, TQM” (TAFE) “LEAN manufacturing, Option to do variety with least effort, Process standardization/ multi model processing and TEI-Total Employee Involvement”(TVS) “Reduced thru-put time and Optimized inventory using Just in Time” (WIPRO)

**Comments on Agile Manufacturing system:** Respondents comments about the Agile Manufacturing system. Their different views are “Planning of material organizing is good. Company need not worry for material movement from supplier” (Ashok Leyland) “It’s an investment which shall be fruitful for at

least couple of decades” (Auto live)”Agile Manufacturing system is good to implement in the current scenario as a plan to enhance global business.Change management should guide in right path, so company can implement Agile to minimize cost, and satisfy the customer needs individually” (Federal Mogul)”It has the capability to serve & prosper in a competitive environment of continuous and unpredictable change by reacting quickly and effectively to the changing markets driven by customer designed products & services” (LG) “A major issue with Agile Manufacturing is the high capitalization often required for flexibility in the production and assembly areas. This system also has a tendency to make a drastic change in faster new product introducing & introducing new configurable and specialized high quality products, and delivering them with unprecedented lead time” (Madras Engineering Industries Pvt Ltd.,)”Ability to respond quickly to unexpected demands,Emphasis on continual reduction in lead time” (Pricol Limited, Coimbatore)”It’s a good tool to reduce overhead costs while being flexible to new requirements” ( Sandhar Locks)”Agile Manufacturing integrates an organization’s people and technologies through innovative management and organization, knowledgeable and empowered people, and flexible and intelligent technologies. Virtual manufacturing provides a model for making rapid changes in products and processes based on customer requirements and an agile manufacturing system attempts to implement it” (TAFE) “Agile Manufacturing is new system that is expected to help the global industries to overcome recession and frame an standard system to adopt the change as a daily work”(TVS) “It is better tool for handling multiple customers”(WIPRO)

**6. CONCLUSION**

The respondents have high a degree of appreciation towards implementing the agile manufacturing system but have some back thoughts for financial investment

especially during this recession. They hold a consideration for resistance to change by employees and customer's acceptance towards the new system. Employee has to be trained for the new system and hence the whole acceptance happens only after a short span of time. Indian companies follow USA, Japan and UK manufacturing systems at greater extent since the corporate office is originally from those countries. A merging of many manufacturing system and so it is analyzed as the implementation of agile manufacturing system might take some time but accepted after probation period.

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