Application of Grounded Theory Technique to study the critical factors for execution of Materials Requirements Planning (MRP) in Manufacturing Industries

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Abstract—This paper illustrates the application of Grounded Theory (GT) method in a research project to identify the factors which are critical to successful or failed implementation of Materials Requirements Planning (MRP) in manufacturing industries as well as the individual beliefs of the domain experts about those factors. Using grounded theory as the research methodology, two qualitative models (theories) have been developed, one linking factors which may be responsible for a successful MRP implementation and the other one linking factors which may be responsible for a failed MRP implementation.

Keywords—MRP implementation, grounded theory.

I. INTRODUCTION

With increasing competition in the global market, companies are turning towards MRP systems implementations in a bid to reduce inventory costs and increase efficiency in the supply and delivery system. But in reality it is seen that implementing MRP system is not always a risk-free endeavour unless some organizational factors are identified and worked upon to ensure a successful consequence of the above mentioned implementation.

A review of literature shows that certain factors had been identified using various techniques and methodologies which are seen as critical to successful or failed consequences of MRP implementation. This paper aims to use grounded theory technique to: (a) identify the various factors, (b) compare those factors with those already identified in previous research works (c) determine the linkages between the various factors.

II. RATIONALE FOR CHOICE OF GROUNDED THEORY FOR THE STUDY

Earlier in 2013, an attempt was made to conduct a research study on the inventory control management at Hindustan Coca Cola Beverages Private Limited (HCCBPL), Dhapkata, Jorhat. It was aimed to study the present status of materials management and planning and also develop an MRP record for the organisation. But due to certain inconvenience like lack of accurate data, lack of expertise and interest amongst the employees the study was aborted in the middle. Then it was decided to go through existing literature of critical assessments regarding MRP implementation in manufacturing organisations. Rather than finding a feasible solution for further research study on MRP implementation at HCCBPL, Jorhat, it was decided to find the decisive factors and their interlinkages which would result in successful or failed results of MRP implementation in any manufacturing organisation in general.

Keeping in view this objective, instead of presenting a set of options to the domain experts, the grounded theory approach was applied to discover the people’s perception for the various factors and the interlinkages between those factors and develop two models (grounded theory) which would show the relationships between the various factors which would result in successful or failed MRP implementation. This ensured that the theory developed would not be influenced by the researcher but rather be an outcome of the data collected during the research. Thus the theory would be ‘grounded’ in the data itself.

III. LITERATURE REVIEW

According to Turbide (1995), Chase and Aquilano (1995), to some extent, the problems with MRP implementation lie within the organizational and behavioural factors. As the study was primarily on MRP implementation, existing literatures on it were reviewed (Patty W. Cheng, 1997; Moustakis V., 2000; Jha V., 2012; Masnita Y. et al., 2012). These reviews helped to get a clearer insight on the problem.

Next, as grounded theory was chosen as the research methodology, existing literatures on grounded theory and its applications were reviewed and this led to know that there are two approaches to grounded theory study- Straussian approach (1990) and Glaserian approach (1992).

Glaser believes that the literature should be reviewed to get a gist of the problem in hand and then later validate the theory. On the other hand, Strauss believes that “theory denotes a set of well-developed categories (e.g. themes, concepts) that are systematically interrelated through statements of relationship to form a theoretical framework that explains some relevant social, psychological, educational or other phenomenon” (Hunter K, Hari S, Egbu C and Kelly J, 2005).
IV. METHODOLOGY

A. Grounded Theory Approach

As it was aimed to determine the factors from an organisational perspective which were significant for a successful or unsuccessful outcome of MRP implementation, grounded theory technique was applied to get an understanding of the factors and their interlinkages from the domain experts’ standpoint. This method does not begin with constructs and their interlinkages and then seek verification; instead, it begins with an area of study and allows them to emerge from that area of study (Corbin and Strauss, 1990). In grounded theory approach, the theory is created from the data.

As mentioned earlier, there are two approaches to doing a grounded theory study: Glaserian approach (1992) and Straussian approach (1990), the former simply identifying the factors based on the perception of the domain experts while the latter including analytical techniques to induce a theory, thus allowing the researcher to actively participate in the research. Glaser (1992) states that “there is a need not to review any of the literature in the substantive area under study. This dictum is brought about by the desire not to contaminate...it is vital to be reading and studying from the outset of the research, but in unrelated fields” (Glaser 1992, p. 32). On the other hand, Strauss and Corbin (1990) maintain that “all kinds of literature can be used before a research study is begun” (Strauss et al. 1990, p.56). In this study, the Straussian approach was followed.

B. Data collection and respondents

The data was collected through consultations of managerial and staff level employees, i.e. the domain experts - a total of 10 respondents across 4 different organizations in India. A review of literature (Hunter K, Hari S, Egbu C and Kelly J, 2005) says that as far as obtaining an appropriate sample size is concerned, “the grounded theorist does not decide on the size of the sample population before the study begins. Sample size is deemed to be satisfactory only when the key concepts that have been identified from the collected data have reached saturation point, in other words, when no new data emerges.”

Open-ended consultations were carried out for exploring the individual reliance on different factors. The same sequence of consultation questions was followed for all the respondents in order to maintain the data reliability. All the consultations were started by explaining the concept of various factors which affects MRP implementation. 4 sets of questions were asked in the same sequence. Immediately after the consultation, cross checking of the facts was done and personal perceptions and impressions were noted down.

The profile of the respondents is as follows: there was a total of 10 respondents out of which 7 (70%) were male and 3 (30%) were female. Their ages ranged from 26-48 years and had work experiences in the range of 3-20 years. The respondents were proficient in their realm and worked for manufacturing and construction companies. They were all familiar to the concepts of MRP and MRP implementation systems. The sample was a reasonably homogeneous one keeping in view their experience and expertise.

C. Coding

1) Open Coding: It refers to the process of primary formation of ideas from raw data. Going through the data in the form of individual responses by the domain experts, an initial categorisation was made. This was done by searching for implications in the statements/responses and organizing phrases with markers to bring to the surface the true meaning of the responses in parts.

2) Axial Coding: It refers to formation of categories and classifying the open codes into them. The meaning behind the codes were compared and grouped into new categories, each category constituting of responses having similar patterns. In this case, the categories represented factors which are critical to successful or unsuccessful results of MRP implementation.

3) Selective Coding: It refers to analysing the factors thoroughly and discovering the causal connections (if any) between them in order to have a more well-defined interpretation of the observations.

D. Analysis And Results

After the coding, the responses by the domain experts were classified into categories and sub-categories, thus revealing a set of factors which characterized their perception of which of the factors were responsible for successful results of MRP implementation and vice versa. The analysis has resulted in development of two models, viz. fig. 1 and fig. 2 which show the causal connections between the factors resulting in two opposite outcomes. Following are the categories of factors which were found to be responsible for MRP implementation to yield successful outcome:

1) Proper Training: Few responses in this category are as follows:
   - Proper training for individuals
   - Education and expertise
   - Good training
   - Trained individuals/staff
   - Proper training of technical staff

2) Commitment Of Staff
   - On time order booking
   - Ability of employees to solve problems
   - Discipline in item update and review
   - Regular review of open order status
   - Improved personal ability to do work

3) Co-Ordination Among Workers (Inter And Intra)
   - Order acknowledgment from vendors
   - Proper co-ordination between cross functional who are involved in MRP related functions
   - Order review with planning department
   - Ability of employees to work as a team
1) Good team work

4) Managerial Control And Support
   - Managerial/organizational support
   - Good leadership
   - Proper planning of control policies
   - Better production scheduling
   - Organizational involvement

5) Accuracy In Data And Record
   - Accurate forecasting and scheduling
   - Data accuracy
   - Correct data and lead time
   - Inventory record accuracy
   - Accuracy of product delivery

6) Software Customization
   - Ease of use of software
   - Best software
   - Characteristics of the software used
   - Software should be user friendly

‘Managerial control and support’ and ‘Commitment of staff’ were embraced into the term ‘Organizational climate’. Similarly, ‘Accuracy’ and ‘Co-ordination among workers’ were embraced into the term ‘Dynamic co-ordination’.

Fig. 1 Inter linkages of factors responsible for MRP implementation to yield successful results

Following are the categories of factors which were found to be responsible for MRP implementation to yield unsuccessful outcome:

1) Rigidity In Lead Time: The responses in this category are as follows:
   - No flexibility in lead time
   - Lead time is fixed
   - Rigid lead time
   - When standard lead time of different activities needs to be squeezed to meet the committed tight deliveries of the products, then MRP cannot work properly

2) Manual Error/Negligence
   - Mistakes in supply chain
   - Transit losses
   - Mistake of transporter
   - Wrong forecasting
   - The erroneous data entered by the persons at site level due to negligence

3) Lack Of Commitment
   - Lack of top management commitment
   - Lack of recognition of MRP by top management as a planning tool with specific reference to profit results

4) Lack Of Competency
   - The system is designed without taking inputs from people at the bottom level who use the MRP system in day in day out basis
   - Inability to meet an increasing number of requests
   - Lack of understanding of computers

5) Insufficient Training And Knowledge
   - Insufficient user training and education
   - Lack of technical expertise
   - Only the store persons and a few from commercial department are trained for using the system
   - Lack of technical expertise to provide the leadership needed to implement the systems
   - Lack of company expertise

6) Uncertainty
   - Variation in customer requirements
   - Breakdown of machinery
   - Uncertainty regarding the exact time of release of one material from one site to another
   - In construction work, often some unpredictable or unexpected situations or challenges are encountered for which a detailed planning is not possible

Different factors were once again included in the terms ‘Organizational climate’ and ‘Dynamic co-ordination’.

Fig. 2 Inter linkages of factors responsible for MRP implementation to yield unsuccessful results
Figures 1 and 2 are the theoretical models depicting the emerging theory.

Thus, it was possible to acclimatize the results of the Grounded Theory study and also develop two contradictory models which complement with existing research on MRP implementation. These models, which are ‘grounded’ in the perception and behaviour of the domain experts (respondents) emphasizes the causal factors which could be critical to MRP implementation.

From figure 1 the following inferences can be drawn:

Managerial support and commitment together have been found to be positively influencing dynamic co-ordination resulting in factors for successful MRP implementation. Managerial support and other organizational factors facilitate in effective co-ordination among different departments resulting in accurate forecasting, scheduling, review, etc. Co-ordination is also seen to reciprocate this effect and both act as a determining factor for success. Organizational climate has a direct impact on the formation of a precise training unit which would result in competent staff. Software customization would enhance the knowledge assets for greater competency.

From figure 2 the following inferences can be drawn:

Lack of management support and commitment has been found to be the determinant for the inactive coordination of different factors. Insufficient managerial support and commitment may lead to insufficient training resulting in incompetency. This in turn would result into occurrence of errors, hence limited success. Rigid lead time and uncertain occurrences may also have their own effect on MRP implementation.

V. CONCLUSIONS

This study has brought the following points to the surface:

One of the many outcomes of grounded theory is “the proposed relationship among various categories” (Glaser and Strauss, 1967; Whetten, 1989). The revelations of the interlinkages among various categories (Figures 1, 2) in this study could be investigated further in ensuing research.

Despite the fact that the results of this study are significant, yet there are certain limitations that cannot be ignored. Firstly, the sample size taken is small; hence the results and findings need to be tested on a larger sample. However, on the one hand, the data collection is led by the sample, but on the other hand, the sample size is decided by the theory which is generated and it is therefore impossible to envisage the size of the sample prior to starting the study.

Secondly, since the study deals with implementation of MRP in manufacturing and construction industries, the investigation is conducted on experts who are functioning mainly within the realm of material handling and management. The future prospects of this study would be to explore how professionals see different factors, in a specific context, affect the outcome of any implementation and how the management can deal with it.

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