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On-Demand Intelligent Resource Assessment and Allocation System Using NLP for Project Management

Emergent Research Forum (ERF)

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Abstract

In the current dynamic era of Agile projects and the usage of different methodologies for managing projects, the assessment, allocation/reallocation of skilled resources still remains a challenge. This could be worse in projects with tight deadlines and cost restrictions. The current project management tools may help in managing projects, calculating buffers, costs and giving out deadlines but the major fallout of these tools is the inability to identify the appropriate resources needed for a given situation. Our Resource Assessment and Allocation System directly tackles these pain points of the existing systems by assessing resources based on various factors and recommends candidates that would be a good fit. The system will consider the various project and resource parameters like cost and finish date and resource parameters like cost, allocation term, grooming period, multi functionality and experience. It will then recommend prospective candidates who could be allocated to projects.

Keywords

NLP, natural language processing, project management, resource allocation, resource assessment, bert, dynamic recommendation.

Introduction

The importance of resource assessment for accurate allocation of resources for projects has always been a concept on paper, yet has never been executed well. Mostly the multimillion-dollar projects in organizations have huge bench strength which can be pulled into projects whenever required. In the current business scenario, where the time to market and projects with low cost are prioritized by clients, effective project management and resource allocation strategies are required for successful handling of projects. Not everyone is able to foresee the risks involved. And with the ever-evolving world of technology, the competition to increase one's market share, has risen to a different level altogether. To mitigate such issues, a good human resource allocation process must be in place. This shall help in optimally using ones' resources to release products and services in the market.

Resource allocation is a very tedious and important task. The changing dynamics of multi-project environments call for quicker actions when resource allocation is required. Failure to do so can impact the project deadlines. The process of coupling everyday planning for every resource is very important to implementing a successful long-term business plan.

Our take on this situation makes it easier to access the pool of pre-assessed resources based on years of experience, relevant experience, duration in a project, cross-skilling ability. This would bring down the time required to screen a resource and would shorten the resource allocation process significantly. Our system would help in recommending resources, with an accurate match, as required by the project.

Background

There were few ways to assign human resources to projects in the past but in recent years, research has been able to introduce procedures and algorithms to make this allocation as effective as possible. Project Management strategies have been evolving with the over increasing budget constrained projects with strict deadlines. Tools like Microsoft Visio help in designing the project allocation plans but these tools are limited to planning. There are times when you need insights and recommendations which can drive your decisions.

According to a PMI survey, 26% of companies use resource management to allocate resources and gauge the needs while 36% of them do it on a regular basis. So, this tells us now project managers have been lacking the ability to allocate good resources on projects. Also, less than 60% of projects meet the original budget and barely 50% of them are being completed on time, the same study says. (PMI.org, 2017)

The Pulse of the Profession 11th Global Project Management Survey says *“Take artificial intelligence (AI): 85 percent of respondents in PwC’s 2019 CEO survey say AI ‘will significantly change the way they do business in the next five years.’ And close to two-thirds of global CEOs see it as a bigger disruptor than the internet has been.”* (PMI.org, 2019)

Implementation Strategy

Resources may need to be allocated or reallocated at any point in the project’s life cycle. The system needs to consider various parameters related to the project like the amount of time elapsed since the project’s commencement, the total budget spent out of the approved amount, the risk involved in either adding new resources to the team or replacing existing ones and the perceived complexity of the project. As the project progresses through its life cycle, the weights associated with the parameters will be higher as compared to when the project would have just kicked-off.

With reference to the resource themselves, the system needs to consider candidates that are scored lower on the cost of grooming, the required grooming period, the onboarding cost, the time required to deploy the resource while simultaneously being scored higher based on the knowledge they possess, the allocated term being long, them being multifunctional, and years of experience. Selecting a candidate that costs lower may not always be the optimum choice. This is mainly because a resource that costs lesser may lack knowledge or experience, whereas, a costlier resource may be highly knowledgeable and experienced and could possibly be able to reduce the duration of the project by a considerable amount of days. Thus, the weight associated with the cost of the resource can be directly correlated to the amount of knowledge and experience they have.

The proposed system uses BERT (Bidirectional Encoder Representations from Transformers), a state-of-the-art NLP (Neuro-Linguistic Programming) model, with a SQuAD (Stanford Question Answering Dataset) Q&A model. BERT will be used to ingest an entire pool of applicants in the form of resumes along with the TF-IDF algorithm (Koujalagi, 2015). Once the resumes are ingested, BERT is able to understand how each applicant is different from the other and will be able to classify them, while the TF-IDF will help in ranking the resources resumes based on the frequency of keywords identified by BERT within the resumes. The Q&A model can be trained on existing data related to resources and the projects they are currently working on. BERT and the SQuAD Q&A model can be hyper tuned to understand if the existing choices made were right or not by tuning the answers. Once the tuning is complete, the decision-maker can interact with the system by just asking it questions. BERT identifies the decision

maker's intent and tries to answer the question by assessing and recommending a suitable resource based on these intents.

Thus, a ranking can be calculated by the models depending on these various parameters and the system can recommend the configured number of candidates to the decision-maker. The final choice can be made by evaluating the recommended candidates and the situation at hand considering how far the project has come in its life cycle.

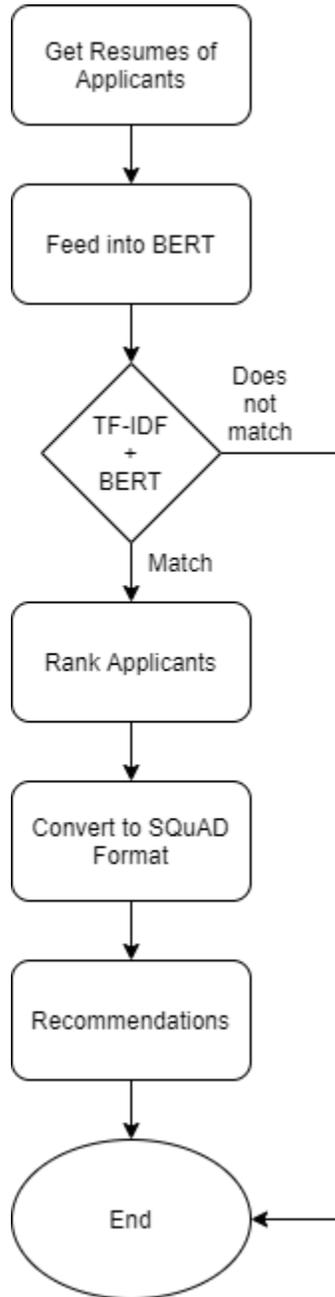


Figure 1. Proposed Process Flow- Resource Assessment and Allocation System

Conclusion

This emerging research aims to help with the assessment of resources before they are allocated to or replaced within a project. It will help Project Managers identify the correct resources that fit the current need while keeping project constraints like time, cost, and risk in mind while evaluating them.

Additional work can be put into identifying additional relevant factors or parameters that play a key role in resource assessment. The models can be programmed to learn the preferences of the decision-maker should also be generic enough to be used within any kind of project and not just limited to Agile. Other future work planned is to create a similar model that could be used for resources that are new to the company and need to be allocated to a project based on the parameters.

To summarize, this system will not just rank the prospective candidates but will let the decision-maker choose between the configured number of candidates that were recommended by the system. It can also be trained to learn how the candidates are performing within the assigned project and if the choice made was optimal. It will make the process of selecting the right human resource easier and much more reliable than the current tools available.

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