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Use of Network Analysis Technique for Prioritizing Project Portfolio: A Case Study

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Abstract

Network analysis is widely used in the context of exploring social phenomena that involve disciplines such as economics, marketing and psychology. This work proposes the use of network analysis from an optics perspective as a strategic analytical intelligence tool, where it discusses its use as a support tool when prioritizing project portfolios. The research was defined through a case study carried out in a Brazilian bank, in which a specific scenario of the need to prioritize demands within the existing portfolio was considered, covering the period from 2018 to the first quarter of 2019. To study these scenarios, 2-mode networks were analyzed to visualize the context and measures of centrality degree, proximity and intermediation were also used to provide analytical intelligence in identifying the best options for negotiation and prioritization. It was concluded, through the information provided by the use of network analysis, that complex scenarios and difficulties for prioritization can be predictively diagnosed, as well as the centrality measures allow the identification of the best options for prioritization and selection and the view of the impacted areas to be involved in the negotiation. The use of network analysis technique as a support tool for decision making in the prioritization of projects portfolio is very promising and becomes potential as a new efficient option to be considered, evaluating its ability to provide analytical intelligence and insights predictive of the prioritization scenarios.

Keywords: Analytics; Network Analysis; Portfolio Prioritization; 2-mode network; Centrality Measures.

Use of Network Analysis Technique for Prioritizing Project Portfolio: A Case Study

1. Introduction

New business models and startups are changing the pattern of competition, causing consolidated companies to “disrupt historical operators and reformulate production, consumption, transport and delivery systems” (Schwab, 2016). Therefore, a resource adopted for the transformation of the company is the use of information technology, whose benefits obtained in projects were considered as a basic condition for the survival and competition of companies (Albertin & Albertin, 2016). Another important factor is the need for analytical intelligence – Kugler (2013) considers that “raising the level of intelligence in organizations is not optional; it is a question of survival”. Davenport, Harris & Morison (2010) observe that the application of tools and analytical intelligence make it possible for the company to identify new insights and serve as a knowledge support providing of information for action and decision making. Companies in the Brazilian banking sector that have historically been recognized for their technology adoption invested R$ 19.5 billion in the sector in 2018 (around US$ 5.34 billion, at the time). 80% of banks identified investment in analytics as one of the most recent innovation technologies (Federação Brasileira de Bancos [FEBRABAN] & Deloitte, 2018), representing 32% of the expenditures for new technologies.

Considering then the need for organizations to have information in a faster way in order to prioritize projects that meet strategic objectives, this work presents the use of an analytics technique called network analysis as an instrument when prioritizing projects in portfolio, providing analytical intelligence and views of predictive scenarios. This analysis is given through a case study in a Brazilian bank, which occupies a position among the four largest in Brazil considering shares listed on the stock exchange and total assets in 2018. It was developed through the exercise of technique in the project portfolio, using the RStudio statistical software and R programming language, with the demonstration of the results evaluated through network graphics and centrality measures. The network analysis technique, based on the mathematical graph theory, allows the study of the interdependence and connection properties between elements, called nodes or actors. It is a non-parametric technique, as well as decision trees, whose principle of utility lies in modeling the problem. This analytics technology, also known as graph analytics, will have significant disruptive potential over the next three to five years (Moore, 2019).

In a solid process like portfolio management, the current proposals for the evolution of the theme are based on new frameworks or adaptation of methodologies, and this proposal is based simply on providing existing information in a structured way when prioritizing projects, adding the analytical intelligence that makes it possible to exercise and explore scenarios to support decision making at the moment of prioritization, thus reflecting on an evolution from qualitative decision methods to more quantitative and therefore more objective methods.

The use of network analysis is largely related to social network analysis (SNA), which is commonly represented by studies with themes referenced to people or organizations. Considering that this type of analysis assesses the relationship between structures with the same or different characteristics, this model can be applied to other themes, generating value through the exercise of the relationship between structures, enabling the presentation of information that can assist in the performing predictive analyzes. Pondering this concept, the present work conducts an analysis of networks with the theme of project portfolio aiming to demonstrate how the application of the network analysis technique can contribute to the prioritization of projects in portfolio, providing the vision of the relationship of projects with competing areas for a predictive analysis of the impacts for the prioritization decision.

2. Theoretical Reference

2.1 Portfolio Management

The term portfolio is defined by the Project Management Institute [PMI] (2018) as a collection of “projects, programs, subsidiary portfolios and group-managed operations to achieve strategic objectives”. Portfolio management is a dynamic decision process, marked by uncertain and variable information, containing projects that are selected and prioritized, with the need to periodically review the projects contained in the portfolio (Cooper, Edgett & Kleinschmidt, 1999). Cooper, Edgett & Kleinschmidt (2000) argues the main difficulties for project portfolio management reflect on four issues: balancing resources (balancing the need for projects with the amount of available resources), prioritizing projects (obstacles begin to appear during execution), decisions in the absence of solid information (Go/No Go - investment decisions based on little or unreliable information) and many smaller projects in the portfolio (absence of more significant revenue generators). These authors also indicate that for an efficient project portfolio management, the quality of information must be improved, establishment of gates already creating a barrier for lower quality projects and a process that directly activates the executives, bringing a better understanding when prioritizing.

2.2 Analytics concept

In the references of the analytics theme, most of the literature is related to the extraction of perceptions and information of value through Business Intelligence (BI) and the analysis of Big Data. Analytics is one of the tools that allows the extraction of information through structured bases for generating reports and that is referenced by Chen, Chiang & Storey (2012) within the different fields of Text Analysis, Network Analysis, Web Analysis, Mobile Analytics and Big Data Analytics as an emerging opportunity in analytical research. For Davenport and Harris (2017) analytics is defined as the extensive use of data, statistical and qualitative analysis, explanatory and predictive models and fact-based management for actions and decision making. The analytics techniques are categorized by Davenport & Harris (2017) as descriptive, predictive, prescriptive and autonomous, where Gartner presents questions to identify these divisions (Hagerty, 2016), according to the definitions below:

- Descriptive Analysis: access to historical or current information, which can provide alerts, exploration or reports and which answer the question: "What happened?";
- Predictive Analysis: use of quantitative techniques (network analysis, segmentation, propensity and econometric analysis) in data from the past that can result in prediction of the future and that answer the question: “What will happen?”;
- Prescriptive Analysis: use of various quantitative techniques and technologies to identify ideal behaviors and actions that answer the question: "What should I do?";
- Autonomous Analysis: use of artificial intelligence or cognitive technologies to create and improve models and learn the data that in this case was identified by Gartner through the term diagnosis, and that answer the question: “Why did it happen?”.

2.3 Network Analysis

The computational representation of objects and their relationships is usually performed through a mathematical structure called graphs (Goldschmidt, Passos & Bezerra, 2015), which refers to mathematical abstractions that can represent a network. Networks are collections of nodes or vertices (nodes) joined by edges (edge), which capture the pattern of interactions between parts of a system (Newman, 2018) as well as the notion of elements in a system and their interconnection (Kolaczyk; Csárdi, 2014). The network demonstrated through the presentation of a graph structure allows us to acquire important information about its elements and their relationships, then dealing with the role of network analysis. In the analysis of a network, we can observe the situation in which an entity (node or vertex) can have a greater influence than others, and this identification can be evaluated through measures of centrality, which measure the importance of a vertex. The best-known measures of centrality are:

- Degree centrality (degree): represents the number of connections (edges) that affect the node; the greater the number of neighboring vertices a given vertex has, the greater its importance in the network (Goldschmidt et al., 2015), which allows identification to focus attention on the most influential elements (Newman, 2010);
- Proximity centrality (closeness): measures the cumulative (smallest) distance from each node to all others in the network; they are vertices where from it is the easiest way to reach other vertices (Goldschmidt et al., 2015), presenting the measure of the average distance from one vertex to other vertices (Newman, 2010);
- Centrality of intermediation (betweenness): measures how much a vertex intermediates the relationship between two other vertices being on the shortest path between them (Goldschmidt et al., 2015) and that they have power through their position within the network, which can be a guide to the influence that a vertex has on the flow of information among other vertices (Newman, 2010).

2.4 2-Mode Networks

In network analysis, when the behavior of vertices with common characteristics is observed, the graph designed for this network is called 1-mode (a mode). When comparisons are generated between two types of vertices with different characteristics, the network is called 2-mode (two modes), which is also known as bimodal or bipartite, representing relationships between two different types (Tsvetovat & Kouznetsov, 2011). The 2-mode networks, according to Tomaél & Marteleto (2013 apud Brusco, 2011) are characterized by the establishment of close relations between the two different sets of objects, where data are collected and the relationships between these structures are identified. These links "are considered as conductors of information and it is through them that one entity receives influence from the others".

According to Tomaél & Marteleto (2013), the 2-mode network can be represented by means of a matrix that registers the affiliation between the different entities (nodes) and also by means of a bipartite graph. The matrix is formed through the relationship between the two distinct nodes, where the existence of a connection between the nodes is identified. In the bipartite graph, the nodes are in two different sets, with their connections being made from one node in one set to the node in another set.

3. Case Study Scenario

3.1 Bank A: Brief history of the company

The company in this study is a large national private bank, which due to the confidentiality agreement for the performance of this analysis will be called Bank A, where the period from 2018 to the first quarter of 2019 was considered for analysis, with a portfolio of 7.096 demands. In 2015, Bank A began a transformation in the organizational structure of the Information Technology area, focused on efficiency in serving projects. Firstly, it defined the organization of a functional model, with the creation of technology boards specialized in the subjects of Architecture, Development, Engineering, Quality, Sustainability and centralized project portfolio management through the creation of the Portfolio Management, adopting the agile methodology as incremental process model for carrying out the projects. In 2017, Bank A redefined the project service model by creating 28 Delivery Business Tribes (DBT), which represented a grouping of subjects with synergy within the same distinct business and who would be responsible for the development and delivery of the projects. Each DBT was formed matrix by the technology teams of the specialized functional structures organized in a collection of squads, having as inspiration model the structure of service of projects of the company Spotify.

3.2 Bank A: Portfolio Composition Process

Following the strategies of organizational restructuring of the Information Technology area, Bank A organized all project demands in a Unified List of Demands Portfolio (ULDP), following an order of attendance following the prioritization based on strategic planning which is defined in the executive committee and reviewed quarterly. The Bank A categorizes demands into 3 main groups: Service to Regulatory Bodies, Risk for Operation and Financial Return, where this order also follows the characteristic of importance for the institution. In the service queue, there are exceptions that may occur in demands for Service to Regulatory Bodies or Risk for the Operation, being received at different periods of the quarterly calendar of the executive committee, going so far as to change the sequence of the ULDP, reflecting in a repriorization in the defined service order previously. After the conclusion of the ULDP for that quarter, the Portfolio Management, following the order of prioritization, sends the demands to the DBT, and they receive only the demands that have their business scope, becoming responsible for delivering the demand. The DBT responsible for a demand is called "Centralizer", and if there is a need to involve more DBT due to the shared scope, they are called "Associate" in that demand.

3.3 Bank A: Service of projects by the technology team

When a DBT is defined as Demand Centralizer, it then performs the service assessment and identifies whether other DBT need to participate to fulfill deliveries of this demand, then sending a service request to the Associates, who in turn perform the scope assessment, the capacity of available resources and DBT current service backlog. In this process of meeting demands, the same DBT can go through the following scenarios in parallel:

- Receive demands in which it will be called Centralizer;
- Be involved as an Associate, sharing a demand with other DBT(s);
- Receive priority demands outside the quarterly planning (such as demands for Service to Regulatory Bodies or Risk for Operation);
- Receive late involvement as an Associate, due to a deficiency in scope verification (superficial analysis) or scope change (incremental model process of agile methodology).
- To suffer changes in the scope of the ongoing project that impact the cost and deadline.

During this period, several meetings are held to evaluate attendance (which can take up to two weeks), holding impact assessment meetings, several decentralized negotiations in situations of competition in prioritization, the need for the involvement of several teams and a lack of depth in the visibility of risk, where this set of situations makes the process time consuming and exhausting.

4. Methodology

4.1 Research Type

The present work consists of presenting a panorama of analysis of portfolio prioritization with the identification of the existing scenarios in the competition of demands between the respective Delivery Business Tribe (DBT). Such scenarios are observed using network analysis, seeking to demonstrate how this analytics technique can contribute as predictive support, providing a visualization of the favorable or unfortunate possibilities available at the moment of prioritization decision. We opted for a methodological approach of case study, which investigates a contemporary and non-historical phenomenon, with quantitative evidence and can be a useful method for making an assessment (YIN, 2015). An applied research with qualitative characteristics was carried out through the collection of data from the projects of the Portfolio Management in the period from 2018 to the first quarter of 2019, carrying out a confidentiality agreement between the researchers and the company.

4.2 Data collection

The first step of the analysis was the selection of sources for data collection: base 1, of demand information originating from the market tool, base 2, which was an electronic spreadsheet handled by the Portfolio Management, adding information that was not included in the market tool and the base 3 with requests for involvement of DBT from a market tool.

Information on the demands present in base 1 (tool) and base 2 (spreadsheet) were consolidated, resulting in base 4 with a total of 7.096 demands in the portfolio. Following, a selection was made only of demands with status in execution, excluding canceled and completed ones to generate the necessary scenario of the current demands, which resulted in an amount of 4.490 demands in the study. To identify the demand in the study, a code masking was used, resulting in a reference like DEM associated with a sequential number, according to the order of demand in the portfolio, and for the name of DBT, the same concept was used, with the DBT associated with a sequential number, following the alphabetical order of the area names. After selecting the demands, it was time to verify the base 3 that has all the requests for involvement. First, all approved requests were discarded as they would be attended by DBT, using only rejected requests for study, which for this reason leave the demands pending, without being able to complete their final delivery. For a demand to be executed and completed, all involvement must be approved for execution, otherwise, the demand will never be able to be completed, as it will have part of its scope pending execution.

4.3 Selection of DBT

To make more focused observations, it was defined to focus the study on the vision of a single DBT, and to simulate the options in this area for the prioritization scenarios. In order to select the best DBT for the study, the following criteria were considered: DBT having demands with characteristics of Centralizer and Associate, having demands shared with other DBTs and having pending requests for involvement. Considering these premises, DBT01 was selected, which in the Centralizer situation contained a portfolio of 66 demands in execution that had a shared scope with 21 DBT in total and, as an Associate, a portfolio of 162 demands in execution that had a shared scope with 27 DBT.

4.4 R and RStudio Statistical Software

For the analysis of networks and generation of network graphics, an open source tool called RStudio was used, which allows statistical analysis and has “software resources for data manipulation, calculation and graphical display” (The R Foundation). It is an integrated development environment (IDE - Integrated Development Environment) that has a console and a window that supports the execution of direct code and uses the R programming language to perform data and statistics analysis. R is a computer language and a tool for data analysis aimed at solving statistical problems. According to the IEEE Spectrum classification of the main programming languages, the R language occupies the seventh place in the ranking, being a specialized language for manipulating statistics and big data (Cass, 2018). The packages made available by R are free and publicly accessible, and information on their use as well as the main packages can be found on the CRAN website (Comprehensive R Archive Network).

5. Presentation and Analysis of Results

5.1 2-mode network: Pending engagement requests

The 2-mode network represents the comparison between nodes with different characteristics, and the first situation analyzed refers to the pending approval of the involvement as a Member of the DBT to carry out a demand. To demonstrate this situation between the competing demands in requests with the number of orders and the DBT that were related, a 2-mode network was generated, using R's visNetwork package, which allows interactive network visualization. For the design of this 2-mode network, two types of nodes were considered, the first node referring to demand (represented by the gray diamond) and the second node referring to DBT (represented by the circles in blue and red).

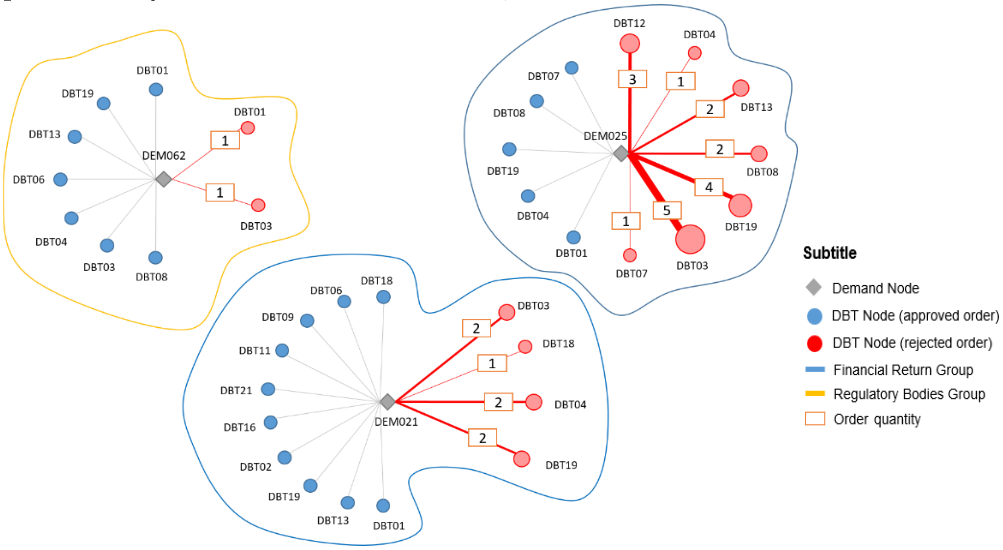


Figure 1: Representation of the 2-mode network: requests for involvement (DEM and DBT)
(Source: Developed by the Authors)

The DBT nodes were identified differently, where the blue circle identifies the DBT that accepted the involvement as Associates, and the nodes with red circles those that refused. The same demand may have accepted and refused involvement requests with the same DBT, as the scope of each request may belong to squads different from this DBT, which have different service capacity plans. The functions of the visNetwork package allow a series of implementations that assist in visualization, and in this analysis a grouping was applied to define areas, identifying the demands classified as Financial Return with a blue line and the demands of Service to Regulatory Bodies in yellow. Another function of the visNetwork package is demonstrated in the representation of the number of involvement refused, in which the thickness of the red line varies between thinner or thicker, following the value of the number of involvements. In the example in figure 1, a single involvement refused is shown by a thin red line, while the increase in the number of involvement refused shows a thicker line, as can be seen in the demonstration of the number of five involvements refused.

For the generation of this model, two files edited in the excel electronic spreadsheet with extension .csv (comma-separated variable) were used, one with the identification of the demands and DBT and the other with the relationship matrix between them. Simply evaluating the scenario, DEM062 has two pending approval related to two DBT (DBT01 and DBT03) to negotiate, while DEM021 demand has seven order pending with four DBT. DEM025 represents the most complex, with eighteen pending orders related to seven DBT, 50% of which are concentrated in two specific DBT (DBT03 and DBT19). DEM062 has priority classification for being Service to Regulatory Bodies (area highlighted in yellow), which in this case, according to the order of importance of this classification in Bank A, needs to prioritize service more than the others evaluated. Having the knowledge that the DEM062 demand will need to be met, now the process will be to use the 2-mode network to evaluate the portfolio in progress, and to identify the best selection for the prioritization evaluation of the portfolio in execution.

5.2 2-mode network: Elegible Demands for Repriorization

After defining the priority of the DEM062 demand for service, the next step was to check the portfolio in progress, analyzing the other demands contained therein and their relationships with the respective DBTs involved. In the data source, only the demands in execution that involved DBT01 and DBT03 were selected simultaneously, considering that the negotiation for reprioritization within the portfolio would be more effective. With the selection defined, a relationship matrix was generated between the demands and the DBT, indicating the existence or not of a connection between them. Through this matrix, a 2-mode network was generated using the GPLOT function, which produces a two-dimensional graph, where the "twomode" argument was included, which represents that the data must be interpreted as two modes.

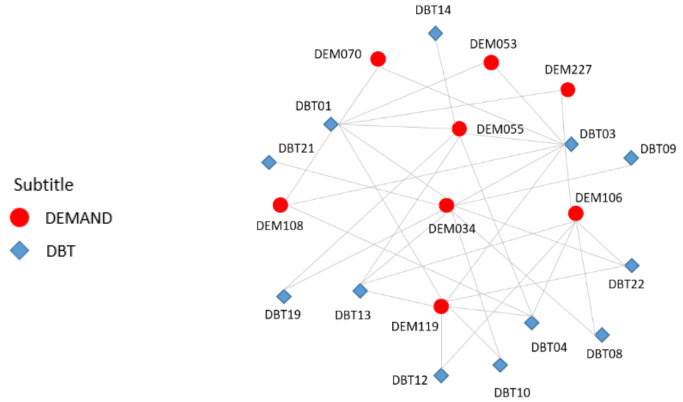


Figure 2: Representation of the 2-mode network: demands eligible for reprioritization (Source: Developed by the Authors)

The network was represented in figure 2, where the relationship in two ways is demonstrated through the connection between the demands and DBT, where the nodes in the shape of red circles are the demands, and the nodes represented by blue diamonds are the DBT.

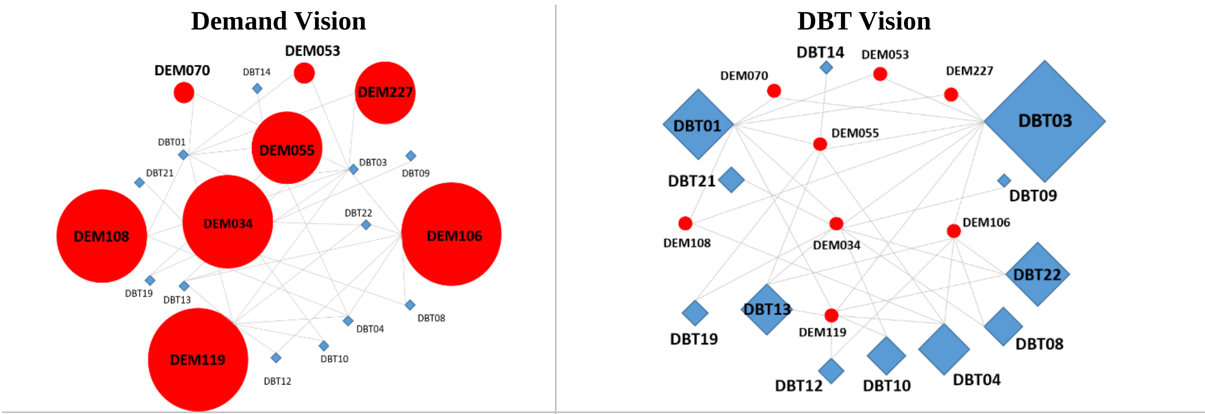
With a view of the demands and their relationships with DBT, it is possible to quickly identify that certain demands have a greater amount of involvement with some DBT than others. For the definition of the best option for the repriorization negotiation, centrality measures will be used, using the techniques of centrality degree, proximity centrality and intermediation centrality.

5.3 2-mode network: Centrality of Degree (degree)

To measure the centrality of degree, the "degree" function was used, with the graph visualized through the "gplot" function with the "twomode" arguments representing the network in two ways, the nodes being represented by the red circles the demands and the nodes represented by blue diamonds the DBT, and the "indegree" argument, which returns the number of connections received at each node.

Just to demonstrate a better view of the connections of the centrality of degree, two representations were separated in figure 3, with the left side showing the demands only, while the right one highlights the DBT view.

Below each figure, there is information on the number of connections identified through the "degree" function.



Function: "degree"

DEM227	DEM053	DEM070	DEM106	DEM108	DEM119	DEM055	DEM034
6	2	2	10	9	10	7	9

Function: "degree"

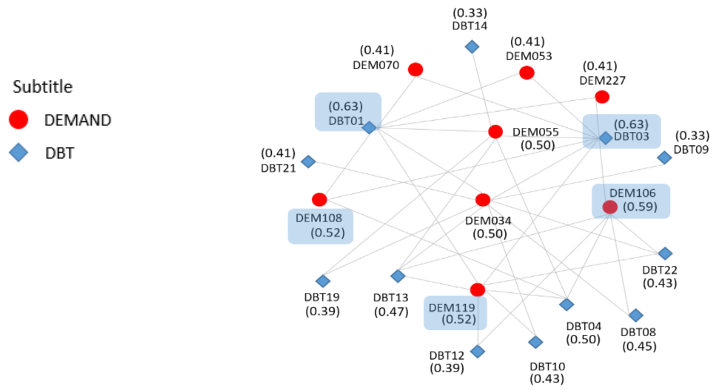
DBT03	DBT04	DBT22	DBT01	DBT08	DBT09	DBT10	DBT12	DBT13	DBT14	DBT19	DBT21
17	4	5	11	3	1	3	2	4	1	2	2

Figure 3: Representation of the 2-mode network: centrality of degree (degree) (Source: Developed by the Authors).

Visually considering the node size and the connection information provided by the "degree" function just below the image of each network, it is possible to identify two possible candidate demands for the reprioritization negotiation, these being the DEM053 and DEM070 demands. Both have the least number of relationships (two connections) with NETs and are also related only to DBT01 and DBT03. Likewise, the DEM106, DEM119, DEM108 and DEM034 demands have higher grade centralities, thus reflecting as less indicated options because they have the largest number of connections, resulting in a more complex prioritization negotiation, due to the number of links with DBT.

5.4 2-mode network: Proximity Centrality (closeness)

To visualize the closeness centrality (closeness) the function "closeness" was used, with the visualization of the graph through the function "gplot" with the arguments "twomode" representing the network in two modes. The nodes represented by the red circles are the demands and the nodes represented by blue diamonds the DBT, and the formatting of the number that represents the proximity value was defined with a limit of two tenths in the visualization. Figure 4 shows the values of the centrality of proximity to the demands and DBT, where the demands and DBT that have greater communication with the others were highlighted with blue boxes.



Function "closeness"			
DEM227	0.41	DBT22	0.43
DEM053	0.41	DBT01	0.63
DEM070	0.41	DBT08	0.45
DEM106	0.59	DBT09	0.33
DEM108	0.52	DBT10	0.43
DEM119	0.52	DBT12	0.39
DEM055	0.50	DBT13	0.47
DEM034	0.50	DBT14	0.33
DBT03	0.63	DBT19	0.39
DBT04	0.50	DBT21	0.41

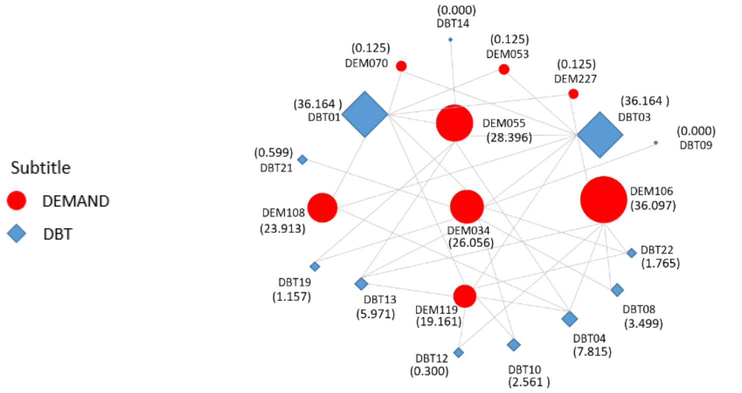
Figure 4: Representation of the 2-mode network: centrality of proximity (closeness) (Source: Developed by the Authors)

In the observation, the demands that have a greater degree of proximity are DEM106, DEM108 and DEM119, which represents for the study the demands with greater complexity at the time of prioritization assessment, as they are the ones that are most related to a high number of DBT. The demands that showed the lowest degree of proximity to the DBT, including the same value calculated at the centrality of proximity were the DEM053, DEM070 and DEM227 demands, being those that would cause less complexity for the negotiation scenario for the reprioritization with the DBT involved , looking at the proximity to the low number of DBT.

5.5 2-mode network: Intermediation centrality (betweenness)

In the calculation of the centrality of intermediation (betweenness), the function "betweenness" was used, with the visualization of the graph through the function "gplot" with the arguments "twomode" representing the network in two modes. The "vertex.cex" argument was indicated with division by three, where it receives the measurement of each node staggered according to its intermediation centrality, where this division was used so that the nodes can be visualized, otherwise they would cause overlap in the visualization of the nodes.

The number representing the intermediation centrality value was defined with a limit of three tenths in the visualization. The measure of intermediation centrality in figure 5 demonstrates first assessing DBT, that DBT09 and DBT14 do not influence the communication path with other vertices, being exclusively related to each demand. DBT03 and DBT01, as described in the proximity assessment, in which the participation of both was a mandatory premise for selection, reflected in the greater result of the degree of intermediation, which are then the most influential vertices.



Function "betweenness"			
DEM227	0.125	DBT22	1.765
DEM053	0.125	DBT01	36.164
DEM070	0.125	DBT08	3.499
DEM106	36.097	DBT09	0.000
DEM108	23.913	DBT10	2.561
DEM119	19.161	DBT12	0.39
DEM055	28.396	DBT13	0.47
DEM034	26.056	DBT14	0.33
DBT03	36.164	DBT19	0.39
DBT04	7.815	DBT21	0.41

Figure 5: Representation of the 2-mode network: centralization of intermediation
(Source: Developed by the Authors)

Assessing the demand nodes, DEM106 is the one with the highest degree of intermediation, which identifies in the study that this would not be a good candidate for repriorization, since it has a strong influence with the other DBT nodes. This would result in greater negotiation complexity due to the greater amount of relationship between DBT that would be involved in the reprioritization discussion. Likewise, the demands DEM034 and DEM055 follow, which occupy the sequence of second and third places with the highest degree of intermediation, resulting in the same scenario as DEM106. For the case studied, the best scenario for selecting demands for reprioritization using this measure would be the one with the lowest degree of demand intermediation, and with this consideration the best options result in demands DEM053, DEM070 and DEM227.

6. Conclusion

To start the discussion of the conclusion, we begin by evaluating the results provided by the graphs and measures of centrality, where in the graphical representation of the demand map related to the respective DBT, it is already possible to have a broad view of this portfolio in a simple way. Using the first measure of centrality of the study, the degree centrality (degree),

the best options were identified from the perspective of this measure, being then the demands DEM053 and DEM070, having the least number of connections with DBT. In contrast to the demands DEM106, DEM119 and DEM034, with high degrees of centrality, they would reflect in more complex prioritization negotiations as they have a greater number of links with DBT.
Observing the measure of closeness degree (closeness), the best selection scenarios were indicated by the demands DEM053, DEM070 and DEM227. These showed the lowest degree of proximity to DBT, unlike the demands DEM106, DEM108 and DEM119, which have the highest proximity values, impacting most DBT for the prioritization negotiation scenario. Finally, the measure of intermediation (betweenness) presented DEM053, DEM070 and DEM227 as the best options, and DEM034, DEM055 and DEM106 were less indicated.

For the representation of the results of the centrality measures, the analysis of the results of the measures were concentrated only in the most representative ones to indicate the best and worst options, and unanimously, the demands DEM053 and DEM070 presented the best selection scenarios for repriorization, according to with the amount of relationships and connections with DBT. The worst view was identified in the DEM106 demand, with the presentation of results of the measures indicating that this demand would bring the most complex scenario for the discussion of reprioritization with DBT. Thus, decision making for the prioritization negotiation would be considering a more assertive scenario, already segregating the demands that would present more complex negotiation scenarios due to its relationship with DBT, and containing the visualization of the most promising scenarios, increasing the analytical capacity. decision makers, providing the necessary information for the evaluation.

But, this work demonstrates that it is not just a matter of considering which demands with more DBT involved are the most complex to be prioritized, but which are the demands to be negotiated and which DBT in which these negotiations can occur, already indicating what the impact on the portfolio on both sides. A DBT can have several squads to attend to, having a considerable number of demands executed in parallel, and exploring demands and other related areas, being able to set up an impact analysis and understand who should be involved in the prioritization negotiation, and what is advisable or not to be negotiated.

The work concludes that the results obtained in the study can contribute as a technical option to be used when prioritizing the project portfolio, in addition to presenting another perspective for the use of network analysis considering the relationship structure between projects and impacted areas, bringing analytical intelligence to the business. For this, it considers data capture by structuring information without the support of people, the need for tools or frameworks, and allowing simulation of scenarios with a predictive view of the situations to be considered. This context supports decision making with fewer dependencies, bringing speed in obtaining information, together with assertiveness, given the possibility of exercising the scenarios proposed for the assessment.

This work focused on the prioritization stage of the project portfolio, but we understand that it can be expanded within other themes of portfolio management such as the evaluation, categorization and selection process, as well as other insights within the broad theme can also be explored of SNA, with comprehensive potential for interesting assessments on the use of this analytical technique. Despite the limitations intrinsic to the experiment scenario, the technique was successfully used and the results demonstrate that it can be applied in project portfolio prioritization scenarios, thus representing a performance gain for this process.

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