Project Portfolio Management in the Digital Era for Organizational Strategy Execution and Sustainable Development

Humphrey Matlala, Hannelie Nel and Jan-Harm Pretorius
Postgraduate School of Engineering Management
University of Johannesburg
Johannesburg, South Africa
hnmatlala@mail.com; hnel@tennelli.com; jhcpretorius@uj.ac.za

Abstract

Delivering a sustainable organizational strategy in the digital terrain has proven difficult for many organizations. Lately, organizations and governments are perplexed by the dynamic environment of unprecedented changes resulting from the digital transformation brought along by the Fourth Industrial Revolution (4IR), and sustainable development visions that are necessary for the future. Through a descriptive study, using both qualitative data from literature and quantitative data collected from 56 project management professionals, the study concludes that there is a need to intensify research and development in the areas of digital migration and sustainable development through project portfolio management to promote the execution of organizational objectives that seek to advance digital transformation and sustainable development initiatives and also to increase research output on such subjects in project management-related studies.

Keywords
Project Portfolio Management, Organization Strategy, Digital Era, Sustainable Development, and Project.

Introduction
There is a need to advance the United Nations' Sustainable Development Goals (UN 2023a), and using project portfolio management to advance the implementation of the UN's objectives in this digital terrain, through organizational objectives could assist organizations in bridging the chasm between their strategy formulation and its implementation. Projects are modus-operant for change. Organizations implement projects to effect changes that seek to add sustainable value to the organization. Often aiming to achieve set organizational objectives and goals, organizations allocate limited resources to implement projects to bring about change that delivers value whilst creating sustainability for the organization and the universe at large.

Project Portfolio Management (PPM) as a tool for the management of projects and programs in organizations has been in use for decades to assist organizations in planning the formulation and delivery of projects and programs that are aligned with organizational strategic visions (Hobbs 2012; Voss and Kock 2013). The PPM model equips an organization with the structure, tools, and techniques that are necessary to ensure that the right projects and programs are in place for sustaining and growing the business, and that change priorities are balanced with resources and capability to deliver such changes consistently and well. It connects the execution of an organization's projects to the fulfilment of strategy.

The digital world brought along by Fourth Industrial Revolution has revolutionized the global economy and changed how people perceive and experience human and environmental development. With much-developed technologies such as artificial intelligence (AI), machine learning, and the Internet of Things (IoT), the world is now experiencing dynamic changes that are brought along by 4IR technologies (Whyte 2019). The PPM model is becoming increasingly important to keep up with global changes and also prepare organizations for current and future trajectories.

On the other side, the call for global sustainable development is increasingly becoming critical. The world is now in greater need of transformational work that leads to sustainability by curbing climate change and reducing poverty (UN 2023a). United Nations describes global sustainability as the security of the future for the entire ecosystem. It is through the global sustainability phenomenon that organizations must act now, instead of later in delivering projects and programs that are aligned with the United Nations' (UN) futuristic goals of sustainable

development. Project Portfolio management could ensure that the UN's 17 Sustainable Development Goals are planned, prioritized, and implemented accordingly to achieve objectives. Organizational strategy formulation and importantly its execution must strive towards sustainable development through the utilization of digital technologies to benefit the globe.

1.1.Objectives

Research is required to understand the extent to which project portfolio management is used to advance organizational strategic goals that seek to advance sustainable development in the digital terrain. The study sought to establish if organizations are prioritizing projects in their project portfolio for advancing sustainable development toward their strategy execution during this digital transformation era.

Whilst the topics of digital transformation, global sustainable development, and project prioritization have been researched extensively by scholars in the past (Flyverbom et al. 2016; Jabareen 2008; Parris and Kates 2003; Purnus and Bodea 2014; Rogers et al. 2012; Simion et al. 2018; Sowlati et al. 2005; Živković and Veljković 2018), and considering the importance lately of such topics in terms of United Nation's mission, there is a need to understand further the extent to which organizations are managing their project portfolios for the adoption of digital transformation and sustainable development strategic visions. Through literature reviews from project management-related studies, and quantitative analysis from a survey, the study evaluates the extent to which organizations are adopting strategic visions of digital transformation and sustainable development in their project portfolio management to implement their strategic goals.

Literature Review

Strategy is about success by setting individual and or organizational goals (De Wit and Meyer 2004; Grant and Jordan 2012; Wheelen et al. 2018;). It is how individuals or organizations achieve their objectives (Grant and Jordan 2012). Apart from optimizing day-to-day operations to maximize output, Wheelan et al. (2018) suggest that organizations must adopt strategic plans that could charter their way to success and sustainability in the long run. Wheelan et al. (2018) further argue that organizations must not put their efforts only on the current activities that satisfy the existing market but must also adapt the organization to new trajectories that will create and satisfy new markets whilst sustaining the business. Winzker and Pretorius (2005) think that the concurrent challenges impinged on organizations, which require the satisfaction of various stakeholders such as customers, employees, unions, shareholders, government, and suppliers are some of the factors that add to the consistent global competitiveness and growth of the organization. Although all these factors contribute to the excessive stress that the organization endures, they must be managed judiciously and concurrently (Winzker and Pretorius 2005).

Following Peter Drucker's philosophy, Peng (2014) describes strategy as an organization's theory that stipulates how to compete successfully. It is researchers such as Peter Drucker (Drucker 2009) and Michael Porter (Porter 1996) that influenced how organizations should carefully consider choices that steer their business to success, and such influence is further echoed by researchers such as Markides and Morris (2016), Raupp and Hoffjann (2010) who suggest that strategy is about making choices and decisions, which will steer an individual or organization in the direction that will bring success if well implemented. Such goals and objectives should bear an implementation plan, which will ensure that the fundamental objectives are realized (Ackermann and Eden 2011).

Graphically, as portrayed in Figure 1, organization strategy entails an assessment of its strength (S) and weaknesses (W) at point A, and work toward its desired performance levels at point B, whilst constantly evaluating its opportunities (O) and threats (T) within its environment (Peng 2014). This SWOT analysis is important for allowing the organization to know itself and its competitors, and upon such assessment, the organization should be in a better position to formulate a strategy on how best to connect points A and B (Peng 2014).

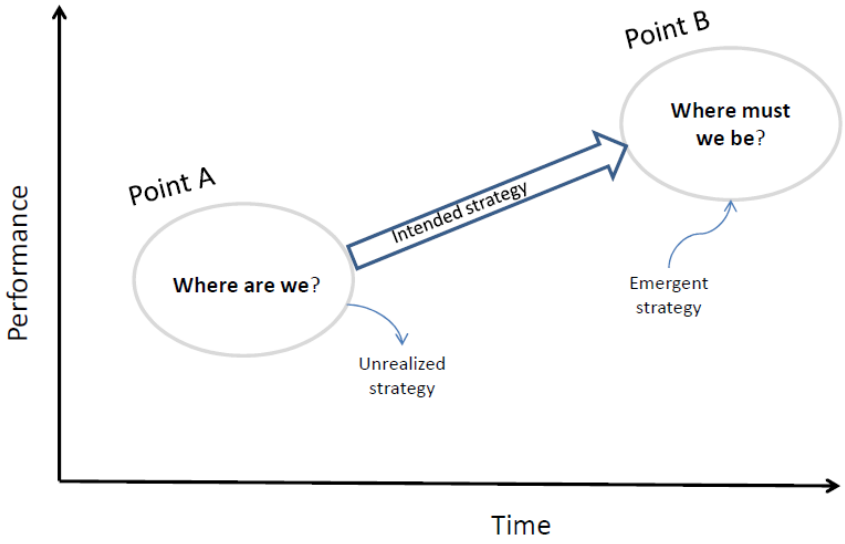

Figure 1. The Essence of Strategy (Peng, 2014)

In discussing the concept of strategy, Grant and Jordan (2012) highlight four characteristics of a strategy that are conducive to success, which include:

1. Long-term goals that are simple and consistent,

Organizational strategic goals should be simple, and consistent, and must also generate a long-term vision that is clear to all and able to be traced.

2. Strategy must understand the competitiveness of the environment,

It is very important that strategies recognize and insightfully appreciate the environment that the organization operates in.

3. Objective appraisal of resources,

Strategies must effectively exploit organizational internal strengths, while at the same time protecting its areas of weakness.

4. And lastly, a strategy must be implementable.

Effective implementation of the strategy will assist the organization in avoiding any unprecedented changes.

Strategy occupies multiple roles within an organization and is continually reviewed through decisions made by members of the organization (Grant and Jordan 2012). It is through those decisions that strategies permit adaptations, and Grant and Jordan (2012) further allude that such adaptations create learnings throughout the process of strategy formulation and implementation.

1.2. The Digital Era

The digital era, augmented by the Fourth Industrial Revolution (4IR) has arrived and introduced transformed technologies that force organizations to rapidly adapt to new strategies with a focus on digitization. According to Preuschoff and Kramer (2016), technologies like blockchain, augmented reality (AR), virtual reality (VR), artificial intelligence (AI), and the Internet of Things (IoT) are now here and are more likely to change how organizations operate, whilst determining how organizations will handle current and future competition to their advantages. Schwab (2017) suggests that the world is now living in exciting times of technological change brought by 4IR, and these technologies are likely to drive the transformation of the entire structure of the world economy. These changes and the rate at which they occur have already forced many organizational leaders to recognize the impact of technology on their organizations (Gobble 2018), and Preuschoff and Kramer (2016) highlight that it will be only successful organizations with an adaptive vision that will know how to strategically navigate this change.

Delivering organizational strategy through PPM is increasingly sacrosanct lately. The PPM model must relate to the digital strategy to incorporate appropriate digital technologies that drive the accomplishment of organizational objectives, and such according to Preuschoff and Kramer (2016), the PPM model must revolve around three basic principles, which are:

1. Satisfy customer needs, so you can ensure business sustainability.

2. Attraction of new customers, so that the business can transition to further developments, and
3. Preparing the organization to adapt very well to the future by equipping it with relevant capabilities.

Nowadays, successful organizations are those that can withstand the impact of disruptive technologies. Matt et al. (2015) suggest that to roll out a successful digital transformation strategy, organizations need to align the four spheres of the digital transformation framework, which are: i) the use of technologies, ii) value creation, iii) structural changes, and iv) financial aspects as illustrated in Figure 2.

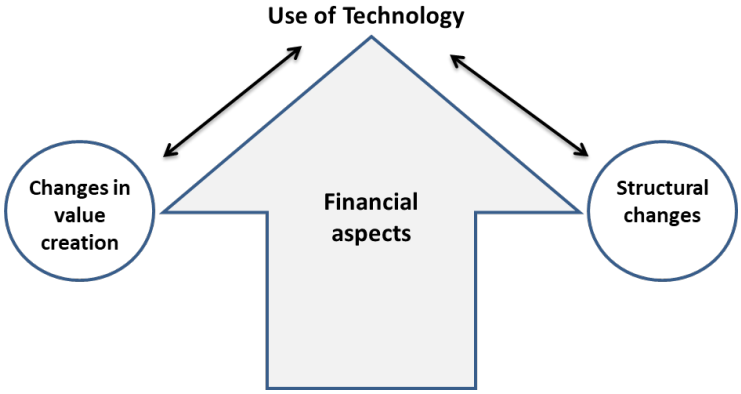

Figure 2. The Digital Transformation Framework (Matt et al. 2015).

From Figure 2 above, the use of technologies drives organizational behavior towards adopting and using new technologies, whilst the changes in value creation from a business perspective imply the impact of digital transformation strategies on organizational value chains (Matt et al. 2015). Matt et al. (2015) further state that structural changes include changes in the organizational setup, and these three dimensions, i.e., use of technologies, change in value creation, and structural changes can only be transformed upon considering the aspects of an organization's financial wellbeing to drive digital transformation.

The Industrial Revolution is a concept and a development that fundamentally changed the environment, society, and overall economy, and this signifies a rapid and fundamental change in how business is conducted (Bloem et al. 2014). The current digital revolution of 4IR is already shifting the previously adopted business models towards the emergence of business models that are characterized by extensive use of the internet and machine learning. A study concluded by Agrawal et al. (2017) on how AI will change organizational strategy concludes that in today's environment of AI, some organizations are anticipating the rapid change that AI will bring to the business, and to align with such changes, Agrawal et al. (2017) suggest that strategists must invest in researches that will provide them with a better understanding of the rapid changes, and also invest in developing researches about the strategy options that are being created by the shifting economics of their business that happen as a result of changes. AI is set to change how business is conducted, and Agrawal et al. (2017) advise us that facing the change that AI will bring could also paralyze many businesses if unaware.

Adapting Organizational Strategy and PPM for Sustainable Development

The United Nations has put forth transformative goals that seek to advance the global world to a better future (UN 2023b). Whilst such a project is massive and complex, it requires contributions from all people, organizations, and governments around the globe to accomplish. According to the UN's progress report, termed: Progress towards the Sustainable Development Goals: Towards a Rescue Plan for People and Planet (UN 2023b), it is unfortunate as the midpoint implementation progress towards the year 2030 goal is falling behind, and with great anticipation that it will not meet most of the goals (see Figure 3), and this requires contributions amongst all to accelerate progress to date.

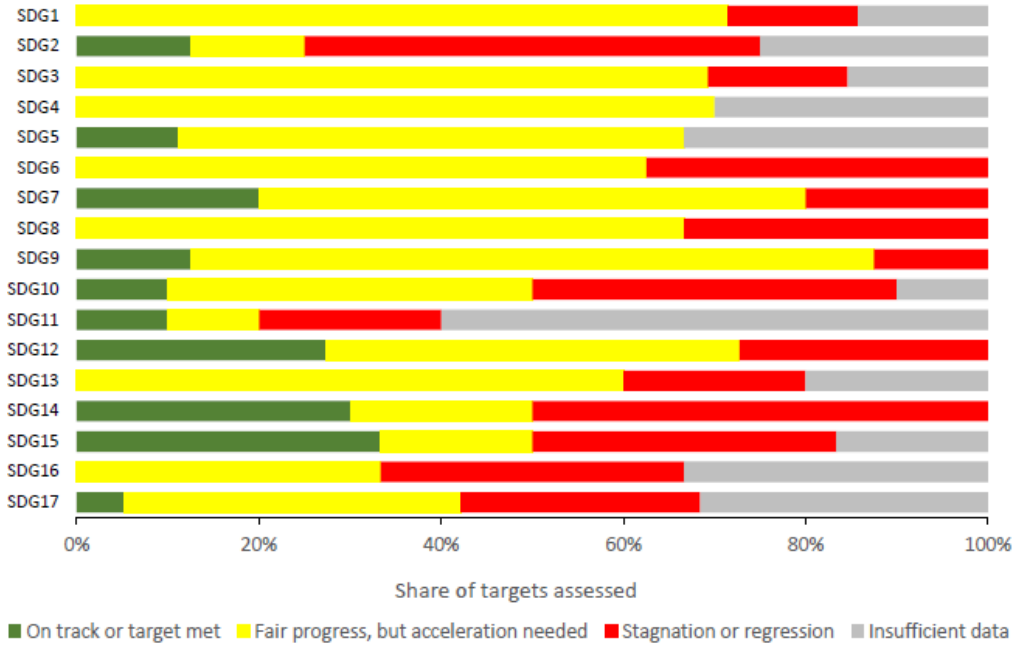

Figure 3. Progress assessment for 17 Goals based on assessed targets, 2023 or latest data (UN, 2023b).

The essence of organizational strategy and project portfolio management revolves around planning, controlling, and monitoring organizational resources to meet a set objective. Whilst the basic elements of the project portfolio management concept are, i) time, resources, and cost control, ii) planning, control, and monitoring of projects (Hansen and Svejvig 2023; Martinsuo 2013; Živković and Veljković 2018), in a nutshell, PPM approach is considered as a set of principles that provides strategic guidance on managing a portfolio of projects (Hansen and Svejvig 2023). Organizational objectives are chartered well and efficiently through the PPM approach (Artto, et al. 2008; Shiferaw and Klakegg 2012).

1.3. Project Portfolio Management for Delivering Organizational Strategy

The gap between strategy formulation and its implementation could be bridged through the process of Project Portfolio Management. The PPM model can assist an organization in ensuring that it selects and prioritize the right projects and programs for sustaining and growing the organization (Rad and Levin 2007), and this enables change in the organizational priorities, whilst ensuring that resources are balanced with capabilities to deliver changes consistently and well.

The importance of managing technology investment and sustainable development is becoming increasingly important for organizations' sustainability. To withstand the increasing pressure exerted by competitive markets, demanding customers, quality of supply, and required flexibility in the latest business environment, Isikli et al. (2018) suggest that leaders in project portfolio management must go beyond project management, and also focus on prioritizing and selection of the right projects that will steer the organization for future trajectories that creates sustainability. Papadonikolaki et al. (2022) examined the impact of digital innovation on projects for future direction and suggest that perhaps factors such as organizational performance measures, development of capabilities within the organization to manage changes in a dynamic environment, and inter-organizational settings are vital in steering the organization's objective into the future trajectory. PPM as a tool for managing change can bring about maximum economic benefits through investments in new technologies whilst considering the technical, environmental, and other challenges that the organization encounters (Isikli et al. 2018).

Kilford and Jenner (2012) suggest that it is during these tough economic times that a transformational PPM is more compelling than when the conditions are favorable, and project portfolio management should:

- Provide critical information that enables alignment and prioritization of projects with organizational goals,
- Monitor the composition of the portfolio to ensure it remains strategically aligned to the current environment and future trajectories for sustainability,
- Manage and guide the allocation of resources to deliver chosen projects and programs,

- Promptly reallocate scarce resources where activities no longer represent their optimum use,
- Realise benefits promptly in terms of efficiency savings or achieving a quantifiable contribution to a strategic object or business priority.

1.4. Project Prioritization as a Function of Project Portfolio Management

Often the amount of work surpasses the available resources to carry out such work, and similarly to project selection and management, prioritization becomes the core function of ensuring that resources are allocated accordingly for accomplishing what matters most (Gosenheimer 2012). Gosenheimer (2012), Purnus and Bodea (2014) and Sowlati et al. (2005) describe prioritization as a technique used to identify which problems are most important to work on or solve first. To do that Kloppenborg (2015) suggests tasks that leaders must do, which are to identify, prioritize and select potential projects for implementation systematically and not by chance. Whilst other opportunities will present themselves as Kloppenborg (2015) suggests, others need to be discovered, and such requires the involvement of the organization's management team of salespeople, operations staff members, and marketing people. According to Kloppenborg (2015), all in the organization must be aware of industry trends as such knowledge could be used to identify and prioritize potential projects.

A generic project prioritization and selection process model is depicted in Figure 4, and the process begins with the identification of projects that support the strategy, follows by the evaluation and prioritization of identified projects, and thus the selection and initiation of prioritized projects, and lastly ends with the regular or constant review of selected projects (Dutra et al. 2014; Joseph et al. 2009).

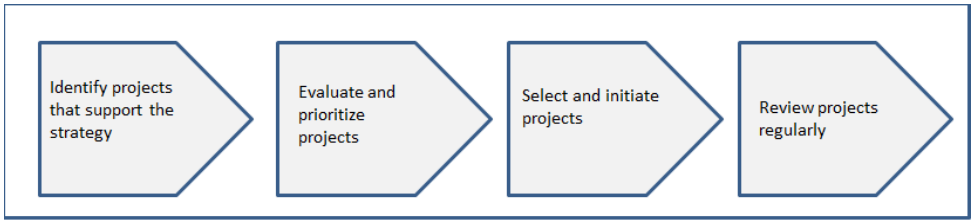

Figure 4. A generic project selection process projects (Dutra et al. 2014; Joseph et al. 2009).

Before the prioritization of projects and programs, Homkes (2015) suggests that projects included in the organizational project portfolio must be those that will ensure the realization of organizational strategy. Strategy execution is about doing three things simultaneously, which are, the alignment of activities and resources with strategy, coordination of functions, business units, and geographies, and lastly, the adaptation to changing circumstances (Homkes 2015). Identifying projects and programs that could help realize the strategy is fundamental step towards strategy execution.

Ackerman and Eden (2011) think that the competing allocation of scarce organizational resources in terms of the project selected for implementation is at the apex of strategy and project portfolio management, and this allocation should be performed by first prioritizing projects for implementation following organizational needs. Upon project implementation and benefits realization, a review of the project viability together with benefits realized through implemented project becomes necessary to benchmark against the strategic goals of the organization (Aziz and Curlee 2017). Aziz and Curlee (2017) suggest that such a process will allow for re-strategizing and or re-benchmarking the strategic initiatives by utilizing data collected from project implementation and benefit realization processes as feedback. In summary of Aziz and Curlee's (2017) model on the integration of change activities and organizational project management, a model as depicted in Figure 5 is developed. Aziz and Curlee (2017) highlight the unique role that portfolio management plays in increasing organizational strategic agility, effective structure planning, and measuring change efforts across programs and projects for organizational change management.

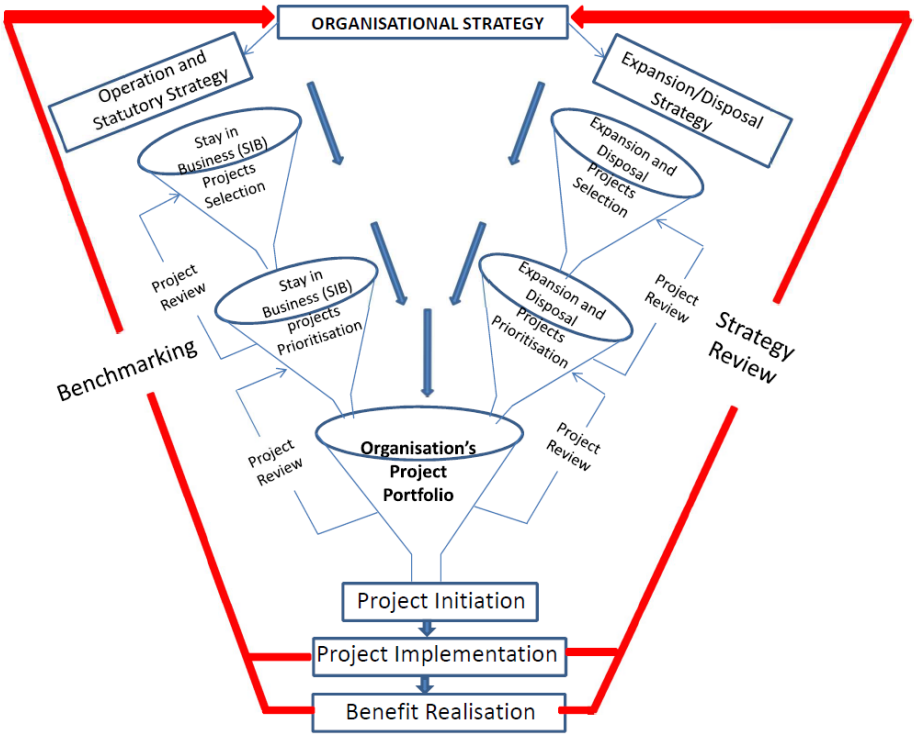

Figure 5. A conceptual process for project prioritization, selection, and re-strategizing or re-benchmarking as derived through Aziz and Curlee (2017).

2. Research Methods

The study is descriptive and both qualitative and quantitative data are used. The descriptive nature of the study seeks to describe the characteristics needed to involve project portfolio management in the execution of an organization's strategic initiatives for sustainable development during the current digital era. Qualitative data was collected through research articles that were published in SAGE Project Management Journal. Project Management Journal is one of the international research publication journals that publish project management-related research (SAGE Journals 2023). Qualitative data collected included published research articles that covered the subjects of digital transformation and sustainable development that were published between the years 2020 to 2022. Although there are many other international project management-related publications, the choice of Project Management Journal was rather not scientific but dependent much on the researcher's accessibility to the journal as a registered Project Management Professional. Though Taherdoost (2016) argues that collecting data from all cases would be doubtful as a researcher would not have all the resources required to collect and analyze the entire population; therefore, a sampling technique must be applied to reduce the number of cases. Anderson et al. (2011) advise us that the reason a sample is selected is to ensure that data is collected to make an inference and or answer a research question about a population.

Quantitative data was collected through an online survey platform, SurveyMonkey and the data came from project management professionals that are based in organizations mostly based in South Africa. Although the research sought to collect data across the global world, this did not happen as the researcher did not have the tools required to reach a bigger population. Taherdoost (2016) advises us though, that the first stage in the sampling process is to clearly define the target population, depending on the number of people living in a particular country. South Africa is a developing country with challenges of inadequacy of skilled people like project management professionals (Asmal et al. 2020). According to the Project Management Institute South African Chapter, which is part of the Global Project Management Institute (PMI), there are only 458 registered members with PMI's project management certification on the PMI-SA Chapter database (PMI-SA 2021).

3. Data Collection

Both qualitative and quantitative data were collected for the study, and the data is presented below.

3.1. Qualitative data

Table 1 lists published research articles, between the years 2020 to 2022 as published in Project Management Journal. The publication journal is one of the Scopus journals with a Cite Score of 6.300, and a two-year impact factor of 5.0 (SAGE Journals 2023; Zijlstra 2021). Scopus is one of the biggest research databases and has more published articles that are related to projects and the project management field than any other research database (Hansen and Svejvig 2023).

Considering the total publication of the journal from the same period 2020 to 2022, the published articles that researched both the topics related to digital transformation and sustainable development studies (Table 1 below) represent approximately 7 percentage (%) of the total publications in the stipulated period. This presents the inadequacy of research studies that links projects and project management to studies with the subjects of digital transformation and sustainable development.

Table 1. Digital transformation and Sustainable development-related articles, published in Project Management Journal for the period 2020 to 2022 (SAGE Journals 2023).

Research Area	Article	Authors
Digital Transformation	The Role of the Project Management Office (PMO) in Stimulating Innovation in Projects Initiated by Owner and Operator Organizations	*Sergeeva & Ali, 2020, Vol 51(4)*
	Digital Technologies in Built Environment Projects: Review and Future Directions	*Papadonikolaki et al, 2022, Vol 53(5)*
	Blockchain Technology for Projects: A Multicriteria Decision Matrix	*Lu et al., 2022, Vol 53(1)*
	21st-Century General-Purpose Technologies and the Future of Project Management	*Steen et al., 2022, 53(5)*
	The Expectations of Project Managers from Artificial Intelligence: A Delphi Study	*Holzmann et al., 2022, 53(5)*
	Data Analytics and Artificial Intelligence in the Complex Environment of Megaprojects: Implications for Practitioners and Project Organizing Theory	*Wijayasekera et al., 2022, 53(5)*
Sustainable Development	The Effects of Megaproject Social Responsibility on Participating Organizations	*Ma et al., 2021, Vol 52(5)*
	The Paradoxical Profession: Project Management and the Contradictory Nature of Sustainable Project Objectives	*Sabini & Alderman, 2021, Vol 52(4)*
	Vanguard Projects as Intermediation Spaces in Sustainability Transitions	*Gasparro et al., 2022, 53(2)*

Research shows that there is a positive impact between research and the work carried out (Dave et al. 2013; Donovan 2011; Henshall 2011). Considering that most of the work carried out was first researched, research provides the necessary tools required to evaluate and execute work well and efficiently. Research can produce knowledge, and capacity building, inform policy or product development, and provide a broader social benefit (Donovan 2011). Even though the broader impact of research is assessed differently (Donovan 2011; Nightingale and Alister 2007), the overall impact of research toward solving problems is positive and fruitful in many instances. Dave et al. (2013) investigated the impact of research and development (R&D) on the financial sustainability of IT companies that are listed on the S&P index and concluded that the financial sustainability of the companies was found to be strongly affected by gross margins, which in turn are strongly linked to R&D intensity. Concerning the causal impact of R&D on sales revenues, Dave et al. (2013) found that there is a positive causal, meaning R&D thus improves sales revenue; although the impact is negative on technological performance, however, technological performance has a positive impact on financial sustainability.

3.2. Quantitative data

Quantitative data was collected via an online platform, SurveyMonkey. The survey attracted 56 respondents, who were mainly project management professionals. Of the 56 respondents, at least 53 indicated that their organizations have a project portfolio management structure, and Figure 6 answers the question on the extent to which project portfolio management influences their organization's strategic goals.

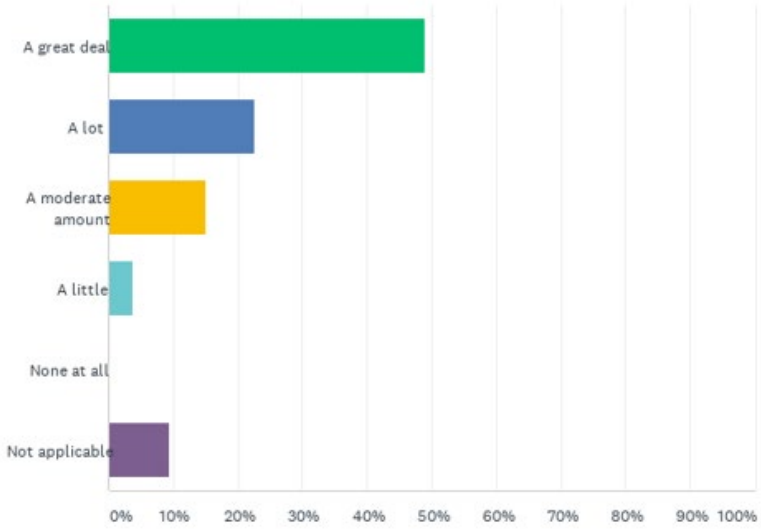

Figure 6. Survey question on – What extent does project portfolio management influence your organization's strategic goals?

Only 49 respondents answered the question which attracted responses as listed in Table 2. The survey questionnaire sought to deliberate in answering the study question that seeks to establish the extent to which organizations are prioritizing projects in their project portfolio for the advancement of digital transformation and sustainable development in their organizations' strategy execution.

Table 2. Survey question on – which of the following are considered factors for project approval in your organization?

Domain	Number of Responses	Percentage
Return on Investment	38	77,6%
Short to long term strategic goals	31	63,3%
Affordability of the project i.e. organization's cashflow	36	73,5%
Resources available to execute the project	35	71,4%
Project's impact towards sustainability of the organization	38	77,6%
Digital migration	13	26,5%
Internal and Enxternal situational analysis of the organization	12	24,5%
Market dynamics	18	36,7%
Viability of the project plan	26	53,1%
Other	2	4,1%

From the data above, it is evident that many organizations are prioritizing returns and organizational sustainability in their execution of the organization's strategy. Even though the two pillars, Return on Investment (ROI) and organizational sustainability are the core business objectives, ROI could be focused on various objectives, including monetary, wellness, public relation, etc. (Watson 2005).

4. Results and Discussions

Qualitative research data shows that there is a need for intensified research and publications in the areas of digital migration and sustainable development, particularly in project management-related studies. Although such research areas are mainly connected with the delivery of organizational objectives, there seems to be less involvement of projects and the project management field as a strategic conduit between an organization's strategy formulation and execution. Literature shows that there is a benefit in using research to drive the execution of developed goals, and project portfolio management could assist in connecting research, organizational objectives formulation, and implementation.

Return on investment (ROI) could represent different returns between organizations and the government. Since the study quantitative survey asked questionnaires based on an organizational viewpoint, in this case, organizations referred to both public and private organizations, it will be necessary to expand the survey study to include government and further elaborate on the context of ROI. It is encouraging to notice from the survey study that organizations are highly considering sustainability in their strategic initiatives, although factors such as digital migration, organizational internal and external factors, and market dynamics are of less consideration.

4.1. Proposed Improvement

Project portfolio management possesses greater potential in directing an organization's initiative toward digital migration and sustainable development. It will be necessary to link the project portfolio management structure with research and development in organizations and governments, and this study requires further exploration to determine the extent to which organizations and governments are involving project portfolio management structure in their research and development areas.

Conclusion

There is a need to extend project portfolio management objectives in organizations to promote the execution of organizational objectives that seek to implement both digital migration and sustainable development initiatives. To meet the UN's 2030 Sustainable Development Goals, organizations must include project portfolio management structures in their research and development areas to merge research initiatives with the implementation structure. PPM has proved over time to be an efficient conduit between strategy formulation and execution in many organizations.

Further research is required to understand the PPM structure in governments and how such structure drives government initiatives toward digital migration and sustainable development goals.

5. References

Journal papers

Artto, K., Kujala, J., Dietrich, P. and Martinsuo, M., What is project strategy?, *International Journal of Project Management,* vol. 26, no. 1, pp. 4-12, 2008.

Cook, W. D. and Green, R. H., Project prioritization: a resource-constrained data envelopment analysis approach, *Socio-Economic Planning Sciences,* vol. 34, no. 2, pp. 85-99, 2000.

Dave, P., Wadhwa, V., Aggarwal, S. and Seetharaman, A., The Impact of Research and Development on the Financial Sustainability of Information Technology (IT) Companies Listed on the S&P 500 Index, *Journal of Sustainable Development,* vol. 6, no. 11, 2013.

Donovan, C., State of the art in assessing research impact: introduction to a special issue, *Research Evaluation,* vol. 20, no. 3, pp. 175-179, 2011.

Dutra, C. C., Duarte Ribeiro, J. L. and de Carvalho, M. M., An economic–probabilistic model for project selection and prioritization, *International Journal of Project Management,* vol. 32, no. 6, pp. 1042-1055, 2014.

Flyverbom, M., Leonardi, P., Stohl, C. and Stohl, M., The management of visibilities in the digital age, *International Journal of Communication,* vol. 10, pp. 98-109, 2016.

Getz, G. and Lee, J. Why your strategy isn't working?, *Business Strategy Series, Vol.12, pp.* 303-307, 2011.

Gobble, M. M., Digital Strategy and Digital Transformation, *Research-Technology Management, vol.* 61, no. 5, pp. 66-71, 2018.

Hansen, L. K. and Svejvig, P., Principles in Project Portfolio Management: Building Upon What We Know to Prepare for the Future, *Project Management Journal,* vol. 0, pp. 1–22, 2023.

Henshall, C., The impact of Payback research: developing and using evidence in policy, *Research Evaluation,* vol. 20, no. 3, pp. 257-258, 2011.

Hobbs, B., Editorial — Special issue on project portfolio management, *International Journal of Project Management,* vol. 30, no. 5, pp. 523-524, 2012.

Jabareen, Y., A New Conceptual Framework for Sustainable Development, *Environment, Development and Sustainability,* vol. 10, no. 2, pp. 179–192, 2008.

Joseph, L. N., Maloney, R. F. and Possingham, H. P., Optimal Allocation of Resources among Threatened Species: a Project Prioritization Protocol, *Conservation Biology,* vol. 23, no. 2, pp. 328-338, 2009.

Martinsuo, M., Project portfolio management in practice and in context, *International Journal of Project Management,* vol. 31, no. 6, pp. 794-803, 2013.

Matt, C., Hess, T. and Benlian, A., Digital Transformation Strategies, *Business and Information Systems Engineering,* vol. 57, no. 5, pp. 339-343, 2015.

Nightingale, P. and Alister, S. Peer review and the relevance gap: ten suggestions for policy-makers, *Science and Public Policy,* vol. 34, no. 8, pp. 543–553, 2007.

Papadonikolaki, E., Krystallis, I. and Morgan, B., Digital Technologies in Built Environment Projects: Review and Future Directions, *Project Management Journal,* vol. 53, 5, pp. 501-519, 2022.

Parris, T. M. and Kates, R. W., Characterizing and measuring sustainable development, *Annual Review of environment and resources,* vol. 28, no. 1, pp. 559-586, 2003.

Purnus, A. and Bodea, C. N., Project Prioritization and Portfolio Performance Measurement in Project-Oriented Organizations, *Procedia - Social and Behavioral Sciences,* vol. 119, pp. 339 – 348, 2014.

Rad, P. F. and Levin, G., Book Review: Project Portfolio Management: Tools and Techniques, *Project Management Journal,* vol. 38, no. 2, pp. 3-104, 2007.

Raupp, J. and Hoffmann, O., Understanding strategy in communication management. *Journal of Communication Management,* Vol. 16 no. 2, pp. 146-161, 2010.

Shiferaw, A. T. and Klakegg, O. J., Linking Policies to Projects: The Key to Identifying the Right Public Investment Projects, *Project Management Journal,* vol. 43, no. 4, pp 2-88, 2012.

Sowlati, T., Paradi, J.C. and Suld, C., Information systems project prioritization using data envelopment analysis, *Mathematical and Computer Modelling,* vol. 41, no. 11-12, pp. 1279-1298, 2005.

Taherdoost, H., Sampling Methods in Research Methodology. How to Choose a Sampling Technique for Research, *International Journal of Academic Research in Management (IJARM),* vol. 5, no. 2, pp. 18-27, 2016.

Voss, M. and Kock, A., Impact of relationship value on project portfolio success — Investigating the moderating effects of portfolio characteristics and external turbulence, *International Journal of Project Management,* vol. 31, no. 6, pp. 847-861, 2013.

Whyte, J., How Digital Information Transforms Project Delivery Models. *Project Management Journal,* vol. 50, no. 2, pp. 177-194, 2019.

Živković, S. and Veljković, M., SUSTAINABLE DEVELOPMENT AND PROJECT MANAGEMENT, *Economics of Sustainable Development,* vol. 2, no. 1, pp. 13-21, 2018.

Conference papers

Simion, C. P., Popa, Ș. C. and Albu, C., PROJECT MANAGEMENT 4.0 - PROJECT MANAGEMENT IN THE DIGITAL ERA, *Proceedings of the 12th International Management Conference,* pp. 93-100, Bucharest, Romania, November 1st-2nd, 2018.

Winzker, D. H. and Pretorius, L., Developing and Implementing Strategic Intent in a Post-Modern World, *2005 IEEE International Engineering Management Conference*, pp. 369-371, St. John's, NL, Canada, September 13th, 2005.

Books

Ackermann, F. and Eden C., Making Strategy. Mapping Out Strategic Success, 2nd edition*,* SAGE, London, 2011.

Anderson, D. R., Sweeney, D. J. and Williams, T. A., ESSENTIALS OF STATISTICS FOR BUSINESS AND ECONOMICS, 6th Edition, SOUTH-WESTERN CENGAGE Learning, 2011.

Drucker, P. F., Innovation and Entrepreneurship*,* Revised Edition, Elsevier, Butterworth-Heinemann, 2009.

Isikli, E., Yanik, S., Cevican, E. and Ustundag, A., Project Portfolio Selection for the Digital Transformation Era In Industry *4.0,* Managing The Digital Transformation, pp. 105-121, Springer International Publishing, Istanbul, 2018.

Kloppenborg, T. J, Contemporary Project Management. Organize/Plan/Perform, 3rd edition*,* Cengage Learning, 2015.

Peng, M. W., Global Strategic Management, 3rd edition, Cengage Learning, 2014.
Rogers, P. P., Jalal, K. and Boyd, J. A, An Introduction to Sustainable Development, 1st Edition, Routledge, London, 2012.
Schwab, K., The Fourth Industrial Revolution, Penguin Books Ltd, 2017.
Sekaran, U. and Bougie, R., Research Methods for Business. A skill-Building Approach, 6th Edition, Wiley, 2013.
Wheelen, T. L., Hunger, D. J., Hoffman, A. N. and Bamford, C. E., Strategic Management and Business Policy, 5th Edition, Pearson Education Limited, Harlow, 2018.

Electronic sources

Agrawal, A., Goldfarb, A. and Gans, J., How AI Will Change Strategy: A Thought Experiment, *Harvard Business Review,* Available: How AI Could Change Amazon: A Thought Experiment (hbr.org), June 2022, 2017.
Asmal, Z., Bhorat, H., Culligan, S., Hofmeyr, H., Monnakgotla, J., Oosthuizen, M. and Rooney, C., Skills Supply and Demand in South Africa. Labour Market Intelligence Programme, *South African Department of Higher Education and Training Report*, Available: https://www.dhet.gov.za/, July 2021, 2020.
Bloem, J., van Doorn, M., Duivestein, S., Excoffier, D., Maas, R. and van Ommeren, E., *THE FOURTH INDUSTRIAL REVOLUTION.* Things to Tighten the Link Between IT and OT, Available: The Fourth Industrial Revolution Things to Tighten the Link Between It and Ot - DocsLib, June 2022, 2014.
Gosenheimer, C., PROJECT PRIORITIZATION: A Structured Approach to Working on What Matters Most, *Office of Quality Improvement, University of Wisconsin*, Available: http://www.quality.wisc.edu, July 2023, 2012.
Homkes, R. Translating strategy into results, *London Business School Review,* Available: http://www.london.edu/think/, June 2023, 2015.
Markides, C. and Morris, R., How to make better strategic decisions, *London Business School Review,* http://www.london.edu/think/, June 2023,2016.
PMI SA, PMI South Africa Chapter. Available: https://pmi.org.za/about/chapter, March 2021, 2021.
Porter, M. E., What is Strategy, *Harvard Business Review,* Available: What Is Strategy? (hbr.org), June 2023, 1996.
Preuschoff, B. and Kramer, B. F., Creating Strategy in a Digital Era. *IBM Global Business Services*, Available: http://www-935.ibm.com/services/us/gbs/thoughtleadership/digitalreinvention/, March 2022, 2016.
SAGE Journals, Project Management Journal, Available: https://journals.sagepub.com/metrics/PMX, July 2023, 2023.
UN, 2023 Global Sustainable Development Report, *United Nations*, Available: https://www.undp.org/, July 2023, 2023a.
UN, Progress towards the Sustainable Development Goals: Towards a Rescue Plan for People and Planet, United Nations General Assembly Economic and Social Council, Available: https://www.un.org/sustainabledevelopment/, July 2023, 2023b.
Van Hove, N., How to bridge the strategy to execution gap, Available: https://www.i-nexus.com/stratex-hub/how-to-bridge-the-strategy-to-execution-gap/, March 2021, 2016.
Watson, T., ROI or evidence-based PR: The language of public relations evaluation, *Prism 3*, Available: http://praxis.massey.ac.nz, July 2023, 2005.
Zijlstra, H., What is CiteScore and why should you care about it?, Available: https://www.elsevier.com/connect/what-is-citescore-and-why-should-you-care-about-it, July 2023, 2021.

6. Biographies

Humphrey Matlala is an engineering professional and holds a Ph.D. in Engineering Management from the University of Johannesburg. He is a registered Professional Engineering Technologist with the Engineering Council of South Africa (ECSA), a Senior Member of the South African Institute of Electrical Engineers (SAIEE), and a Project Management Professional (PMP) with the Project Management Institute (PMI). Humphrey also holds an MPhil in Engineering Management, a BSc Hons in Management of Technology, and a BTech degree in Electrical Engineering. He has over 20 years of work experience in the industry, working as an automation design engineer, reliability engineer, engineering manager, and project manager.

Prof. Hannelie Nel is an Associate Professor at the Postgraduate School of Engineering Management at the University of Johannesburg and a registered Professional Engineer. She holds a DEng Engineering Management, an MSc Industrial Engineering, and a BEng Chemical Engineering; and has over 20 years' experience in both industry and academia. She served as Past President of the Southern African Institute for Industrial Engineering and is currently an Honorary Fellow. She was twice nominated for the prestigious Kris Adendorff Award as the most outstanding Industrial Engineering professional in South Africa and was recognized for professional contribution with two SAIIE Special Commendation Awards. As former Vice-Dean of the Faculty of Engineering and the Built Environment at UJ, she founded the UJ-Group Five Women in Engineering and the Built Environment program for the recognition of excellence by technical women in Southern Africa. Consequently, she received the IEEE WIE Award for Human Capital Development in Science, Engineering, and Technology and was a finalist in the Standard Bank Top Women in Business Awards. Hannelie is an international author and speaker with over 50 publications and two professional books to date, Leadership and Agency of Women Engineers in South Africa and The Development of Women and Young Professionals in STEM Careers, published as co-author. In 2016, she became a member of the International Women's Forum, an invitation-only network of the most accomplished women leaders in the world. Hannelie also works with Consulting Engineers South Africa to develop young and experienced technical women in Leadership in the industry.

Prof. Jan-Harm C. Pretorius obtained his BSc Hons (Electrotechnics) (1980), MIng (1982) and DIng (1997) degrees in Electrical and Electronic Engineering at the Rand Afrikaans University and an MSc (Laser Engineering and Pulse Power) at the University of St Andrews in Scotland (1989), the latter cum laude. He worked at the South African Atomic Energy Corporation as a Senior Consulting Engineer for fifteen years. He also worked as the Technology Manager at the Satellite Applications Centre of the Council for Scientific and Industrial Research. He is currently a Professor and Head of School: Postgraduate School of Engineering Management in the Faculty of Engineering and the Built Environment where he worked since 1998. He has co-authored more than 250 research papers (journals and peer-reviewed conferences) and supervised over 65 PhD and 270 master's students in Electrical Engineering and mostly in Engineering Management (mostly 50% dissertation). He is a registered professional engineer, professional Measurement and Verification practitioner, senior member of the Institute of Electrical and Electronic Engineering, fellow of the South African Institute of Electrical Engineers and a fellow of the South African Academy of Engineering.