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An Experimental Study of Software Engineering Model for an Large Industry Automation Design

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Abstract: - This paper will explain that how the traditional software development models can be used to automate the tasks in large scale industries. Using the SDLC approach, the development of the system can be automated which will save a lot of time and efforts which can be utilised for other crucial tasks. This paper will also brief the life cycle of automation. The advantages and challenges of the implementation of the automation software development will also be explained.

Keywords: Automation in industries, Automation life cycle, categories of automation, advantages, disadvantages.

Introduction: - In large scale industries like manufacturing industries, there are many components of the machine for which the manufacturing is done separately. Large number of human manpower is required to handle those tasks manually. This will result in higher cost and is a time-consuming task. In few scenarios, the security of the employees is also at risk. In such cases, the use to automation comes in to picture. Automation can be implied to automate the tasks which requires less intervention of the manpower. Using the manual way of designing the system, the automation techniques can be used to automate the tasks which will save time and increases the efficiency of the manufacturing process of the system.

Importance of Automation in Industries: -
The scope of automation in large scale industries is that it helps to improve the quality of the product being made. It is because of the automation of the tasks which requires human being working manually on the task. As the human tends to make mistakes, by converting those tasks using automation all those errors can be reduces to a large extent which will improve the quality of the product. Automating such tasks also improves the efficiency and performance of the industry. This in turn will attract more clients as they will receive their products on time which have good functional performance.

Figure 1: - Importance of Automation in industries.

In order to automate the tasks handled by human beings in the industry, there is certain process which should be followed to receive proper automated system. Like other software engineering life cycle, there are few stages in the automation system life cycle. Each stage is discussed in details as follows: -

- Industry goals: - In the first step the automation designer will understand the goals and scope of the industries in detail. He will gather all the necessary information in this stage in order to understand that what are the requirements of the industry. What type of machines and tools are being made, how much manpower is deployed, what is the role of human beings in handling of the tasks. Bases upon this he will document everything and prepare requirement specification.
- Planning: - Based on the output of the previous stage, the automation designer will do research and try to provide all the possible solutions to the industry. He will study and research all the pre-existing solutions is any and will go through all the available and possible solution to implement automation design.

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- Analysing and Designing: - In this stage, as planned in the previous stage, he will analyse all the solutions one by one and select one best solution and will do complete detailed analysis of that solution so that to avoid all possible errors which may arise. Once the analysis is done, he will create analysis report and based upon this he will start designing the automated software which will replace the human tasks. His designing will be in details which will be based on flow charts, graphs etc which will explain how the components of the software will communicate with each other and how the system will work automatically.
- Testing and Evaluate: - When the analysis and designing is done then a protype is made and then the designer will ask the testers to check whether there are any errors occurring during automatic working of the system. It is evaluated in this step whether the system is working as expected for example if a person is giving command to start the machine, then the machine is starting or not? Like wise all the different modules of the system is tested and if there are any errors then it is fixed.
- Support and Maintenance: - Once the testing and evaluation is done then the actual software to automate the machine is made finally and deployed. If there are any issues then the designer will provide full support to rectify it. If he finds that there is any malfunction in the designing of the software then he will fix it and provide full support.

In this way, the software will be automated which helps to reduce the time and effort to complete a task. The automation of machines in industries is proved to be boon to large scale industries.

Figure2 Software automation life cycle.

Advantages of Automation in large scale industries: - [1]

1. Reduced time: - As the manual process is automated so it saves a lot of time and energy which can be utilised for other tasks. The automation of the tasks in an industry reduces the time taken to manufacture the product.
2. Increased efficiency: - As the tasks are done using automation technique so the overall efficiency of the manufacturing unit increases as the tasks are done with reduces error.
3. Reduced Cost: - As tasks of the human beings are replaced by the automated machines, the cost to employ workers reduces which can be invested in other department of the industry.
4. Higher performance: - Since the tasks are automated which increases the performance of the industry. There are less chances of error as the human tend to make mistakes but on the other hand the automation reduces this risk to a large extent which helps to improve the performance of the industry.
5. Higher Security: - There are many tasks where the security of the workers might be at risk. They can even meet with an accident if not working cautiously. This issue reduced to large extend as the task will be automated which will not risk workers life.
6. Customer Satisfaction: - The process of manufacturing of the machine or product becomes faster once the automation technique is implemented. This will result in on time and faster delivery of the product to the end user. This helps to achieve customer satisfaction and the trust will increase and more clients will come for their needs.
7. Less pressure on workers: - With the help of automated tools, the life of workers becomes easy and they will not be tired because of efforts required to complete the task manually.
8. Improved quality: - The quality of the end result will be higher as compared to process the manufacturing manually. The use of automation helps to improve the quality of the product being made.
9. Increased production: - As the process is automated so the time taken for the delivery will be reduced due to which the industry becomes capable of manufacturing more units in less time. Hence, it helps to increase the productivity rate.
10. Communication becomes easy: - With the help of automated machines, databases, the data and the information can be saved and updated easily. This helps to improve the communication system of the industry which was difficult by using manual methods of staring of the data.
11. Maintenance and monitoring: - With the help of the automated systems and software, the monitoring and maintenance of other devices, appliances, machines become very easy and saves a lot of time and energy. It was very difficult to go and check the machines working conditions manually. But automation has improved the monitoring process as well.
12. Easy status update: - With the help of the automation technique, it is very easy to identify the working status

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of the systems. The user can login in the application which shows the status update of the machine and can check whether there is any issue or not.

13. Durability of materials: - Human beings tend to make mistakes which can led to damaging the material used for the manufacturing of the product but using the automated system the chances of damage reduced.

Challenges of Automation in Industry: - [2]

- Unemployment: - The main disadvantage of automation in industry is that many workers might lose their job and becomes unemployed. The lower level of workers who are poor becomes poorer with the implementation of automated systems in the industry as they become unemployed.
- Less interaction: - The implementation of automated tools give rise to less human interaction due to which there will not be any communication between workers which will affect their mental health.
- Higher cost: - The implementation of automating the system can cost a lot. Not all industries can implement automated tools.

Types of Automation in Industry: - [3]

There are four major types of automation techniques: -

- Programmable Automation: - In this type of technique the tasks or the configuration of the machine can be changed by changing the programming of the system or machine. This will require more time and efforts as a lot of changes need to be done in the code of the machine.
- Fixed Automation: - This type of technique can be used where it is fixed that the particular machine performs certain specific list of tasks and which are repetitive. There is no scope of any modification in the automation of the machine in later stages.
- Integrated Automation: - In this type of technique various independent machines, processes, data, tools work parallelly by giving one command, which means all this can be automated using only one automated command.
- Flexible Automation: - In this type of automation, the automation can be modified to accommodate manufacturing of different parts of the product. This type of technique is flexible as it is easy to make small changes in the existing automation to add new features.

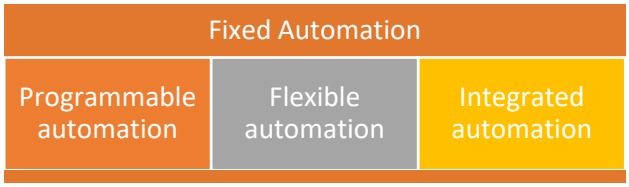

Figure 3 Types of automation techniques in industry

Conclusion: - Hence it is concluded that with the growing demands of the industries, the implementation of the automation system helps to reduce the time and cost of the manufacturing process. It helps to increase the production and performance of the industry which will attract more clients. There are advantages as well as few challenges to implement automation which are discussed in this paper. The automation designer should understand the industries needs and requirements and then implement one of the available automation types in the industry.

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