Management

UNDERSTANDING CHALLENGES IN IOT (INTERNET OF THINGS) ADOPTION, FACED BY ENGINEERING MANUFACTURING COMPANIES, IN PUNE (INDIA).

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ABSTRACT As manufacturing sector is getting ready for Industry 4.0, the researchers have investigated challenges faced by the proactive large scale manufacturers, of Pune region, in India, for the adoption of IoT (Internet of Things) for their production plants. The researchers identified manufacturers who are engaged in implementing IoT for their manufacturing companies and interacted with the top level decision makers, who are a part of IoT adoption process. This research article gives an insight to the parameters faced by manufacturers, for the adoption of IoT. The parameters include, Capital investment for IoT adoption, Business process change –change management in the organization, Availability of special Skill-sets, Vendor finalization for IoT implementation, Expectation of immediate ROI (Return on Investment), Requirement clarity etc.

INTRODUCTION

Industrial production is now days driven by global competition and there is a constant need for quick adaptation to newer methods of production to meet the ever-changing market demands [1]. These requirements can be met only by adopting to the modern tools and techniques in the existingmanufacturing technology. IoT is a promising approach based on integration of the business and manufacturing processes, as well as integration of all components in the company's value chain. In manufacturing sector, it is termed as Industry 4.0 /Smart factory/ Smart Manufacturing.Many large scale companies have started adoptingto this technology at various levels, whereas few companies are in the process of implementation and few are planning to implement [2].

The IoTenabled manufacturers gain better visibility and insights to their operations through the efficient utilization of data .It also add value by the integration of distinct systems[2]. This opens up the possibility for manufacturers to move away from simply selling products to become a provider of services .This helps themto strengthen the relationship they have with the end users of their products IoT helpsto ensure that conversations happen between the right machines. No matter since how long the employees might have set up their routine, once they experience the efficiency and savings by themselves, buy-in to the new system is almost guaranteed [1,3]

As the younger generation of manufacturing professionals is being handed over with the baton, they will bring in, with them, their expectations for smart, connected, innovative devices and methods. These expectations will raise the bar for other acquainted areas in manufacturing sector [4]

In this IoTadoption process, early adopters will get benefited with IoT advantages. However, it is important to note, that there is a value, in building a strategy for adoption to IoT and taking adequate time to set expectations, internally and externally, prior to the investment[4,5, 6].

Literature review

The Internet of Things is clearly one of the major technology trends today and a ubiquitous buzzword," said Mike Milinkovich, executive director of the Eclipse Foundation. Forrester predicts (2018), for the Indian Manufacturing sector- IoT will move from the shop floor and become an essential part of B2B value propositions & pricing models. Providing proactive & predictive maintenance services would become a business model for many companies, to ensure better customer experience [2, 3].

As mentioned in Manufacturing Journal, Real-time data – from people, processes, and devices through sensors is real revolution. It is really a game changer where we can see innovation in various manufacturing processes and various sub domains of manufacturing sector. It will provide more visibility across the process [7].

Many companies are thinking that IoT is something very expensive and not for their pocket. Due to this attitude companies are limiting themselves from exploring IoT and its advantages [2, 8, 9].

As IoT is a new technology and being relatively transparent to the users, it is likely that some of the consumers use at least some simple IoT networks without knowing about it [2, 9].

Identifying the problems / challenges faced by the industry, which is trying to adapt toIoT, is essential as it would be then easier for other manufacturing companies to plan or evaluate adoption to IoT. Solutions to the ensuing problems could also be thought off by the technologists/innovators. While going through previous research, it has been observed that challenges faced by the manufacturing companies, specific to Puneindustry, are yet to be identified,although Pune is a large manufacturing hub [3, 10 ,11 ,12].

This survey, seeks to provide real insights into what challenges manufacturing industry,in Pune, isfacing with the adoption to IoT right now.

Research Methodology

The researchers belong to Pune, India, and surveyed the industry in Pune region. Pune is not only a major automobile manufacturing hub but also is the leading IT hub of India. The initial survey showed that the small and medium entrepreneurs (SME's) have neither thought of adapting to IoT or are unable to afford to think of new technology. It was realized that only about fifty large scale manufacturing companies are inclined towards IoT adoption, the database of Pune based large manufacturing companies was selected. All such companies are multinational companies (MNCs) and are leading in their respective businesses. Based on the literature review, a questionnaire was designed and a pilot survey was conducted to finalize the questionnaire. Data was collected by conducting one-on-one interviews with decision makers from the IT, Manufacturing and marketing departments of 51 such companies from Pune Manufacturing industries. The secondary data was collected for cross checking the data from various articles and research papers.

Analysis and Interpretation:-

For analyzing the data, standard statistical tools, liket-tests, regression analyses were used. After analyzing the data, following important challenges, faced by these industries have surfaced.

1. Top challenges faced by manufacturing companies while IoT Adoption across Globe was listed, based on literature review and the pilot survey. The respondents were allowed to select multiple options from the list. Below is the response given by all the respondents
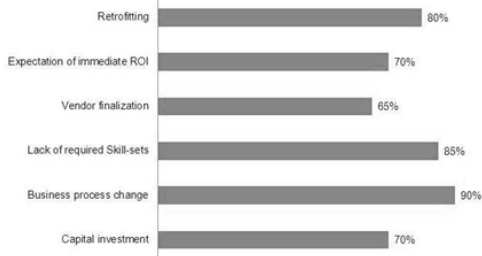
Figure 1:Challenges faced by manufacturing companies in to IoT adoption

Findings:
Respondents have selected multiple challenges while expressing their experience about IoT adoption. The majority of the respondents (90%) have said that the Change Management, i.e. the changes required in the Business process, is a major challenge for IoT Adoption. 85% of the respondents says that lack of required skill sets is also one of the major challenges faced by them. Additionally Vendor finalization for IoT implementations, Capital Investment and expectation of immediate ROI are also various challenges faced by manufacturing companies. 80% respondents say retrofitting is one of the showstopper for IoT adoption

1. Another important finding of the research was to find out whether the companies are worried about sharing their data to IT enablers? A straightforward question was put to all the participants," Do you feel that there is a risk of misuse of data during exchange of information with IT partners" and the response was as follows,

Table 1:

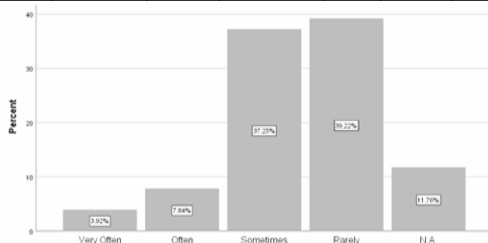|	Frequency	Percent	Cumulative Percent	Mean	Median	Std. Deviation
Very Often	2	3.9	3.9	3.59	4.00	1.169
Often	4	7.8	11.8			
Sometimes	19	37.3	49.0			
Rarely	20	39.2	88.2			
N.A.	6	11.8	100.0			

Figure 2:

Findings:
The majority respondents expressed that there is a risk of misuse of data during information exchange however 39.22% says rarely there is risk of misuse of data during exchange of information with partners

1. While discussing on various challenges with respondents, most of them found reluctant in sharing their entire data. The reason for that was given as probable harm to their Intellectual Property ,after being asked the reason, they talked about intellectual property .So the following question was framed to check the relevance:"Do you see any concern with respect to intellectual property due to IoT adoption"

Table 2:

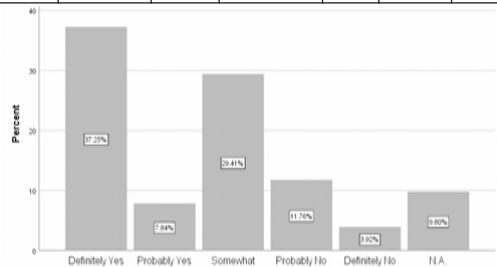|	Frequency	Percent	Cumulative Percent	Mean	Median	Std. Deviation
Definitely Yes	19	37.3	37.3	2.67	3.00	1.633
Probably Yes	4	7.8	45.1			
Somewhat	15	29.4	74.5			
Probably No	6	11.8	86.3			
Definitely No	2	3.9	90.2			
N.A.	5	9.8	100.0			

Figure 3:

Findings:
Regarding intellectual property due to IoT Adoption, 74.5% of the respondents have concern. 15.68% of the respondents did not find any concern with respect to intellectual property.

CONCLUSION
The analysis based on various questions highlights that "Change Management" i.e. the change in business processes is the major challenge faced by manufacturing companies in Pune while adopting IoT. At the same time required Skill Set for IoT adoption are not easily available in the market. The right set of talent will be the key to IoTsuccess. Up-skilling the workforce, investment and collaboration from all stakeholders will be key pointers for the IoT roadmap. This will require significant planning from the beginning.

It has been seen that management in the manufacturing industry is worried about data leakage .They expressed concern about the risk of misuse of data, if they are sharing the data with IoT partner/vendors. Management feels that this may have an impact on their intellectual properties. They are reluctant to share their data outside the organization

"Retrofitting" (adding a component to something that did not have it when manufactured)was one more challenge expressed by many decision makers.

The analysis of the challenges faced by manufacturing companies in IoT implementation says thatIoT Solutions are very important while doing IoT project management.

Recommendations
• It is not possible to have all required IoT skills in house, considering IoT architecture. Companies should have small IoT labs in house for Skill developments. It is possible, in Pune region, to quickly arrange for training or awareness workshops, for all the levels ofmanagement personnel (Lower management, middle management and top management).This will improveIoT adoption within the organization.
• IoT requires a company to undergo a change which should be well thought of, while starting the IoT adoption project.This changeover cannot take place without a fundamental cultural and organizational change throughout the entire value chain, including suppliers and clients.
• There's an IoT solution for everyone. IoT adoption will give value in terms for internal efficiency gains, customer offerings etc. however the challenge is going to be in picking out the right initial project to work on, as a proof-of-concept/ pilot project.

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