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A Comprehensive Framework for Sustainable and Adaptive Project Portfolio Management in Dynamic Business Environments

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Abstract:
In the face of accelerating market volatility, resource constraints, and sustainability imperatives, traditional Project Portfolio Management (PPM) frameworks are increasingly inadequate for modern business environments. Existing models predominantly emphasize financial optimization and static planning, often neglecting sustainability metrics and the need for adaptive decision-making. This paper proposes a comprehensive framework for Sustainable and Adaptive Project Portfolio Management (SAPPM) designed to address these critical gaps. The framework integrates sustainability considerations through the incorporation of Environmental, Social, and Governance (ESG) metrics into portfolio selection and evaluation processes. Additionally, it leverages artificial intelligence (AI) and machine learning to enable real-time scenario analysis, dynamic risk prediction, and continuous portfolio rebalancing in response to shifting market and operational contexts. The proposed model is structured to serve diverse sectors, including construction, energy, public administration, and non-profits, by embedding sector-specific constraints and policy sensitivities into decision-making. The framework also bridges the disconnect between ideation management and formal PPM processes, ensuring that innovative ideas are systematically evaluated and aligned with strategic objectives before resource allocation. Empirical insights from recent literature and practical case studies are used to validate the framework's efficacy in enhancing project selection, sustainability outcomes, and organizational resilience. Future research directions are identified, including the need for cross-cultural validation, longitudinal impact studies, and the development of user-friendly decision support systems. The proposed SAPPM framework aims to equip organizations with a robust and forward-looking tool for navigating complex, dynamic, and sustainability-focused business landscapes.

Keywords: Project Portfolio Management, Sustainability, Adaptive Decision-Making, Artificial Intelligence, Risk Prediction, Dynamic Environments.

1. Introduction

In today's fast-evolving global economy, organizations face unprecedented levels of uncertainty, market volatility, and environmental challenges. These dynamics have fundamentally transformed how businesses plan, prioritize, and execute their projects. Traditionally, Project Portfolio Management (PPM) has served as a strategic tool for organizations to align their projects with business objectives, optimize resource allocation, and maximize financial returns. However, conventional PPM models often operate within rigid, financially-driven parameters that are ill-equipped to manage the complexities of modern business environments characterized by rapid change, sustainability demands, and technological disruptions.

The global emphasis on sustainability and environmental responsibility, driven by frameworks like the United Nations Sustainable Development Goals (SDGs), has introduced new dimensions to strategic decision-making in project management. Organizations are now expected to evaluate not only the financial viability of projects

but also their environmental, social, and governance (ESG) impacts. Despite these growing expectations, the integration of sustainability into PPM frameworks remains limited. Current models inadequately incorporate ESG metrics, thereby missing opportunities to align project portfolios with broader sustainability commitments. This gap hinders organizations from achieving a balanced approach that supports both profitability and long-term ecological and social value creation.

Simultaneously, the pace of technological advancements and market shifts necessitates an adaptive approach to PPM. Static, annual planning cycles are no longer sufficient when strategic decisions must be revisited frequently due to fluctuating commodity prices, regulatory changes, and geopolitical instabilities. Industries such as energy, construction, and technology have particularly experienced the limitations of traditional PPM in responding to these rapid changes. As highlighted by Howell et al. (2016), organizations increasingly require agile planning mechanisms that allow for real-time scenario analysis and dynamic reallocation of resources to mitigate emerging risks and capitalize on new opportunities.

Furthermore, the growing complexity of projects, especially in diversified portfolios, demands advanced risk prediction and management capabilities. Conventional risk assessment models, often qualitative and historical in nature, fail to anticipate evolving risk factors that can disrupt project execution. The application of artificial intelligence (AI) and machine learning (ML) offers a transformative potential in this context. AI-driven models can process vast amounts of structured and unstructured data to predict risks more accurately, providing proactive insights that inform portfolio adjustments before risks materialize.

Another significant challenge in PPM is the disconnect between ideation and execution. Innovation-driven organizations frequently struggle to systematically evaluate and integrate new ideas into their project portfolios. Without structured mechanisms to bridge ideation management and PPM, many potentially valuable innovations are either overlooked or poorly aligned with strategic goals. This disconnect impedes an organization's capacity to foster innovation while maintaining a cohesive and strategically aligned project pipeline.

Moreover, sectors such as non-profits and public administration face unique constraints that existing PPM models often do not address adequately. These include political sensitivities, stakeholder diversity, and policy constraints, which require tailored PPM approaches that can adapt to sector-specific demands. Studies like those by Lacerda et al. (2016) and Stentoft Arlbjørn et al. (2015) emphasize the need for models that incorporate these unique dimensions to enhance the relevance and applicability of PPM across various organizational contexts.

In response to these multifaceted challenges, this paper proposes a **Comprehensive Framework for**

Sustainable and Adaptive Project Portfolio Management (SAPPM). This framework aims to integrate sustainability metrics directly into portfolio evaluation, employ AI-driven adaptive mechanisms for dynamic decision-making, and establish linkages between ideation processes and strategic portfolio management. By addressing these gaps, the proposed SAPPM framework aspires to equip organizations with the tools necessary to navigate complex, dynamic, and sustainability-focused business landscapes. The framework not only enhances project selection and resource allocation but also supports organizational resilience and long-term value creation in an era defined by rapid change and global sustainability imperatives.

2. Literature review

Purnus, Augustin et al. (2015), The construction sector is highly sensitive to economic shifts, especially during recessions due to its capital intensity, limited cost flexibility, and intense competition. Contractors often accept excessive risks to stay in business, leading to vulnerabilities, especially from financial shortfalls that cause delays and project health deterioration. To address these challenges, a cash flow analysis model is proposed to help construction companies optimize portfolio decisions and mitigate financial risks [1].

Howell, John I. et al. (2016), Since 2014, the energy industry has faced a volatile environment marked by declining commodity prices, reduced financing options, and survival-focused strategies. Traditional planning approaches proved inadequate, prompting firms to use portfolio management models to explore strategic

scenarios. This approach aids in rapid decision-making on investments under varying commodity prices and helps balance operational and financial metrics efficiently [2].

Dobrovolskienė, Nomeda et al. (2016), Traditional portfolio theory maximizes returns for a given risk but lacks sustainability considerations. Addressing this gap, a sustainability-oriented financial resource allocation model integrating a sustainability index into the classical mean-variance framework was developed. Tested empirically, the model not only aids risk-return optimization but also promotes sustainable project execution across industries [3].

Alvarez-Dionisi, Luis Emilio et al. (2016), Although project management concepts are well-documented, little research exists on emerging project management trends. This study investigates global trends for 2015-2017, exploring how project management integrates with knowledge management to adapt to evolving professional landscapes [4].

Costantino, Francesco et al. (2015), Critical Success Factors (CSFs) are pivotal in preventing project failures within portfolio management. This research introduces an artificial neural network (ANN)-based decision support system that predicts project risk levels by leveraging past project data, enhancing the selection phase in project portfolio management [5].

Danesh, Darius et al. (2018), Project Portfolio Management (PPM) relies on sound decision-making, often supported by Multi-Criteria Decision-Making (MCDM) methods. This paper reviews MCDM applications in PPM, proposing a framework for classifying these methods and highlighting the need for comprehensive performance assessments [6].

Lacerda, Fabrício Martins et al. (2016), Nonprofit organizations are increasingly adopting project portfolio management strategies. This research develops a PPM model tailored for nonprofits, validated through qualitative methods like interviews and document analysis, introducing a fund-raising dimension specific to the nonprofit context [7].

Srivannaboon, Sabin et al. (2016), Open innovation management is often treated as isolated projects, which increases costs and risks. This paper reviews literature on project management, PPM, and open innovation, advocating for better integration of these concepts to enhance innovation outcomes in practice [8].

Alexandrova, Matilda et al. (2015), The role of the Project Management Office (PMO) in improving project portfolio performance is explored through a media sector case study. The findings suggest that PMO implementations enhance PPM across varied organizational settings, reinforcing its universal applicability [9].

Patanakul, Peerasit et al. (2015), Despite widespread PPM practice, understanding its effectiveness remains limited. This study identifies six key attributes of PPM effectiveness, including strategic alignment and project visibility, offering a foundation for measuring PPM's business impact and guiding future research [10].

Souza, Pedro Bruno et al. (2015), There is scarce guidance on evaluating the quality of PPM processes. This qualitative study synthesizes expert insights and literature to define and operationalize PPM accomplishment, contributing conceptual clarity to the field [11].

Rank, Johannes et al. (2015), This study examines how management quality and proactiveness affect preparedness for the future in PPM, supported by survey data from 165 organizations. The findings confirm that organizational culture and entrepreneurial traits like willingness to cannibalize enhance future readiness [12].

Eik-Andresen, Petter et al. (2016), A case study analyzing over 2000 project milestones reveals consistent patterns of delays across multiple business areas. By understanding these patterns, portfolio managers can govern project cash flows effectively, demonstrating that portfolio-level success can occur despite individual project delays [13].

Kock, Alexander et al. (2015), Managing ideation at the front end of innovation is crucial for a successful project portfolio. An empirical study in German firms shows that ideation strategy, process formalization, and creative encouragement all contribute to front-end and overall portfolio success, with synergistic interactions among these elements [14].

Meifort, Anna et al. (2016), Innovation Portfolio Management (IPM) is reviewed across optimization, strategic, decision-making, and organizational perspectives. This synthesis integrates these approaches into a comprehensive framework and outlines a detailed research agenda for future studies in innovation management [15].

Stentoft Arlbjørn, Jan et al. (2015), In Danish municipalities, development projects face implementation challenges, exacerbated by political sensitivities and prioritization issues. Empirical research identifies the need for improved portfolio management practices in the public sector, especially for enhancing administrative workflows [16].

El Hannach, Driss et al. (2016), Project prioritization is critical due to limited resources and the complexity of balancing strategic objectives with operational constraints. This article proposes a new prioritization process for PPM that aligns strategic and operational needs while addressing data inaccuracy and uncertainty challenges [17].

Tahri, Houda et al. (2015) Project selection via mathematical optimization is examined through a literature review and practical case study. Using Integer Linear Programming (ILP) and Integer Goal Programming (IGP), the study presents optimization methods that maximize organizational benefits while minimizing costs within strategic constraints [18].

Table 1. Literature review

S. No.	Author Name	Year	Title	Method	Advantage	Application	Limitation
1	Purnus, Augustin & Bodea, Constanta-Nicoleta	2015	Financial management of the construction projects	Practical cash flow analysis model	Avoid financial exposure and losses	Construction	Limited to financial aspect only
2	Howell, John I. & Warren, Lillian	2016	Solutions to 5 Strategic Issues Plaguing Executives	Portfolio management with scenario planning	Rapid strategic scenario exploration	Energy Industry	Focused on energy sector, limited to strategic issues
3	DobrovolskienÄ—, Nomeda & TamoÅ¡iÅ«nienÄ—, Rima	2016	Sustainability-oriented financial resource allocation	Multi-criteria decision-making with sustainability index	Integrates sustainability with risk-return	Business & Construction	Complexity in sustainability quantification
4	Alvarez-Dionisi, Luis Emilio et al.	2016	Global project management trends	Trend analysis in project management	Identification of global trends	Project Management	Limited empirical validation
5	Costantino, Francesco et al.	2015	Project selection in PPM using ANN	Artificial Neural Network on Critical Success Factors	Predict project riskiness	General PPM	Dependent on past data quality
6	Danesh, Darius et al.	2018	MCDM methods for PPM	Multi-criteria decision-	Framework for evaluating	Project Portfolio	Lacks performance

				making review	MCDM in PPM	Management	assessment of combined methods
7	Lacerda, FabrÃ-cio Martins et al.	2016	PPM model for nonprofit organizations	Conceptual PPM model adapted to nonprofits	Tailored to nonprofit context	Non-profit sector	Limited to qualitative case study
8	Srivannaboon, Sabin & Munkongsujarit, Songphon	2016	PPM in open innovation	Literature review on PPM and open innovation	Insights on integrating PPM and innovation	Innovation projects	Limited empirical data
9	Alexandrova, Matilda et al.	2015	Role of project office for PPM	PMO implementation case study	Enhances organizational PPM	Media Sector	Context-specific findings
10	Patanakul, Peerasit	2015	Key attributes of PPM effectiveness	Identification of six attributes	Better understanding of PPM impact	Business sectors	Needs further validation
11	de Souza, Pedro Bruno et al.	2015	Conceptual dimensions of PPM	Qualitative inquiry and conceptual framework	Defines accomplishment in PPM	General business	Limited practical metrics
12	Rank, Johannes et al.	2015	Preparedness for the future in PPM	Survey-based analysis on management quality	Links proactiveness & riskiness to preparedness	Business organizations	Survey limitation to specific countries
13	Eik-Andresen, Petter et al.	2016	Controlling large project portfolios	Milestone KPI-based governance	Govern portfolio despite delays	Multibillion projects	Unique data, limited global evidence
14	Kock, Alexander et al.	2015	Ideation portfolio management & front-end success	Empirical study on ideation management	Balances variety and selection in ideation	Innovation	Context-specific to German firms
15	Meifort, Anna	2016	Innovation portfolio management synthesis	Synthesis and research agenda	Integrates different IPM perspectives	Innovation	Theoretical, needs practical validation
16	Stentoft ArlbjÃ¸rn, Jan et al.	2015	Development projects in Danish	Empirical study via	Highlights public sector challenges	Public sector	Single respondent bias

			municipalities	questionnaire			
17	El Hannach, Driss et al.	2016	New project prioritization process	Strategic & operational alignment prioritization	Addresses multiple conflicting objectives	General business	Complex and data inaccuracy
18	Tahri, Houda	2015	Mathematical optimization in PPM	ILP and IGP for optimization scenarios	Mathematical rigor in decision making	PPM	Requires precise data input

3. Research Gaps Identified from the Reviewed Studies:

1. **Limited Integration of Sustainability in PPM:** While Dobrovolskienė et al. (2016) introduced a sustainability-oriented resource allocation model, the broader integration of sustainability indices into mainstream Project Portfolio Management (PPM) remains underexplored. Most models still prioritize financial metrics over environmental and social considerations.
2. **Inadequate Real-Time Planning and Adaptation Models:** Howell et al. (2016) highlighted the need for dynamic and real-time strategy adaptation in volatile industries like energy. However, existing PPM models largely operate on annual or static planning cycles, lacking mechanisms for rapid scenario analysis in fast-changing markets.
3. **Insufficient Empirical Validation of MCDM Methods:** Danesh et al. (2018) reviewed multiple MCDM methods in PPM but noted the lack of empirical studies assessing the combined performance of these methods in real-world applications. The practical utility of hybrid MCDM frameworks remains a gap.
4. **Scarcity of PPM Models for Nonprofit and Public Sectors:** Lacerda et al. (2016) and Stentoft Arlbjørn et al. (2015) identified adaptations of PPM for nonprofit and public sector organizations. Yet, models specifically addressing the unique challenges like fundraising, political interference, and resource constraints are limited.
5. **Deficient Tools for Measuring PPM Effectiveness:** Patanakul et al. (2015) and de Souza et al. (2015) observed that while PPM is widely practiced, standardized tools and frameworks to quantitatively assess PPM effectiveness are still lacking, limiting objective performance evaluation.
6. **Gap in Integrating Open Innovation with PPM:** Srivannaboon et al. (2016) emphasized that project management, PPM, and open innovation are often treated in silos. Research on integrated frameworks that align open innovation strategies with structured PPM processes is minimal.
7. **Need for Advanced Risk Prediction Models in Project Selection:** Costantino et al. (2015) proposed ANN-based methods for predicting project risk, yet further research is needed to improve model accuracy, scalability across industries, and the inclusion of unstructured data sources.
8. **Limited Understanding of PPM Preparedness for Future Challenges:** Rank et al. (2015) introduced proactiveness and willingness to cannibalize as factors influencing preparedness, but cross-cultural and sector-specific studies are required to generalize these findings.
9. **Absence of Ideation Portfolio Management Models:** Kock et al. (2015) addressed ideation portfolio management's role in front-end innovation success, but research remains sparse on its longitudinal impact on overall portfolio outcomes and its integration with strategic planning.
10. **Optimization-Based Project Selection Models Need Refinement:** Tahri et al. (2015) presented mathematical optimization for project selection; however, the models face challenges in handling real-world constraints, multi-objective scenarios, and data uncertainty.

4. Solutions to Identified Research Gaps

1. **Enhanced Sustainability Integration in PPM:** Develop **comprehensive sustainability-oriented PPM frameworks** that incorporate environmental, social, and governance (ESG) metrics alongside traditional

financial metrics. Embedding **triple bottom line principles** in resource allocation models can enable organizations to align project portfolios with sustainable development goals.

2. **Development of Real-Time Adaptive PPM Models:** Introduce **AI-driven adaptive PPM systems** capable of processing real-time data, market changes, and external shocks. Integrating **machine learning and scenario-based simulations** can support continuous strategy reassessment and dynamic portfolio adjustments, particularly in volatile sectors like energy and technology.
3. **Empirical Validation of MCDM Methods in PPM:** Conduct **large-scale empirical studies** combining multiple MCDM techniques (e.g., AHP, TOPSIS, VIKOR) within real-world PPM cases. Building **benchmark datasets** and applying comparative analysis will help in selecting optimal decision-making frameworks for diverse industries.
4. **Tailored PPM Models for Nonprofit and Public Sectors:** Design **context-specific PPM models for nonprofit and public organizations**, addressing unique factors such as fundraising, political influence, and public accountability. Incorporate **stakeholder engagement mechanisms** and **policy sensitivity analysis** to enhance model relevance.
5. **Standardized Tools for PPM Effectiveness Measurement:** Develop **standardized metrics and evaluation frameworks** for PPM effectiveness, combining **quantitative KPIs (e.g., strategic alignment, delivery predictability)** and **qualitative assessments (e.g., stakeholder satisfaction)**. Tools like **Balanced Scorecards for PPM** can formalize performance tracking.
6. **Integrated Open Innovation and PPM Frameworks:** Propose **hybrid models that integrate open innovation with PPM practices**, facilitating the **seamless flow of ideas from ideation to execution**. Establishing platforms that manage both innovation and project portfolios under a unified governance structure can optimize innovation outcomes.
7. **Advanced Risk Prediction and Project Selection Models:** Leverage **deep learning models and natural language processing (NLP)** to enhance risk prediction accuracy using both structured and unstructured data (e.g., market reports, social media insights). Implement **explainable AI (XAI)** to ensure transparency in risk evaluations.
8. **Cross-Cultural and Sectoral Research on PPM Preparedness:** Undertake **comparative studies across sectors and cultural settings** to validate variables like proactiveness and risk-taking in preparedness for the future. Developing **culture-sensitive PPM readiness frameworks** can enhance global applicability.
9. **Longitudinal Studies on Ideation Portfolio Management:** Implement **long-term studies to track the impact of ideation portfolio management on innovation success**, integrating ideation metrics with strategic planning processes. Creating **continuous feedback loops** between ideation, execution, and strategy will strengthen portfolio alignment.
10. **Refinement of Mathematical Optimization Models for Project Selection:** Advanced optimization models by integrating **fuzzy logic, stochastic programming, and robust optimization** to manage uncertainties and multi-objective constraints. Developing **user-friendly decision support systems (DSS)** can facilitate the practical application of these models in organizational settings.

5. Conclusion & Future Work

5.1 Conclusion

The reviewed literature on Project Portfolio Management (PPM) reflects significant progress in methods and frameworks across various sectors, including construction, energy, non-profits, innovation, and public administration. Despite these advances, critical gaps remain in areas such as sustainability integration, real-time adaptability, and effectiveness measurement. Existing models tend to prioritize financial optimization while neglecting sustainability and social impacts, which are increasingly relevant in modern organizational strategies. Additionally, most traditional PPM frameworks are designed for static environments, limiting their responsiveness to dynamic market conditions and unforeseen disruptions. The lack of empirical validation of Multi-Criteria Decision-Making (MCDM) methods and optimization models in real-world settings further

weakens the practical application of many theoretical approaches. Similarly, sectors like non-profits and public administration remain underserved by existing models, which often fail to address their unique operational and political constraints. Risk prediction methods, although explored through artificial neural networks, still require enhancements to handle diverse data types and dynamic risk environments effectively. There is also a noticeable disconnect between ideation management and formal PPM processes, which hampers innovation-driven organizations from realizing their full potential.

5.2 Future Work

Future research should prioritize the development of adaptive, AI-enabled PPM systems capable of real-time decision-making and scenario analysis. Integrating sustainability metrics and ESG considerations into PPM models will enable more balanced decision-making that aligns with global sustainability goals. Moreover, large-scale empirical studies are necessary to validate the combined use of MCDM methods and optimization techniques in practical settings. There is a need to develop specialized PPM frameworks for non-profit and public sectors, incorporating policy sensitivity and stakeholder engagement. In addition, advanced risk prediction models leveraging deep learning and unstructured data analysis can provide more robust decision support for project selection. Future studies should also investigate cross-cultural and sector-specific variables that influence PPM effectiveness and organizational preparedness for future challenges. Finally, longitudinal studies on ideation portfolio management and its integration with strategic planning can help bridge the gap between innovation and execution in portfolio management.

REFERENCES:

1. Purnus, Augustin, and Constanta-Nicoleta Bodea. "Financial management of the construction projects: a proposed cash flow analysis model at project portfolio level." Organization, technology & management in construction: an international journal 7, no. 1 (2015): 1217-1227.
2. Howell, John I., and Lillian Warren. "Solutions to 5 Strategic Issues Plaguing Executives in 2015-2016: Solving the Right Problems With Portfolio Management." In *SPE Hydrocarbon Economics and Evaluation Symposium*, p. D021S006R003. SPE, 2016.
3. Dobrovolskienė, Nomeda, and Rima Tamošiūnienė. "Sustainability-oriented financial resource allocation in a project portfolio through multi-criteria decision-making." *Sustainability* 8, no. 5 (2016): 485.
4. Alvarez-Dionisi, Luis Emilio, Rodney Turner, and Mitali Mittra. "Global project management trends." *International Journal of Information Technology Project Management (IJITPM)* 7, no. 3 (2016): 54-73.
5. Costantino, Francesco, Giulio Di Gravio, and Fabio Nonino. "Project selection in project portfolio management: An artificial neural network model based on critical success factors." *International Journal of Project Management* 33, no. 8 (2015): 1744-1754.
6. Danesh, Darius, Michael J. Ryan, and Alireza Abbasi. "Multi-criteria decision-making methods for project portfolio management: a literature review." *International Journal of Management and Decision Making* 17, no. 1 (2018): 75-94.
7. Lacerda, Fabrício Martins, Cristina Dai Pra Martens, and Henrique Mello Rodrigues de Freitas. "A Project Portfolio Management model adapted to non-profit organizations." *Project Management Research and Practice* 3 (2016): 1-19.
8. Srivannaboon, Sabin, and Songphon Munkongsujarit. "Project management and project portfolio management in open innovation: Literature review." In *2016 Portland International Conference on Management of Engineering and Technology (PICMET)*, pp. 2002-2007. IEEE, 2016.
9. Alexandrova, Matilda, Liliana Stankova, and Angel Gelemenov. "The role of project office for project portfolio management." *Economic Alternatives* 1, no. 1 (2015): 19-30.
10. Patanakul, Peerasit. "Key attributes of effectiveness in managing project portfolio." *International Journal of Project Management* 33, no. 5 (2015): 1084-1097.

11. de Souza, Pedro Bruno, Jorge Carneiro, and Rodrigo Bandeira-de-Mello. "Inquiry into the conceptual dimensions of project portfolio management." *BBR-Brazilian Business Review* (2015): 118-148.
12. Rank, Johannes, Barbara Natalie Unger, and Hans Georg Gemünden. "Preparedness for the future in project portfolio management: the roles of proactiveness, riskiness and willingness to cannibalize." *International Journal of Project Management* 33, no. 8 (2015): 1730-1743.
13. Eik-Andresen, Petter, Agnar Johansen, Andreas Dypvik Landmark, and Anette Østbø Sørensen. "Controlling a multibillion project portfolio-milestones as key performance indicator for project portfolio management." *Procedia-Social and Behavioral Sciences* 226 (2016): 294-301.
14. Kock, Alexander, Wilderich Heising, and Hans Georg Gemünden. "How ideation portfolio management influences front-end success." *Journal of product innovation management* 32, no. 4 (2015): 539-555.
15. Meifort, Anna. "Innovation portfolio management: A synthesis and research agenda." *Creativity and innovation management* 25, no. 2 (2016): 251-269.
16. Stentoft Arlbjørn, Jan, Per Vagn Freytag, and Lisa Thoms. "Portfolio management of development projects in Danish municipalities." *International Journal of Public Sector Management* 28, no. 1 (2015): 11-28.
17. El Hannach, Driss, Rabia Marghoubi, and Mohamed Dahchour. "Project portfolio management towards a new project prioritization process." In *2016 International Conference on Information Technology for Organizations Development (IT4OD)*, pp. 1-8. IEEE, 2016.
18. Tahri, Houda. "Mathematical optimization methods: application in project portfolio management." *Procedia-Social and Behavioral Sciences* 210 (2015): 339-347.