IRIS – Intelligent Resource Identification System

Avinash Karthik Sundarraj, Vinod Kumar D

Abstract— The fundamental idea behind the project is to scientifically identify the "Best fit, available resource for a project". This plays a big part in solving the larger demand v/s supply problem in a projects scenario. Having established the end objectives, the project aims at improving operational efficiency and enhancing user experience which ultimately results in better client satisfaction

The concept involved data identification, extraction, building of the model, scaling and integration into the larger project's digital ecosystem.

Index Terms— TOPSIS, Ranking, Allignment, Decision making, Optimization, Resource Allocation. Demand, Supply, Project, Python, SQL, Excel, VBA, Macro

1 Business Problem

THIS project was conceptualized because of a need to have a scientific method to allocate the best-fit resources to the project by specific role. The managers used their experience and intuition to assign resources. The second major drawback was that the availability of the associate was assertained post idenfication and if the associate is unavailable, this process repeated until the right available associate has been allocated.

Thus, the need for a solution that would prove to be an effective method to perform this process. Post the implementation of this project, the resource managers will be able to use this tool to identify the most compatible associate for their requirement.

The estimation & capacity management team [1] scopes the demand hours [2] required for the completion of a project in accordance with its requirements. Every project has various combinations of roles/resource [3] pools which have their individual demand hours. Based on the total demand hours required, the production month [4] wise distribution and project schedule, the resourcing report [5] is generated. From the demand distribution, the resource manager [6] assigns an associate [7] to that project based on instinct and experience and later checking for bandwidth [8]..

The resource manager assigns an average of 15-20 projects in a day. Each project assignment entails the resource manager to identify associates that are available for the entire duration of the project which essentially is using the demand by production month and comparing associate availability for each month, for the duration of the project The resource manager then uses his/her best judgment for the final decision. This exhaustive and time-consuming process is repeated for the unfulfilled projects. The possible challenges in this process are: Oversight in resource compatibility, fatigue due to the exhaustive cross referencing and bandwidth and project time line misalignment.

This projects aims at increasing the accuracy of this process through a scientific method to identify the best-fit associate by role/resource pool for the project by factoring in their past experience[9], project performance[10], utilization[11] and overtime[12] from historical data[13]. The second phase is using a technique to rank the associates using the abovementioned parameters. The project uses Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) [14]. The third phase will check the recommended associates' bandwidth with the demand of the project and will display top three recommendations. The final stage will allow allocation of one of the associates to the said project(s) and his/her availability will be updated for further allocations.

This process will repeat for the next project in the pipeline. Mistake [15] proofing steps have also been implemented to enhance user experience. This tool will now have rationale of resource allocation post bandwidth compatibility.

2 Resource Allocation

2.1 Data Collection and Processing

The exhaustive list of projects is provided through a Portfolio Management tool. This tool provides a list of un-resourced projects along with all the attributes that is required for the optimum allocation of resource. Each project is viewed as a line-item which will contain the project ID, the project type, the project sub-type, resource pool, the demand hours the project warrants and the schedule of said project. This list is refreshed everyday with either new additions and/or updates to pre-existing products. The data is loaded via an ETL process into a tool daily. Once the data is loaded the resource identification process will begin.

2.2 Resource Identification

The process of resource identification is integrated in the overall process flow. Via a web page, the first project (based on priority) is selected. Details such as project type, sub-type, duration, demand etc is displayed for easy identification. Potentially, many associates will be available to handle the project. However, there are a few criteria through which an associate compatibility can be measured. They are project experience, project performance, utilization, and overtime. These attributes are available in the associate portfolio which are captured automatically as prior projects complete. This matrix is then cross referenced based on associate project experience to identify commonality and filter out the relevant associates. This step provides a list of associates who have worked on similar projects (project types) based on their vital attributes.

2.3 Alternatives Selection and Ranking

The list of associates available (for the full project duration)

and their vital attributes are then stacked to form a matrix to be fed into the ranking algorithm. To rank the associates a method referred by the acronym TOPSIS is employed. Technique for Order of Preference by Similarity to Ideal Solution or TOPSIS is one of the methods often used in multi criteria decision making to aid the user to make informed decisions based on multiple criteria. The main advantages to this method are:

a. Simple, rational, and comprehensible method,
b. Intuitive and logic driven method that represents the rationale of human choice,
c. Possibility of visualization of the decision-making process
d. The rank is a scalar value that accounts the best and worst attributes to measure the relative performance of each alternative in a mathematical from

The algorithm starts by forming the decision matrix displaying the satisfaction criterion with each alternative (i.e.) the associates along with the attributes are represented in the form of a decision table. The satisfaction criteria are the four attributes mentioned before. Next, the matrix is normalized using pre-determined weights (validated by the business) that are multiplied with the criteria to obtain a normalized decision matrix.

The next step is to identify the ideal solution. An ideal solution in the case of associate allocation is a high project experience, a high project performance, a high utilization, and a low overtime. This is regarded as an ideal solution as these attributes in this combination provide higher success rate. Subsequently we then calculate the positive and negative ideal solution and the respective distance of each alternative (associates) to these solutions is calculated with a distance measure. This step involves identifying the maximum magnitude of each of the progressive attributes such as highest project experience, highest project performance and highest utilization and identifying the minimum magnitude of each of the regressive attribute(s) such as lowest overtime. This combination represents the positive ideal solution. This is the solution that is would lead a resource pool manager to make the allocation. The negative ideal solution is in fact the reverse namely lowest project experience, lowest project performance, lowest utilization, and highest overtime. This combination of attributes is usually least desired in an associate prior to allocation.

To evaluate the influence of these attributes on the alternatives, the distance of each alternative to both the positive ideal solution and negative ideal solution is measured using root sum square (RSS). This is a distance measure wherein the distance for each alternative for all the attributes is calculated from their respective positive ideal solution and squared to get the absolute magnitude. The square root of the sum of the absolute distance for each alternative is calculated. The same is carried out to obtain the absolute distance for the negative ideal solution.

The fundamental principle for an alternative to obtain a high rank is that is should have a low distance from the positive ideal solution and a high distance from the negative ideal solution. To rank the alternative, the relative closeness to the ideal solution is used. Thus, the rank of the alternative is the ratio of the absolute distance from the positive ideal solution to the sum of the total distance (absolute distance from the positive ideal solution and absolute distance from the negative ideal solution). This calculation represents the rank of the associates. The decision matrix is then sorted with the highest rank would be the most ideal candidate for scoped project.

2.4 Associate Allocation

The algorithm displays the top three associates, giving the resource pool manager the final decision to map the associate to the project. Once the resource pool manager assigns the associate, the project is marked as fulfilled (resourced) in the resourcing report and the project demand is reduced from the associate's bandwidth in the associate portfolio. All these steps are carried out linearly and instantly thus reducing the resource pool manager's effort and most importantly, facilitates data driven decision making.

3 Result

This new process is now completely digitalized and integrated into the overall process flow. As of now, resourcing decisions are being taken using the recommendations for over 1500 project per year. This solution is being expanded to other products and workstreams where resourcing decisions are to be taken.One of the key responsibilities of a manager is to ensure the best fit resource is assigned to a project, which would result in overall smooth and efficient execution of the project. ~21K man hours were saved in 2018 because of efficient execution resulting from optimal resource allocation.

4 Conclusions

Data is the greatest asset for decision making. This algorithm and the digital solution provide for the ability to make rational decision making in an environment of data overload, pressing deadlines and uncertain situations. The technique can be applied to any type of work that requires a decision to be made based on factors by ranking the optimal solutions.

5 Review Of Literature

An attempt has been made to review the related empirical investigation relating to the use of TOPSIS. Although limited number of studies are available, this facilitate an insight as to how the above-mentioned technique functions have been described in the following reports. The results of various studies can be taken as the model for the purpose of the present study.

Even though there is no direct relationship between the previous studies and the present one, the theoretical insights have been taken into consideration in all the studies that are reported.

Chang, H. J. & Hseih, C. M. (2014): Store location selection has become the most important decision for many retailers. The selection of store location can be assessed by five criteria: Crowds, Store Cluster, Site Features, Store site acreages and the proportion of rent expenses against annual sales, respectively. This study uses the TOPSIS (Technique for order preference by similarity to ideal solution) method to obtain the optimal spot of site selection. Finally, an empirical case reveals the feasibility of the primary results developed in this paper.
M.Clement Joe Anand, A.Victor Devadoss (2013): Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is the best method to find out the ideal solution of the problem. In recent years, TOPSIS has been widely applied to many fields with good results such as marketing strategy selection, mechatronic system optimization, network security management, location planning for urban distribution centers, business competition evaluation, irrigation water pricing decision making, 4 emergency management, low carbon development evaluation, spaceflight mission planning, Environmental Science. This is the first time we study the causes of suicidal thought in domestic violence using TOPSIS Method. This paper has four sections. Section one gives the introduction to the suicide thought. Second section gives the Algorithm of TOPSIS method is explained. In section three we derive the framework of the research topic. Final section gives the conclusion based on our study.

Mohammad Mahmoudi Maymand, Yousof Malek Mirzaei and Naeemeh Mohebi (2015): Marketing strategies in electronic markets has always been one of the major issues that have been addressed in the new areas of marketing. Studying these strategies is more important, since by entering into the world of e- commerce and using new tools in new areas of technology and business, firms will be forced to use new business strategies in order to prepare themselves for new competitive pressures. The results suggest that marketing strategies in electronic markets can be divided into four categories of transactional marketing strategies, database marketing strategy, relationship marketing strategy and knowledge-based marketing strategy. Then in order to prioritise and select the e-marketing strategies and effective factors in their implementation the TOPSIS method is used. According to the results of

TOPSIS technique, among the e-marketing strategies, database marketing strategy has more weight and has a greater impact than other strategies. Also effective factors in e- marketing strategy will be prioritised and should be considered according to their weights and importance.

6 References

[1] Estimation & Capacity Management Team: A team of associates who are involved in the planning and management of workforce for a given project spread across a given time period.
[2] Demand Hours: The count of hours required to complete a given task by a role/ resource pool.
[3] Role/Resource Pool: Is a set of associates of a given skill that perform certain tasks / functions on a project.
[4] Production Month: A time standard used to plan and scope upcoming projects and mark associate availability. Generally, it spreads from the 15th of the previous month to the 14th of the current month. Example: Production Month of May 2016 ranges from 15th June 2016 to the 14th May 2016.
[5] Resourcing Report: The report generated which contains the upcoming projects along with its corresponding project type and resource pool prioritized using various factors including effective start date and project criticality.
[6] Resource Manager: The Manager responsible for the allocation of associates to the project based on the availability.
[7] Associate: The personnel working with Fidelity who's efforts lead to the sustenance and betterment of the company.
[8] Bandwidth: The net availability of the associate post deductions of his/her current allocations. It is calculated in hours.
[9] Past Experience: It is the count of the number of times an associate has worked on a particular project type.
[10] Project Performance: The ratio of the difference budgeted hours and the actual hours to the budgeted hours. Higher the ratio, higher the project credibility of the associate.
[11] Utilization: The ratio of actual hours clocked-in, to the available hours of the associate.
[12] Over Time: The difference between the actual hours clocked-in, to the maximum hours.
[13] Historical Data: The data containing the allocation experience, performance, utilisation and over time at an associate level of the previous fiscal years
[14] TOPSIS: The Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is a multi-criteria decision analysis method, which was originally developed by Hwang and Yoon in 1981 with further developments by Yoon in 1987, and Hwang, Lai and Liu in 1993.
[15] Mistake Proofing: Its Japanese equivalent poka-yoke (pronounced PO-ka yo- KAY), is the use of any automatic device or method that either makes it impossible for an error to occur or makes the error immediately obvious once it has occurred.

- *Avinash Karthik Sundarraj is working for Fidelity Business Services India Pvt Ltd., India, PH-+91 900 3080 232. E-mail: avi.karthik@mail.com*
- *Vinod Kumar D is working for Fidelity Business Services India Pvt Ltd., India, PH-+91 9972313914. E-mail: vinoddkumar@gmail.com*