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Prioritization Model for IT Project Portfolio Management in Private University: A Literature Review

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Abstract

The swift progress of technology can be harnessed to address the increasing demand for projects, particularly in various organizations like private universities that must cope with resource limitations and make critical decisions. Information Technology (IT) encompasses any technology, such as equipment or techniques, employed by businesses, institutions, or other organizations to process information, including computing, telecommunications technologies, consumer electronics, and broadcasting, as it increasingly digitizes. Choosing between dozens or hundreds of project alternatives presents complex multi-criteria decision-making problems for an organization's portfolio and priorities, necessitating clear-cut techniques, methods, and factor definitions for prioritizing decision-making. This literature review formulates the problem, specifically identifying the criteria for comparison and prioritization models, and seeks a framework and methodology for prioritizing portfolio management in private organizations, particularly universities. The literature review identifies the characteristics of private organizations and the methodologies and practices employed in researching the application of portfolio management priorities and explores the use of portfolio management techniques from prior studies tested in practice and project priority methodologies in private services. The results contribute to enhancing theories on techniques, methods, and, particularly, portfolio project management priorities for the private sector.

Keywords: Project Prioritization, IT Project Portfolio Management, University Private Sector, Decision Making

1. INTRODUCTION

The evolution of communication and information technology has had a significant impact on various facets of life, accelerating global change. The need for data and information in decision-making permeates nearly all aspects of life, particularly in the organizational sphere of both business and non-business entities. Digital information technology facilitates and encourages improvements in acquiring, inputting, processing, and using data to generate more pertinent and useful information for specific decision-making purposes [1].

In a dynamic, service-oriented, and technology-rich academic campus environment, staff devote an increasing amount of time to devising and implementing new products and services to meet users' evolving needs. To be effective, organizations must be agile and efficient, able to detect trends and introduce new services while contending with budgetary constraints and limited resources [1]. While some initiatives are originated by upper management, service and workflow enhancement projects often stem from staff members who work in close proximity to users, observe how they operate, and understand their needs. Although this fosters a lively and innovative workplace, as formal and informal projects abound within an organization, staff may feel overwhelmed, undertaking new initiatives in addition to their ongoing college service [1].

Multitasking employees can easily become overwhelmed by their workload, and new projects, whether well-defined or not, can become drawn out due to a lack of clear priorities and dedicated resources [2]. Poor planning and oversight, unclear outcomes, and scope creep are just a few of the reasons why initiatives may not be completed, and this is precisely the problem that project management was created to address. In addition, not all academic users are familiar with information technology, and the investment in equipment is not always affordable [2]. Furthermore, developing a long-term information technology plan and strategy for higher education institutions is closely linked [1].

Translating a strategy into an information system development plan is risky because requirements can change due to global market influences and internal organizational policy changes, making it necessary to revise requirements specifications. This study examines the theoretical approach of portfolio management in the implementation of private higher education information systems [3]. The next step is to develop a planning model and implement portfolio management, which can serve as a guide for implementing IS/IT for private higher education institutions and make institutions more responsive to portfolio management demands from stakeholders. Both management and education imply the existence of an action process that must be followed to achieve specific goals [3].

Combining the two terms, higher education portfolio management can be defined as the process of effectively and efficiently managing and empowering all educational resources through the practices of planning, organizing, leadership, and control [4]. In essence, university portfolio management aims to organize the education sector, particularly educational institutions, to ensure that all management functions run smoothly and efficiently, thereby facilitating the proper attainment of educational goals [5].

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The study of the concept or model of project selection and prioritization is a broad area that has been extensively researched. No single definition is widely agreed upon and used as the basis for all related research. Previous studies have explored various frameworks, including the APM framework by Erik van Ramshorst in 2013, the APM framework by Simon et al. in 2010, project portfolio selection by Archer and Ghasemzadeh in 1999, strategic application of matrix information systems by McFarlan in the 1940s, and the portfolio approach to the assessment and prioritization of IS by John Ward in the 1990s [6].

To ensure the development of a model that best meets the needs of model building, research is conducted to determine the most suitable model and supporting theory to serve as the basis for building the paradigm. Additionally, a review of prior studies is carried out to serve as a reference and guide for the research, including the criteria used to evaluate the model that will be developed [6]. A comprehensive model was developed by the researchers, building on previous models through the study of relevant theories and concepts. The resulting model will assist private universities in determining their required information system services, the number of requested services, and the order in which they should be selected and prioritized for the implementation of private university information system applications [7].

The Applied Portfolio Management (APM) template originates from Modern Portfolio Theory (MPT), which was developed by Markowitz in the early 1950s. APM, also known as Application Portfolio Management, provides a step-by-step approach to creating business-driven metrics within existing applications by linking their components and cost of management and maintenance, while maintaining business process continuity, business value, and business metrics [8]. According to Marcus Adamsson, APM is a tool and methodology used to evaluate how existing solutions can help achieve business goals and fine-tune what needs to be done for implementation, namely: (1) maximizing business value, (2) ensuring the right architecture, (3) supporting transformation planning, and (4) minimizing business risk, as based on Adamsson's 2013 research [9].

The APM framework has been studied in various research works. According to Simon D. in 2010, who conducted research on Application Portfolio Management - Integration Framework and Software Tool Evaluation Approach, the APM framework can reduce the level of complexity in the application landscape [9]. From the processes included in the APM, it can provide space to address the modified assessment technique. Therefore, the APM framework will be used as a primary reference to prepare an online utility application portfolio management process, with detailed explanations of the steps that can support the internal processes.

The theory of university or university management is founded on the theory of corporate property management (CREM), which is incorporated into stakeholder theory that emanates from sociology, organizational behavior, politics of vested interests, and managers' self-interest [10]. Campus management is geared towards facilitating the university's operation in the most efficient way possible by integrating the viewpoints of all stakeholders into the management process. This is achieved by taking into account aspects such as location, conditions, quality (physical perspective), user needs (functional perspective), benefits and costs (financial perspective), and institutional goals (organizational perspective) [11].

The four perspectives, and their corresponding 12 campus goals, have an impact on sustainability, user productivity and well-being, university profitability, and competitive advantage. Sustainability can be achieved through the reduction of the footprint (for example, energy consumption and CO2 emissions) and the more efficient use of space, by periodically upgrading and sharing facilities with third parties [11]. Furthermore, increased user productivity and satisfaction can be achieved by supporting their activities, such as learning, teaching, and research. This can be done by creating an attractive and comfortable physical environment that meets the evolving expectations of users and increasing the flexibility of buildings and interiors [12].

2. METHODS

2.1. Research Questions

The aim of this literature review is to comprehend and consolidate the preferred model of application portfolio management, especially in private universities. To accomplish this objective, it is essential to develop research problems or questions (RQs). From this point, two primary RQs will be addressed, namely:

a) RQ1: What are the components of a comprehensive comparative model for creating a preferred model of applied portfolio management in private universities?
b) RQ2: What is the suitable methodology and framework for developing a preference model of applied portfolio management in private universities?

2.2. Literature Search Process

The search process for this study, including the online databases used, is presented in Table 1. The data sources were obtained from existing conference papers and literature searches, and manual searches were no longer necessary. Relevant keywords were used to search and review the literature data sources related to the problem addressed in this study, specifically "university application portfolio

management," "private university portfolio project," "private sector portfolio project priority," "project prioritization for private university," and "project selection for private university." Table 2 displays the search results obtained using these keywords.

Table 1. Resource of literature search

Resource	URL
Science Direct	sciencedirect.com
Emerald	emeraldinsight.com
IEEE Xplore	ieeeexplorer.ieee.org
Google Schoolar	schoolar.google.com
Research Gate	researchgate.net
Springer	springer.com

Table 2. Result of literature search

Resource	URL	Literature Search
Science Direct	sciencedirect.com	35714
Emerald	emeraldinsight.com	2000
IEEE Xplore	ieeeexplorer.ieee.org	461
Google Schoolar	schoolar.google.com	222000
Research Gate	researchgate.net	not specific
Springer	springer.com	5925

As noted by D.D. Dang and S. Pekkola (2017), the selection of search results was performed by filtering the results based on predetermined criteria, which included inclusion and exclusion criteria. Inclusion criteria were based on search results in English from a predefined online database [5]. The literature search yielded the latest journals and conferences from the past ten years related to prioritizing project portfolio management in private universities. Exclusion criteria included non-English research, books, theses, journals, or conferences published in the past year (excluding the last ten years) that were not related to preferences in project portfolio management in private universities. Short articles that fell under the exclusion criteria were also excluded. Based on the inclusion and exclusion criteria, 54 works were selected as references for this literature review.

The literature candidates were derived from the analysis of the literature titles and summaries. The next step involved selecting the documents based on the criteria described above, and the results of the document search are presented in Table 3..

Table 3. Segregation of literature search results

Resource	Found	Candidates	Selected
Science Direct	28	20	14
Emerald	17	12	5
IEEE Xplore	7	4	3
Google Schoolar	10	7	5
Research Gate	15	9	5
Springer	3	2	2

To ensure the quality and relevance of the literature review to the research topic, each online database's title, summary, overview, and digitization have been thoroughly read and assessed. The selection process resulted in 34 articles out of the total number of articles available in the online journal database. The selection steps were taken carefully and repeatedly to eliminate any errors and ensure that the selected journals were relevant to the research topic. During the analysis stage, the results of the literature review were mapped by the topics covered. The findings of the research literature analysis are presented in the literature analysis section.

2.3. Research Topic Analysis

The main focus of this document is on the development of research topics, particularly on the priority application of project portfolio management in private universities. The topic covered is the central theme of the document, and through topic analysis, potential future work can be identified. The topic analysis revealed two themes relevant to the priority topic of portfolio management, particularly in the context of private universities. These themes are described in the Table 4.

Table 4. Research topic analysis

Research Topic	Description
Portfolio Management Prioritization and Selection Techniques	Identify each project being worked on in the same portfolio, model evaluation with ranking criteria, establish a model for prioritizing projects, and determine the order of execution that ensures effective value the highest of the entire generated catalog.
Framework and Methodology	Framework and methodology for understanding project budgets, prioritizing project portfolios, and helping executives determine which projects should work and which should not.

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As private service decisions are rare, they must be well-supported. Therefore, it is essential to study the private sector context of IT project planning portfolio management to ensure that the decision model is suitable for the specific environment or conditions. Accordingly, research on management design techniques appears appropriate for developing and evaluating organizational decision support systems for managing a portfolio of information technology projects.

The main trend of recent years is the increasing number of contributions related to the context of portfolio management of information technology projects. This development is based on the perception that many literary articles are too numerous and limited in prioritizing projects and managing resource allocation without considering the environment or conditions of private organizations. While numerous empirical contributions regarding governance issues and success factors for prioritizing overall project management already exist, a number of in-depth investigations indicate that the large-scale empirical studies published to date cover a broad range of concepts and are only long-term integrated.

Therefore, the researcher recommends further investigative studies to develop an integrated and optimal framework and methodology. Additionally, the governance structure that prioritizes project portfolio management within the functions of private universities is constantly changing. While some contributions cover the topic of decision-making in the private sector, further in-depth coverage is necessary because of the significant value of practice and the development of job declaration.

3. RESULTS AND DISCUSSION

Several studies have criticized the rigidity of most approaches to prioritizing project portfolio management, which offer only a single solution and do not allow for customization or alternatives. This criticism is applicable to most approaches discussed in previous literature on case studies of private universities. However, at least seven decision support systems have been proposed that allow user interaction and an equal number of visual usage approaches to help users evaluate alternatives [13]. Additionally, it is widely recognized that portfolio management of information technology projects is a dynamic process that is subject to frequent changes due to unexpected new projects, changing required input and output parameters, the need for project reassessment, and the need to reallocate resources [14].

3.1. Prioritization in Project Portfolio Management

The project prioritization method used depends on the evaluator's personal preferences and the unique operating environment of the organization and industry. There are also detectable differences in the prioritization of IT projects between the private sector environment and previous studies. Critical factors emerge in prioritizing private sector IT projects that require project and senior management support. Mandatory projects are obviously adopted, and in prioritizing project techniques, various criteria can be considered. Criteria such as financial value, human resource efficiency, technology, project risk, people committed to the project, project size, and others have been proposed in previous studies [10]-[15].

3.2. Economic Prioritization Method

The economic method can be used to calculate the present benefits of a project or assess its financial risk. Various economic methods such as present value index, net present value, internal rate of return, expected net present value, and practical options, as well as financial criteria like capital budgeting techniques, can be used to select projects. A study by Cooper et al. in 2001 examined the most commonly used method in the decision-making process, and their results showed that the financial method is the most prevalent, even though it may not be the most suitable method to use independently. Different prospective methods have their own strengths and weaknesses, and in many cases, the economic method has shown better results when combined with other methods to achieve better outcomes [16]-[20].

3.3. Mathematical Prioritization Method

The mathematical method is designed to maximize the organization's net profit by selecting the optimal project from the list of projects in the portfolio. This is achieved through techniques such as linear, nonlinear, integer programming, objective and dynamic programming models that optimize specific target functions. The expected benefit of a particular project portfolio is taken into account while considering the resource constraints. These techniques have been extensively studied in literature and various models have been proposed to help decision-makers effectively evaluate the project portfolio and select the most suitable projects. These models have their own strengths and weaknesses and can be used in combination with other methods to achieve better results [21]-[25].

3.4. Multi Criteria Decision Prioritization Method

The choice of method for project prioritization depends on the number of criteria used in the prioritization process. Several decision-making models, such as AHP

(Analytic Hierarchy Process), Multi-Attribute Utility Technique (MAUT), and decision trees, use a multi-level framework to determine the best project alternative by placing objectives at a lower level and project alternatives at the bottom level. In the context of private universities, a fuzzy integrated approach that uses FAHP and FMOLP has been found to be an effective tool for prioritizing projects and reducing uncertainty caused by decision makers [20], [33].

The literature also proposes an effort to integrate the AHP method with DEA to determine the interval priority from the interval comparison matrix. Since the number of proposed projects can be quite large, pairwise comparisons may not be practical, and the AHP method is used only to assess the importance of the criteria, not to evaluate project proposals [20]. Another proposed approach is a combination of soft set theory and a hierarchical model of analysis, which has the advantage of being computationally simple, with low computational complexity for the proposed algorithm.

3.5. Assessment Prioritization Method

A multi-criteria assessment approach using this methodology may be particularly relevant in helping senior private sector executives prioritize IT investments based on a range of business objectives and key performance indicators that focus on achieving specific goals. This method is often easier to use than other approaches, making it more suitable for communicating with strategic IT decision-makers and providing clear criteria for decision-making within their areas of responsibility [26]-[30].

3.6. Interactive Prioritization Method

The Delphi and Q-sort methods involve comparing projects based on subjective judgments, without using digital logic or mathematical algorithms. The decision-making process is based on comparing the opinions of stakeholders involved in each project. These methods are only suitable for decision-making situations where certainty can be achieved. This is mainly because it becomes challenging to design a dialogue procedure when the evaluation of alternatives is not represented by a fixed number, but is random or fuzzy [31]-[35].

3.7. Strategic Prioritization Method

Qualitative results were obtained by applying a purely qualitative procedure that used subjective input data. Another approach, the rapid assessment, is also used by the strategy team as the latest methodology designed to optimize the entire project portfolio. Once the business strategy is formulated, decision makers identify both potential investment areas and the available economic resources for

each project. These techniques are discussed in further detail in research articles [12], [29].

3.8. Hybrid Prioritization Method

This method combines two or more approaches to prioritize projects and is particularly suitable for private institutions. By combining financial methods and mathematical methods, it allows for flexible development of dependencies between projects, excluding those that are technically dependent on each other. Additionally, the model structure considers the economic nature of project dependence, making projects replaceable or complementary to one another [20].

The AHP method is often used to prioritize software requirements across multiple projects. Several papers discuss case studies on the application of the AHP method, categorized by the number of requirements and divided into small-scale and large-scale scenarios [22].

3.9. Framework and Methodology of Prioritization

Seven promising methods have been identified; however, considering other factors, especially the combination of dynamic and interrelated changes, mathematical modeling seems difficult to overcome. Some literature reviews also discuss and consider the environmental conditions or utilities under which a budget is established for each project, which projects are selected, and which resources are allocated. In particular, there is a decentralized constellation that has been discussed in the literature review, and at least four contributions to research have been identified.

This development is quite promising, as the collected literature overview shows that private organizations and social aspects with an applied context, as well as a number of literary criticisms that have been extensively discussed in empirical studies, are increasingly being studied by researchers interested in decision support for portfolio management and information technology project items.

4. CONCLUSION

The aim of this study is to provide a comprehensive understanding of project portfolio management, which is a highly relevant topic in private organizations. The research covers different processes, techniques, methods, and decision-making, and focuses on technical priorities and interrelated aspects of project portfolio management. The outcome of this study is to develop a suitable model for prioritizing project portfolio management in private universities, based on seven methods derived from previous literature. The criteria used to prioritize project portfolio management are generally financial value and benefit, human

resource efficiency, technology, project risks, dedicated personnel, and project size. Other topics like portfolio performance and success rate measurement are complex and problematic, especially in private institutions, due to stakeholder issues and differences in goals. Portfolio performance and success metrics are important in portfolio risk management and control. In the public sector, portfolio risk management is weaker due to the long-term progress of the project, while portfolio control is higher because of political aspects and internal/external controls.

To refine the chosen framework and address its shortcomings, future research can include in-depth literature reviews, priority analyses, interviews, surveys, analytic model development, and case studies. This will lead to the development of domain-specific criteria models, which can be adapted to specific application areas for ease of use. The model should also consider criteria that were not identified during the study. By putting different contexts together, new originality can be achieved, leading to more efficient preference criteria choices for flexible priority methods. This study is an important step towards the adaptation of the business application domain model to the priority framework. The model has been successfully implemented in the learning environment and validated by checking the research object.

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