



Project portfolio management applied to an electronic company

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Portfolio management allows the alignment between the set of efforts developed in the business scope and its strategic objectives. However, in addition to the misallocation of resources employed, with the increase in the number of projects, this activity becomes even more complex. This article aims to present a guide for prioritizing projects that includes not only quantitative or financial data, but also qualitative information about the projects. The intention is to assist in the decision-making process adjusted to multiple projects. To this end, the strategic objectives, candidate projects, as well as budgetary constraints are raised by the company participating in the case study. The guide made it possible to prioritize executable projects within the objective and financial limitations of the company in the studied electronic business. Due to the replicability factor, the study allows for conducting in different companies and types of projects

Keywords: Analytic Hierarchy Process, Multi-Criteria Analysis, PPM, Strategic Planning.

1. Introduction

Due to the advent of globalization, companies from all sectors are reinventing themselves in their processes, improving them in the most diverse aspects with the help of project management methods and techniques with a view to reducing costs and increasing competitiveness (SANTOS *et al.*, 2016; CHATTERJEE *et al.*, 2018).

Project Portfolio Management (PPM) has emerged as a strong ally of organizations in order to facilitate and achieve the proposed strategic objectives, facilitating decision making and supporting top management for an assertive project selection (LOUREIRO *et al.*, 2018; DANESH *et al.*, 2018). In regard to the aforementioned findings, it is noted that within the PPM, the selection and prioritization of projects is the most relevant element of other activities. This is illustrated, according to Loureiro *et al.*, (2018) due to its management encompassing the entire life cycle of projects, portfolio information flows, and foreseeing steps determined at the beginning of the activities in order to analyze financial and non-financial criteria, from new ideas to new products.

In this context, one can see that global market changes are increasing, as well as customer demand for products and services that perform well, with reduced costs and maximum quality. However, it is observed that organizations spend less time focusing on their routine activities, which are often their core activities, and spend significant time in trying to manage projects (JAFARZADEH *et al.*, 2018).

In organizations that have their scope based on projects, it is necessary to allocate resources efficiently, since they are limited and interfere directly in the organizational strategic planning. Furthermore, with the increasing number of projects, it can be observed that the selection and prioritization of projects in a complex business environment requires satisfactory and appropriate decisions to the unique business context (CHATTERJEE *et al.*, 2018).

In the meantime, it is inferred that the PPM perspective, responsible for prioritizing, selecting, and closing projects, is an active part from the formulation of organizational strategies to the implementation of the project as a whole. Moreover, these projects that the PPM acts can be emergent (without the formal strategic process) or initiated from the strategic planning (using the cascade effect), structuring the organizational strategic bases with an implementation roadmap (KOPMANN *et al.*, 2017).

In contrast, company ABC presents problems related to resource over-allocation, decision making based on stakeholder power, lack of strategic alignment, low-quality portfolio selection,

and difficulty in cancelling projects. All the mentioned aspects can be better managed with a systematic and efficient project portfolio management.

The objective is to prioritize the organization's projects according to its requirements and constraints. This objective occurs as the complexity of PPM increases due to the exposed organizational variables, as well as in the question of the numerous possible techniques to be applied. In general, according to Borhy *et al.* (2019), the use of purely financial strategies can be misleading to the organization; thus, to avoid such inaccuracies, different methods can be used and combined with distinct strategic approaches to balance the portfolio and align it with strategic planning.

In summary, a systematic decision support method for selecting and prioritizing projects was created for ABC that could select and locate in time the implementation of these projects by means of a schedule. The management, organization and prioritization of organizational projects in a single portfolio using Project Portfolio Management (PPM) collaborates and assists decision makers from different models.

However, according to Loureiro *et al.*, (2018), the prioritization of projects through PPM is a highly complex task, due to the many different factors that must be considered in any variant of projects, such as: costs, resources and deadlines. Thus, the use of AHP to assist ABC in its decision-making processes is of significant importance when applied to the PPM, thus enabling an appropriate, assertive, and potentialized solution for ABC's projects.

2. Project Management

A project can be defined in many ways depending on the context but the project management defined a project as “a temporary endeavor undertaken to create a unique product, service or result” (PMBOK, 201). For Silvius and Schipper (2014), projects are implemented to achieve a certain goal and selected objectives.

For PRINCE2 the project management (PM) is the development of project deliverable, known as products, which produce the project results, controlling work expertise needed to create the project products (AXELOS, 2017). In addition to the iron triangle objectives of scope, time, and cost, companies are increasingly concerned with a project's broader benefits and value. (KIVILA *et al.*, 2017).

The over focus on delivering triangle performance measures can create an “output-focused” mentality. For Badewi (2016) and Chihh & Zwikael (2015) “output-focused” mentality creates problems at the organizational and individual level. At the organizational level, the problem is

limiting the effectiveness of the organization to realize benefits from its projects. At the individual level when inexperienced project managers tend to focus more on iron triangle performance measures than on customer satisfaction measures.

The application of project management contributes to generating business results that can create economic value and sustainable advantage (MARTENS & CARVALHO, 2017). Economic and sustainable value allows organizations to link their results with the business objectives, compete effectively in their support and respond to the impact of changing business environments (PMI, 2013).

3. Project portfolio management

The project prioritization helps a company remain focused on its most important strategic objectives, as it more effectively allocates scarce resources. It is the process of evaluating individuals or groups of projects and then choosing to implement those that help achieve their goals (MEREDITH *et al.*, 2017; RUDNIK *et al.*, 2021).

For Huang *et al.*, (2016) project selection is a scenario where an appropriate combination of projects having a potential to maximize total profit of a company will be selected. The Project Portfolio Management (PPM) is regarded as a business strategy for management that intends to pinpoint on selection. This is based on priorities and incorporation as well as control concerning multi-project prevailing in contemporary organizations (RAJABI & BHEIRY, 2020).

For Verissimo and Goldman (2017) its main objectives of PPM are to identify, select, finance, monitor and carry out an appropriate combination of projects and initiatives to achieve as goals and objectives or achievements. Plentiful research has been carried out to formulate tools and techniques required for selection of projects or evaluation of portfolios (PEREZ *et al.*, 2018; VILLACRESES *et al.*, 2017).

Eriksson (2013) affirms abundant research is carried out concerning global PPM standards together with the development of practical toolkits. Thus, PPM not only frames the process of translating a corporate strategy into a project roadmap for implementation, but also provides the oversight of the project landscape that comprises the grassroots of emergent strategies (KOPMANN *et al.*, 2017).

3. Analytic hierarchy process

The Analytic Hierarchy Process (AHP) was developed by Saaty in 1980 and since is one of the most inclusive systems for multi-criteria decision making. The best part in this type of analysis

is that multiple criteria give a balanced view of the problem. It looks at the problem in totality by incorporating all the relevant criteria (KARASAKAL; AKER, 2017; HO; MA, 2018; KHAIRA; DWIVEDI, 2018; ZANDI *et al.*, 2020).

It also evaluates a set of alternatives and creates a final question by splitting decision making into many sub-problems that are equal and can be solved by summarizing sub-problems in which results of the initial problem are evaluated (WU; TSAI, 2011). Khaira and Dwivedi (2018) affirm a typical AHP problem starts by defining the issue preceded by identifying the goal to achieve, pairwise comparison of components with respect to criteria and at last structure them as a hierarchy that resembles a family tree which is viewed as a logical and organized form in representing the problem.

Marinis and Salis (2020) describe in their research that literature shows Analytic Hierarchy Process, among other techniques and tools, can be used as a ‘bottom-up’ participatory method, working as a consensus-building tool to enable stakeholders to discuss single criteria and weights to understand each other’s viewpoint in iterative decisions processes.

Improta *et al.*, (2018) assert that literature review demonstrates that AHP was initially used alone and with the increase in researchers’ confidence, it began to be applied in combination with other mathematical techniques or modified versions. It can be confirmed the use of AHP extends in several sectors such as hospitals applied to assess the impact and the efficacy of treatments and therapies (RAHMAN *et al.*, 2016; IMPROTA *et al.*, 2018), agriculture (ZANDI *et al.*, 2020), civil construction (RAJABI; BHEIRY, 2020) and as a tool to select sustainable projects (KUDRATOVA *et al.*, 2018).

4. Methodology

The company operates in the electronics sector, sells refrigerators, stoves, washing machines and air conditioners. It markets its products in Brazil and Latin America. It is part of its mission to digitize the business and increase the demand for its products and its business value is sustainability. For this paper were considered elements establish by the project team as criteria to use the Analytic Hierarchy Process, presented below.

- Organizational objectives;

In its strategic planning, the organization defined four objectives, which were considered by the team to establish the criteria for prioritizing projects. The objectives are:

- a) To increase the company's profitability (financial);
- b) To increase the public served (client);

- c) To reduce WIP crossing times (internal);
- d) To increase team satisfaction (learning), for each of them, the company defines goals and indicators.
 - Ongoing projects;

Eight projects were already underway, which was also considered by the project team. The projects are:

- a) Product A, Product B, Fixed cost scanning project (objective 1 to increase the company's profitability);
- b) Customer Satisfaction Research Project (objective 2 to expand the public served);
- c) TRF Implementation, Basic Stability Project (objective 3 to reduce WIP crossing times) and
- d) 360 ° feedback project, performance-based profit-sharing project (objective 4 to increase team satisfaction).
 - Goals;

For each objective the company defined goals, which were considered by the project team when establishing weights for each proposal. The objectives and goals were as follows:

- a) Objective 1: increase the company's profitability; Goal: increase profitability by 15%;
- b) Objective 2: expand the public served; Goal: increase 10% of the customer base per year;
- c) Objective 3: reduce Work in Process (WIP) crossing times; Goal: reduce the WIP by 15%;
- d) Objective 4: increase team satisfaction; Goal: 80% job satisfaction.
 - Projects budgets;

Considering that the team received six project proposals and the budget made available is R\$ 200,000.00 per month, the monthly costs and daily costs were calculated as well as the execution time. According to the available budget and the monthly restriction, the deadline is considered to be 19.7 months.

5. Results

The following criteria were defined for the selection and prioritization of projects: (1) Costs; (2) Image; (3) Sustainability. The project portfolio was analyzed considering the criteria established by the project team as shown in Figure 1.

Figure 1 – Project Portfolio

Project	Budget (R\$)	Monthly Budget (R\$)	Execution Time		Cost/day (R\$)
			Days	Months	
Social	3.120.440,00	304.433,17	205	10,25	15.221,66
ADL 4.0	450.000,00	118.421,05	76	3,80	5.921,05
Kanban	12.000	18.461,54	13	0,65	923,08
Omnichannel	300.000	50.420,17	119	5,95	2.521,01
Waste Management	65.000	18.055,56	72	3,60	902,78
Total Cost: R\$ 3.947.440,00 Monthly Budget: R\$ 200.000,00 Time Restriction: 19,7 months					

Source: Authors (2021)

Such criteria were established after analyzing each proposal to assist in the selection, the AHP methodology was applied because it is a method that allows dealing with complex problems in which there is a need to consider a different number of variables for decision making and allows specialists to assign weights to each variable.

5.1 Projects portfolio selection

The AHP methodology devised by Saaty (1980) is fundamentally based on the construction of three steps:

- a) Creation of the hierarchical structure of the problem;
- b) Elaboration of a criteria comparison matrix in pairs;
- c) Calculation of the consistency of the values arising from the decision-making process.

Based on the results obtained from the criteria comparison matrix and with the objectives explained in Figure 2 it is concluded that the priority of initiation is the ADL project with a percentage of 30%, followed by the Omnichannel Project (22%), Kanban in third with 19%, waste management (16%) and, finally, social project with 12% on the scale defined by the AHP.

Figure 2 - Phase 1 Prioritizing by AHP model

1 st Month Project	AHP Percentage	Budget (thousand R\$)	Cost Priority Rank
ADL 4.0	60%	120	1
Omnichannel	25%	50	2
Kanban	6%	12	3
Waste Management	5%	10	4
Social	4%	8	5
Total	100%	200	

Source: Authors (2021)

After the hierarchy of criteria (Image, Costs and Sustainability) listed in conjunction with the projects (Waste Management, ADL, Omni, Kanban and Social). It was possible to normalize the matrix and define the priority vector for each criterion. The result is shown in Figure 3, 4, 5 and 6 with an RC consistency level of 0.0567.

Figure 3 – Phase 2 Prioritizing by AHP model

2 nd and 3 rd Month Project	AHP Percentage	Budget (thousand R\$)	Cost Priority Rank
ADL 4.0	60%	120	1
Omnichannel	25%	50	2
Waste Management	10%	20	3
Social	5%	10	4
Total	100%	200	

Source: Authors (2021)

Figure 4 – Phase 3 Prioritizing by AHP model

4th Month Project	AHP Percentage	Budget (thousand R\$)	Cost Priority Rank
ADL 4.0	45%	90	1
Omnichannel	25%	50	2
Waste Management	7,5%	15	3
Social	22,5%	45	4
Total	100%	200	

Source: Authors (2021)

Figure 5 – Phase 4 Prioritizing by AHP model

5th and 6th Month Project	AHP Percentage	Budget (thousand R\$)	Cost Priority Rank
Omnichannel	25%	50	1
Social	75%	150	2
Total	100%	200	

Source: Authors (2021)

Figure 6 – Phase 5 Prioritizing by AHP model

7th to 20th Month Project	AHP Percentage	Budget (thousand R\$)	Cost Priority Rank
Social	100%	200	1
Total	100%	200	

Source: Authors (2021)

The final control of the Projects portfolio, regarding execution time and cost is simplified according to Figure 7.

Figure 7 – Projects Execution Time and Cost

Priority / Project	Budget (thousand R\$)	Days	Monthly Cost (thousand R\$)								Total (thousand R\$)	
			1	2	3	4	5	6	7-19	20		
1. ADL 4.0	450	76	120	120	120	90						450
2. Omni	300	119	50	50	50	50	50	50				300
3. Kanban	12	13	12									12
4. Waste Management	65	72	10	20	20	15						65
5. Social	3120,44	205	8	10	10	45	150	150	200	147		3.120
Total	3947,44		200	200	200	200	200	200	200	147		3.947,44
Budget Monthly Restriction: R\$ 200.000,00 Time Restriction: 19,7 months												

Source: Authors (2021)

Due to the restriction of the monthly budget (budget) of R \$ 200,000.00, the Portfolio Management group defined the strategy for dividing resources as follows, obeying the priority created by the model. Only the Social Seal Project had to be readjusted in relation to the initially planned execution time from 205 days to 425 days due to the limited budget defined by the organization.

6. Conclusion

Due to the difficulty of selecting the most important project, the AHP method was applied to assist the decision making of the project portfolio management group. The selection criteria of the projects were crossed in pairs and the group defined the relevant criteria based on the premises of Cost, Sustainability and Image to assist in the decision-making process. The consistency of the model's result was validated by calculating the consistency relationship with the value 0.0567 where it proved its relevance, as it was below the 0.10 limit of the model proposed by Saaty.

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