Role of Machine Learning in Software Project Management

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ABSTRACT: Monitoring and control project work is both critical and challenging. The greatest asset of any organization is its human resource that ensures the success to achieve the goals and objectives of the company. Managers have to manage and organize the team to enhance productivity. The effective human resource enables their employees to contribute effectively and achieve desired growth of an organization. The assignment of role to a process depends on the skills and competence of an individual. If these details of an individual are known to the manager, then it will add an extra point to him while assigning a new task. It is observed from the previous study that managers spend a lot of time in allocation which is performed according to the experts experience rather than following some specific criteria which lead to inefficient utilization of the resource available, so if a model is developed and trained using machine learning algorithms to handle this routine task so that the manager can spend time in other developmental activities rather than spending time on routine tasks.

Keywords: Resource allocation, Productivity, Machine Learning.

I. INTRODUCTION

According to the Project Management Body of Knowledge (PMBOK), three factors include time, cost, and scope that are used to analyze the quality of work in a project [5][6][7]. However, only these three factors are not always sufficient in a real environment to decide the success of a project as other factors contribute to successful projects like team member's collaboration, their satisfaction with their position in projects [8]. The failure of projects is always due to improper human resource allocation. The main objective of human resource allocation is to decide what work needs to be carried by whom. For organizing and completing a project it is needed to schedule the project carefully. Effective project scheduling provides success. To keep the project on track it is necessary to allocate resources appropriately and manage the quality to reduce errors. This will typically increase the project’s productivity and decreases the cost. Ultimately, a machine learning system will save time by efficiently using historical project data for allocation. It provides a service that increases the overall productivity by predicting the right task to the right team member. Early project management software’s focused on managing a team by supporting the team in a specific area rather than dealing with complexities involved in managing the project. To provide even more value to a project, project management with machine learning needs to evolve.

Despite the work done on task allocation. Little research has been done to understand the factors that influence human resource allocation, this can be seen in the section 3 of the paper. The main aim of this paper is to identify the factors to be considered while allocating the task which ensures that important points are not missed when considering the human resource allocation in a team.
2. RELATED WORK

Human resource allocation is first considered in a social network of individuals and has been known as highly computationally intractable by T. Lappas et al. [9], who explained the team formation problem in the presence of a network of individuals. Team formation is a practice, as it the combination of people working together, for example, development team formed with needed programmers and software engineers for building the project, marketing team with needed communication skills are formed for marketing the product, so it is required that the team is built with all required skilled person for the success of the project [6][11].

Idri, et al. [1] used K-nearest Neighbour Algorithm (KNN) this paper conducted studies on management of missing values (MV) in data systems of software engineering (SE) The study has observed increase use of Machine Learning (ML) techniques in dealing with the missing values in software engineering data.

Alsalemi and Yeoh [2] has given the summary of Machine learning techniques used to predict requirement volatility. It is observed that researchers used machine learning techniques like Fuzzification, Bayesian network, Binary classification, Artificial neural network. Most of the software development use iterative models, every type of project encounter requirement volatility where the requirements keep changing. The research show that change in requirements causes project failure Machine learning methods like ANN and logistic regression uses independent variable which are extracted from requirement document and apply regression analysis to find the estimation of correlation of independent variables.

Sharma and Singh [3] It is observed that Machine learning models are proven to provide high accuracy due to their learning nature. In this paper machine learning algorithms like Random Forest (RF), Multi-Layer Perceptron (MLP), Support Vector Machine (SVM) are used to predict the effort put in the projects.

Shivhare and Rath [4] According to this paper Effort estimation is done based on on non-quantitative data Machine learning techniques. The estimation is carried out by applying Naive Bayes classifier. Performance of these techniques is evaluated and compared based on three parameters such as Mean Magnitude of Relative Error (MMRE), Mean Absolute Error (MAE), Root Mean Squared Error (RMSE) and it is observed that among all, Naïve Bayes classifier achieves better results when compared with other Neural Network techniques.

3. RESEARCH QUESTIONS

In recent studies, numerous papers identified problems and solutions to solve this problem related to project management. Many studies have focused on the development phase of the project development life cycle but inadequately covered the project management phase which plays an important role in project success. Thus, the main objectives of this paper are to identify and classify the methods and predictors for resource allocation in project management planning assessment. In particular, focused on the recent studies which discovered the current attributes that were used for prediction of resource allocation in project management to improve the way of predicting task to assign a team member. Thus, the objective of this paper is to understand how traditional project management planning copes with the problem of human resource allocation methods they utilize. Identification of factors that influence task allocation will help the researchers to know what factors have more impact while assigning the task to a team. Few research questions are formulated to understand the current situation of project development issues.

The questions are framed to understand the impact of resource allocation problems in different types of organizations so that decisions can be taken to solve the problem in a better way.
RQ 1: Where does your team operate from?

RQ 2: Which type of software development process do you use?

RQ 3: What is the immediate team size you are managing?

RQ 4: How much time do you spend in a day on each of the project management activities.

RQ 5: Which project management areas do you think can be automated?

RQ 6: What tool do you use to assign the task to the employee?
RQ7: How is task allocation done in your organization?

![Task Allocation Chart]

RQ8: If the Manager / Lead assigns work, what is the most important factor you consider in assigning the task to an individual.

![Factor Importance Graph]

The results were considered from both product-based companies and service-based companies. As the human resource allocation criteria have a different impact on these two types of organizations. In Product based companies the resources need to be utilized more efficiently when compared with service-based where not much impact as just to provide service to the product.

Many of the responses from the survey resulted that Machine learning in project management will result in great progress in the project. It is evidenced that till today the resource allocation in a project is done using online resource management software like Instagantt, Team Gantt, Asana, Click up, Wrike, etc... This helps to track, create user stories and issues, plan sprints, distribute tasks across the teams, and provide complete visibility of teams' work eventually improve the team's performance. There are also paid software available in the market like JIRA, Monday.com, LeanKit, etc. which provides bigger space, can extend to a greater number of comprehensive-time storage, comprehensive-time and task management also provides security and support for the project information. It is observed it will manager seat use to software manager to automate routine tasks like task allocation will help them to invests their time in innovation and to focus on increasing teams’ productivity.

4. CONCLUSION

The research present in this paper has emphasized machine learning in project management, which will have a great impact on the overall increase in achieving the organization's goals and objectives. A depth study of the project attributes is required for implementing a machine learning model. It is a big challenge to get the right dataset related to project resource allocation to implement a machine learning model. ISBSG is one of the non-profitable benchmarking standard group which was founded in Australia in the year 1997 by a group of national software metric association which promotes the use of IT industry data in research and to improve the software process and products. It depends on the researcher to identify relevant data and to identify attributes in the dataset which will have more impact on the
resource allocation process and come up with the best model to automate this process. If done in right way it has a great impact on overall increase in productivity of the software project.

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