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AGILE PROJECT MANAGEMENT PRACTICES AND SMART WASTE MANAGEMENT PROJECT IN GASABO DISTRICT, KIGALI, RWANDA

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Abstract

Agile project management practices have gained widespread popularity in recent years as a means of managing complex projects across various industries with roots in software development. As governments seek to address environmental challenges, the rise of smart cities has become a prominent trend. Rwanda has launched the Smart Waste Collection and Management project as part of its smart cities initiative to minimize waste. However, implementing such complex projects has been a significant challenge. This study, guided by complexity and shared mental models theories, aims to examine the contribution of agile project management practices to the performance of Smart Waste Collection and Management project in Gasabo District, Kigali, Rwanda. Specifically, the study aims to achieve three objectives: determining how iterative practices affect project performance, investigating the relationship between project group dynamics and performance, and analyzing the extent to which stakeholder collaboration affects project performance. The research designs adopted for this study are descriptive and correlational research design and quantitative data gathered using a questionnaire while qualitative information gathered using interview. The study used census sampling technique because the population is relatively small to carry out sampling, the target population was composed of 52 respondents that have something to do with the project including project staff, and beneficiaries in Gasabo District. The collected data was analyzed using descriptive statistical techniques such means and standard deviations. Analysis of quantitative data computed using SPSS version 27.0 whereas data gathered using interviews analyzed thematically using content analysis. The analysis of variance (ANOVA) also done for the purpose of testing correlation between variables. The results indicated $p=0.000<0.05$ which indicates that there is a significant moderate relationship between iterative practices and the performance of the project. Model summary results of a regression analysis between project group dynamics and project performance are a value of R of 0.911, R Square of 0.829, and an adjusted R Square of 0.826 indicate that project group dynamics indicated by project team autonomy, face to face conversations and collective decision making increase the performance of Smart Waste Collection & Management project by 82.6%. Findings show analysis of variance between independent variable and dependent variable whereby F-test is positive 326.356 and p value of $0.000<0.05$ indicates that active stakeholder collaboration is good predictor of performance of the project. Results showed that the objectives of the study had been achieved which is evidence to bridge of identified gap on existence of the study on effect of iterative practices, project group dynamics and stakeholder collaboration on project performance in Rwanda. Hence, the research gap was filled as the study was successfully completed.

Keywords: Project management practices and smart waste management project.

Introduction

Over the past few years, there have been several trends such as increasing complexity, dynamic markets, and climate and environmental changes. These trends have led to a high level of uncertainty, which can negatively impact project performance. Uncertainty can arise from various sources, including ambiguous and contradictory information, lack of data or structure, biases (known and

unknown), limited control over project players, and ignorance about the effort required to clarify the situation. (John Wiley & Sons, 2003)

For organizations, it is necessary to be able to respond to changing conditions. Yet, traditional plan-driven project management techniques are no longer effective (Ciric, Lalic, Gracanin, Palcic & Zivlak, 2018). Furthermore, Koskela & Howell, (2002) states that "In the present big, complex, and speedy projects, traditional project management is simply counterproductive; it creates self-inflicted problems that seriously undermine performance." A traditional approach to project management seeks to comprehensively plan and foresee all potential details and requirements prior to the project's realization. It still puts a lot of emphasis on assuring conformance to time, budget, and scope constraints and frequently overlooks important things like continuous improvement, customer-centered thinking, and reflective learning which makes project companies become less flexible and unable to accumulate the knowledge and experience needed to adapt to change (Ronald, 2014). Project managers assume that the project's external factors are predictable and that the requirements are well defined, however, projects rarely follow a sequential order during implementation and stakeholders usually are unable to understand all the requirements at the beginning of the project. However, to successfully manage dynamic projects in today's environment of rapid change and to make changes acceptable, most organizations are aiming to adopt new ways of working that provide them the opportunity to adapt to changes, one of these ways is agile management. (Amna, 2016). Agile project management addresses the reality of ongoing change or incorporates discovery and learning throughout the project life cycle. By its very nature, agile project management encourages direct customer involvement, modifications, and even redirection using a type of iterative methodology throughout a project's activities that address the level of uncertainty encountered (White, 2008). As an alternative to traditional project management, agile project management overcomes limited possibilities of managing projects that are characterized by a lack of sequential flow, require flexibility due to continuous changes, and require extensive collaboration and communication with stakeholders.

Worldwide, agile project management is gaining traction, and organizations reported using agile sometimes or more frequently than in the past to run their projects. In fact, over the past 12 months, one in five projects has used agile approaches. (PMI's Pulse of the profession, 2017). In Europe, a study done on a Slovenian wire manufacturing company revealed that agile project management can be adopted in part instead of adopting a whole agile project management methodology that requires undergoing a complete organizational transformation and still benefit significantly. Some reported benefits included better communication among team members, quicker error detection during product development, adapting and responding quickly to the external environment, more efficient problem-solving, and flexibility. (Zuzek, *et al*., 2020).

In Czech Republic, the use of agile project management is not so high as in other foreign countries. Companies in the ICT sector show a greater knowledge of agile approaches than other sectors whereas, in the construction sector, only big companies have reported using agile approaches. (Antlova, 2014)

In Africa, specifically, Kenya, a number of government-funded projects have failed (Osedo, 2015) this is clear that there is a problem of project delivery and for the past few years, agile methodologies have been regarded as the ultimate solution in successfully addressing the high project failure rate (Namatsi & Muchelule, 2021). This could be particularly important for government-funded projects, which often have a significant impact on the lives of citizens and the development of the country. By adopting an agile approach, project teams may be better able to respond to changing requirements, manage risks, and deliver products or services that meet the needs of end-users.

While the contribution of agile project management to the performance of software development projects is well documented, it remains underexplored in the domain of smart waste management projects. The United Nations (UN) adopted 17 Sustainable Development Goals (SDGs) which are intended to guide the actions of all countries toward a more sustainable future. Specifically, the 12th goal talks about responsible production and consumption and encourages industries, businesses, and consumers to recycle and reduce waste generation by 2030. The pace at which the earth's climate is changing has put pressure on governments and companies to come up with innovative projects to combat environmental challenges.

According to the report by (UN-Habitat and UNESCAP, 2015), there is a rapid growth of urban populations in developing countries and estimates show that two-thirds of the world's people will be living in cities by 2025 and the quantity of waste generation increases with the nation's economic, and population growth, urbanization, and industrialization (Rana, et al., 2015). Cities around the world are on the urge to become smarter. In

order to improve the effectiveness of municipal services and increase advantages and convenience for their communities, engineers, urban planners, architects, and city managers are currently working together to construct Smart Cities at a rapid pace. (Kunzmann, 2014).

As part of Rwanda's Smart Cities initiatives, the Government of Rwanda has implemented the Smart Waste Collection and Management project through the Ministry of ICT and Innovation (MINICT), the City of Kigali, and the Rwanda Information Society Authority (RISA), in collaboration with Smart Africa and the Norwegian Development Agency (NORAD) with the aim to improve solid waste management using innovative technologies. (MINICT, 2021)

The aim of this study, therefore, is to investigate the contribution of agile project management practices on the performance of smart waste management projects.

Statement of the Problem

Waste generation is a significant issue in many growing cities including Kigali city in Rwanda. The waste generated by households and commercial entities is collected and ends up dumped at Nduba landfill and the quantity of waste collected has increased from 180 tons per day to more than 500–800 tons per day. (Whyte, *et al*., 2020). This can have a severely negative impact on the environment and the economy (Etea, *et al*., 2021). According to Maksimovic *et al*., (2018), smart waste management projects have the potential to improve waste management efficiency and reduce environmental impact. Despite their potential, the implementation of smart waste management projects can be quite challenging.

A study conducted by Yadav *et al*., (2023) aimed at identifying barriers to the smart waste management implementation in India showed that difficulty in implementing innovative technologies ranks the second. This is because technologies involved may be relatively new or untested which can lead to uncertainty and without proper project management there is a risk of failure. In fact, according to a report by IBM, 68% of project failure was due to poor project management. Specifically, in Rwanda, government projects fail due to delayed implementation schedules because of lack of readiness by project management. (OAG, 2022). Several studies have shown that agile project management practices have been proven to enhance project success. Yet, the extent to which they can contribute to the performance of smart waste management projects remains unclear.

Therefore, the primary objective of the current study is to address this gap by assessing how application of the agile project management practices contribute to the performance of smart waste management project in Gasabo District, Kigali.

Research objectives

The objective of the study was categorized as general and specific objectives as shown below:

General objective

The study is designed to assess the contribution of agile project management practices to the performance of Smart Waste Collection and Management projects in Gasabo District.

Specific objectives

i. To determine how iterative practices affect project performance at Smart Waste Collection & Management project in Gasabo District.

ii. To investigate the relationship between project group dynamics and project performance at Smart Waste Collection & Management project.

iii. To analyze the extent to which stakeholder collaboration affects project performance at Smart Waste Collection & Management project.

Research hypotheses

H_o1: Iterative practices have no statistically significant influence on performance of Smart Waste Collection and Management project.

H_o2: There is no significant relationship between project group dynamics and performance of Smart Waste Collection and Management project.

H_o3: Stakeholder collaboration does not affect the performance of Smart Waste Collection and Management project.

Review of Literature

Conceptual Review

Agile Project Management (APM)

Agile project management is an iterative approach to project management that focuses on breaking down large projects into more manageable tasks, which are completed in short iterations throughout the project life cycle. (Workfront, n.d.). Agility has been defined by Highsmith (2004) as the ability to balance stability and flexibility, while Lindvall et al. (2002) have defined agility as an iterative and incremental process that allows the project team to organize itself in a way that best suits the work with the ability to emerge requirements through the development of product lifecycle.

Agile Alliance & Project Management Institute (PMI) defined agile as the ability to create and respond to change. It is a way of dealing with, and ultimately succeeding in, an uncertain and turbulent environment. Amaral, *et al*., (2011) defined APM as an approach based on a set of principles, whose goal is to render the process of project management simpler, more flexible, and iterative in order to achieve better performance with less management effort and higher levels of innovation and added value for the customer.

In 2016, Conforto et al. in what they considered to be a complete definition of agility proposed that agility is the project team's ability to quickly change the project plan as a response to customer or stakeholders' needs, market or technology demands in order to achieve better project and product performance in an innovative and dynamic project environment.

Agile first appeared in software development in the 1990s and gained popularity primarily after 17 software development gurus published the Agile Manifesto in 2001. All participants were looking for an alternative way of building software because the former way of heavy-weight and documentation-driven software development was only creating problems such as late and over-budget delivery of less than satisfactory products. So, (Peter M & Radtac, 2015) argues that the agile software manifesto provides a single definition and underlines the development and delivery of agile frameworks. The Manifesto came up with the following values: people over processes; products that actually work over documenting what that product is supposed to do; collaborating with customers over negotiating with them, and responding to change over following a plan. (Jeff Sutherland, 2014).

Denning (2016) noted that it is important to understand agile as a mindset and that implementing agile methods without an agile mindset would be futile. Agile Alliance argues that the agile mindset is informed by the Agile Manifesto's values and principles, and they provide guidance on how to quickly respond to change. While its title 'the manifesto for agile software development' suggests that it is only applicable to software development, the values and principles described in the manifesto can easily be applied to the development of many products. (Peter M & Radtac, 2015). Also Ciric, D. *et al*., (2019) argue that although agile emerged as a concept for software development and IT projects, agility today represents one of the basic competitive advantages of contemporary organizations.

Coras, (2018) states that the ability of an organization to meet the challenges of an uncontrollable external environment is often the difference between success and failure. These challenges may present themselves as changing customer needs, budget cuts, market dynamics, or evolving industry trends. This environment is forcing entire businesses to become more agile, needing them to be able to rapidly respond to unexpected changes and challenges. Also Tena Ž *et al*., (2020) note that APM is now increasingly recognized and adopted also by other industry sectors due to the highly dynamic and unpredictable project environment. The authors also argue that companies need to be able to manage changes quickly and effectively, otherwise, the final product will not be current and will only go to waste.

The researcher understands that a detailed explanation of the 4 manifesto values, 12 agile principles, and agile frameworks is not part of the scope of this study. For this reason, only APM practices will be explained in detail in the following section.

Agile Practices

A project management practice is a specific type of professional or management activity that contributes to the execution of a process and that may employ one or more techniques and tools PMBOK® Guide (2017). It should be noted that the practices described in this study do not represent the majority of practices, tools, and techniques comprised in the Agile theory, but only a small and selected sample.

Group Dynamics

The agile manifesto's first value is "individuals and interactions over processes and tools" which highlights the importance of collaboration between the stakeholders and the software developers over software development process and tools (Amna, 2016). In the context of other sectors, this would mean that if there's no effective teamwork among employees, even the best processes and tools will be futile.

Iterative Practices

Agile teams work in short, recurrent, one- to five-week-long work iterations. At the beginning of each iteration, team members and business owners agree on what will be delivered during the upcoming iteration (Tuomivaara *et al*., 2017). The team estimates the amount of work each task will require, and based on this, it plans and decides on how much work can be completed (Tripp *et al*., 2016). Tuomivaara *et al*., (2017) also notes that agile teams prefer to reduce the scope of tasks to keep their timetables rather than delay deadlines. It is done

iteratively, repeating the planning cycle several times over the course of the project life cycle, as opposed to traditional project management which creates a single plan for the entire project that is revised and improved phase by phase. This enables the agile team to keep receiving feedback from the customer, thereby responding to whatever change they may incur.

Cooper (2016) critiques that delivering a functional and marketable physical product every few weeks is nearly impossible compared to a software product and thus the deliverable or "done" iteration needs to be redefined. For this reason, the same author introduced the idea of a *protocept*, a product version somewhere between a concept and a prototype that can be shown to the customer to seek feedback (Žužek *et al*. 2020).

Stakeholder Collaboration

According to PMI (2017), a stakeholder is an individual or organization who can affect or is affected by the project. The complexity of a project changes every time a stakeholder joins or leaves it since stakeholders are individuals or groups that are directly or indirectly involved in a project and have a vested interest in its success, they provide the resources and support necessary for the organization to achieve its goals and objectives. However, if an organization is unable to meet the expectations of its stakeholders, it may withdraw its support, which can ultimately result in the failure of the project and the organization (Hamdan *et al*., 2021). It is important to actively engage with stakeholders and listen to their feedback and suggestions to ensure project risks are kept at a minimum. Collaboration is one of the key principles of APM which is often used to foster the most effective customer collaboration, whereby customers are actively involved in the product development process. This enables customers to provide feedback and suggestions that can be used to improve the product, increasing the long-term value of the product for both the customers and the organizations. This in turn increases the sustainability of the organization, as the products are designed with the needs of the customers in mind, which ultimately leads to the development of a more sustainable business.

Traditional Project Management (TPM)

Traditional project management often referred to as the waterfall model entails thorough planning and control, with a focus on clearly identifying the client's expectations at the outset of the project and preventing changes later. In traditional project management, tasks are performed one after another in an orderly sequential flow and believe in the predictability of events affecting the project. Additionally, within traditional project management once a phase is completed it is assumed that it will not be revisited. (Kathleen, 2007).

Karlesky and Voord (2008) traditional or plan-driven methods try to limit change as much as possible by planning and documenting in advance, if any change occurred during the project lifecycle it is considered as a threat to the development process. The researchers went on to explain that a high percentage of traditional projects fail to meet the requirements on time and often experience project cost overruns.

The strength of this project management approach, however, according to Kathleen (2007), is that some projects require thorough planning in advance especially projects where the steps needed to be taken are known. For example, in construction projects, to fully grasp the breadth of the project, the team must define the requirements, design, and plan for the complete structure, not just individual components.

Project Performance

The performance of a project is based on task accomplishment as determined by its completeness, adherence to the accuracy of the standards, speed, and cost (Omondi, 2017). According to the current trends, a project is successful when it is finished on schedule, within the allocated budget, and in accordance with all set requirements. However, the concept of project performance has been enriched and expanded beyond the three project constraints (Hassan & Adeleke, 2019). Kabirifar and Mojtahidi (2019) recommended the inclusion of stakeholder satisfaction and realization of benefits as additional measures of project performance. They noted that a project may be completed on time, within budget, and meet all pre-established requirements, but fail to meet the expectations of key stakeholders such as the customer. Therefore, project managers have the responsibility of ensuring that key stakeholders are involved at every step of the project so that they can clarify their expectations on a continual basis (Osedo, 2015; Sikudi & Otieno, 2017).

Theoretical Framework

Complexity Theory

Complexity Theory can be used to explain how a set of connected, interdependent parts work together to form a system and that interactions and synergies between individual parts cannot be predicted by studying the properties of the individual part alone. Thus, complexity theory can be used to study complex adaptive systems (CAS) (Park, 2017). The theory and its concept emerged in the mid-late 20th Century across multiple disciplines, and this has

presented a challenge in understanding its origins. However, much of the research on complexity theory originates from Santa Fe Institute (Encyclopedia, 2023).

Complexity theory has also been used to better understand new methods to project management, as traditional or waterfall models have been found inadequate for solving current challenges in society (Saynisch, 2011). According to these methods, it is important to create an atmosphere of trust that encourages new ideas and promotes collaboration.

Therefore, the researcher understands that there are complexities in every situation and thus, in projects such as waste management projects. In other words, projects by nature have individual situations or parts that must work together to enhance the system. Accordingly, it is typical for the complexity to result in several adjustments in the projects for which the stakeholders may not have been prepared. This will result in the agile project team being flexible and adjusting the project plan to avoid further time and cost overruns.

Shared mental model theory

This theory has been used to explain team functioning. The idea behind this theory is that performance is directly proportional to team members' shared understanding of the work that is to be completed. (Jonker *et al*., 2011). In other words, for the team to effectively perform, team members should possess a common or overlapping understanding of task requirements, processes, and their roles and responsibilities.

The concept of the shared mental model is defined by (Castellan, 2013) as knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task, and, in turn, coordinate their actions and adapt their behavior to the demands of the task and other team members. Shared mental models thus help describe, explain, and predict the behavior of the team, which allows team members to coordinate and adapt to changes.

A shared mental model also helps team members explain other members' actions, understand what is going on with the task, develop accurate expectations about future member actions and task states, and communicate meanings efficiently.

Critical Review

The relationship between agile project management practices and waste management project performance is relatively a new field in research though much emphasis has been placed on agile project management as a whole and mainly within the IT sector.

From past studies such as Zuzek, *et al*., (2020) emphasized that agile project management practices had an influence on the performance of manufacturing projects. The study findings indicated that a few adopted agile practices significantly influenced company projects' performance where the project team's ability to respond to changes quickly and effectively was improved. The findings of this study can be really difficult to generalize and they may pose a risk of bias since the methods used in the research was mainly observation. Also the definition of complexity differs per project.

Research Gap Identification

The contribution of agile practices to the performance of smart waste management projects which are at the same time funded by the government is yet to be comprehensively covered. This study seeks to show how the selected agile practices can influence project performance in terms of stakeholder satisfaction, and overall set goals.

Materials and Methods

The research was statistical survey; it is key role in statistics and data analysis. Descriptive and correlation, describes, compares, and measures data; it is also identify characteristics, frequencies, trends, and categories for contribution of agile project management practices to the performance of waste management projects in Gasabo District. The study was statistical survey and was useful in obtaining information on the current status of the phenomena to describe what exists (Natasha, 2011). It is an efficient way of collecting information from a large number of respondents. Very large samples are possible. Statistical techniques can be used to determine validity, reliability and statistical significance. Surveys are flexible in the sense that a wide range of information can be collected by researcher.

Target Population and Sample size

Population was all employees from the case study which was comprised by 52 people. Julius (1990) said that population is a group of people of organization, objects or events, about which the researcher wants to, draw a conclusion and respondents that he/she was addressed the questionnaire. Thus, the researcher met the total number of 52 respondents that he/she was addressed the questionnaire where sample size was 52 respondents.

Data Collection Methods

Data collection is the systematic gathering of data using a specified scientific process (Cooper, Schindler, 2014). Poor selection of data collection methods affects the collected data. Research was used primary and secondary data.

Data Analysis

Data collected was analyzed using descriptive statistics because the data obtained in this study was quantitative. It uses correlations and regression analysis. According to Quang and Hong (2009), quantitative data are observations measured on a numerical scale. Results collect also was entered into the statistical analysis. This analysis indicated variations of the response in the sample, response to the various questions and variations among different groups. Presentation of the results and findings were in terms of tables and graphs.

Descriptive statistics

Descriptive statistics was used to describe the basic features of the data in the study in the tendencies and then replicated in tabular manner. It involved use of percentages, frequencies, mean and standard deviation.

Spearman (Pearson) correlation

Spearman (Pearson) correlation coefficient measures the extent to which, as one variable increases, the other variable tends to increase, without requiring that increase to be represented by a linear relationship. If, as the one variable increases, the other decreases, the rank correlation coefficients were negative. Statistical correlation is measured by what is called coefficient of correlation (r). Its numerical value ranges from +1.0 to -1.0. It indicates the strength of relationship. In general, $r > 0$ indicates positive relationship, $r < 0$ indicates negative relationship while $r = 0$ indicates no relationship (or that the variables are independent and not related). Here $r = +1.0$ describes a perfect positive correlation and $r = -1.0$ describes a perfect negative correlation.

Closer the coefficients are to +1.0 and -1.0, greater is the relationship strength between the variables. As a rule of thumb, the following guidelines on strength of relationship are often useful (though many experts would somewhat disagree on the choice of boundaries). It was employed Statistical package for Social Sciences (SPSS) in processing and data examination of which informed the presentation of findings, examination and elucidation. The presentation was emphasized on the hypothesis. Statistical treatment depends upon the problem, especially the specificity of data gathered. Data analysis was done based on descriptive statistics particularly means and standard deviation. The coefficient of determination, R^2, was used to analyze how differences in one variable can be explained by a difference in a second variable. For example, when a person gets pregnant has a direct relation to when they give birth. More specifically, R-squared gives you the percentage variation in y explained by x-variables. The range is 0 to 1 (i.e. 0% to 100% of the variation in y can be explained by the x-variables.

The R^2 is similar to the coefficient correlation, R. how strong is a linear relationship for two variables. R Squared is the square of the correlation coefficient, *r* (hence the term r squared).

Results

Descriptive Statistics on Influence of iterative practices

	N	Minimum	Maximum	Mean	Std. Deviation
Tracking progress of the project daily enhances project performance	52	2	5	4.13	.991
Breaking the project goals into sprints and reviewing them at the end of each sprint influences project performance	52	2	5	4.13	.991
Continuously improving the plan to meet user needs improves project performance	52	2	5	4.13	.991

Regular meeting in reaction to project changes enhances project performance	52	2	5	4.17	.923
Valid N (listwise)	52				

Source: Primary Data (2024)

From the findings show that 'Tracking progress of the project daily enhances project performance with mean of 4.13 and .991 standard deviation. This implies that the respondents strongly agreed with the statement as indicated by a strong mean and a high standard deviation showed the heterogeneity of answers which means the respondents had diverse opinions of the statement.

The second statement shows that "Breaking the project goals into sprints and reviewing them at the end of each sprint influences project performance where the respondents agreed with a mean of 4.13 and standard deviation of .991 and this indicated that the respondents agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement.

The third statement shows that "Continuously improving the plan to meet user needs improves project performance with mean of 4.13 and .991 standard deviation. This implies that that the respondents strongly agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement.

The fourth statement shows that "Regular meeting in reaction to project changes enhances project performance" where the respondents agreed with a mean of 4.17 and standard deviation of .923 and this indicated that the respondents agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement.

Descriptive Statistics on Stakeholder collaboration and project performance

	N	Minimum	Maximum	Mean	Std. Deviation
Collaboration with stakeholders in setting up project processes and documents improves project performance	52	2	5	4.48	.779
Considering stakeholder feedback enhances project performance	52	1	55	5.44	7.047
Support and guidance provided by stakeholders influences project performance	52	1	5	4.02	1.146
Valid N (listwise)	52				

Source: Primary Data (2024)

The findings in table 2 indicated that for the first statement that stated that "Collaboration with stakeholders in setting up project processes and documents improves project performance" "the respondents agreed with a mean of 4.48 and standard deviation of .779 with the statement and this indicated that the respondents agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement".

The second statement evaluated that "Considering stakeholder feedback enhances project performance"where the respondents strongly agreed with a mean of 5.44 and standard deviation of 7.047. "This indicated that the respondents disagreed with the statement as indicated by the weak mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement.

The third statement evaluated was “Support and guidance provided by stakeholders influences project performance" this was measured by a mean of 4.02 and standard deviation of 1.146. This indicated that the respondents are strongly agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement”.

Descriptive Statistics on Project performance

	N	Minimum	Maximum	Mean	Std. Deviation
Project delivery was completed on targeted schedule	52	1	5	3.88	1.041
The project/system was developed based on beneficiary’s requirements	52	1	5	3.88	1.041
Project team was satisfied with project progress deliverables and processes	50	1	5	3.88	1.062
The budget for each phase of the project was essentially the same as planned	52	1	5	3.88	1.041
Stakeholders were satisfied with overall project outcomes	52	1	5	3.85	1.055
Waste management processes were optimized	52	1	5	3.85	1.055
Valid N (listwise)	50				

Source: ***Primary Data (2024)***

The findings in table 3 indicated that for the first statement that stated that " Project delivery was completed on targeted schedule" On average the respondents agreed with a mean of 3.88 and standard deviation of 1.041 with the statement. “This indicated that the respondents agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement”.

The second statement evaluated was “The project/system was developed based on beneficiary’s requirements" “where the respondents agreed with a mean of 3.88 and standard deviation of 1.041”. “This indicated that the respondents agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement.

The findings indicated that for the third statement that stated that "Project team was satisfied with project progress deliverables and processes" On average the respondents agreed with a mean of 3.88 and standard deviation of 1.062 with the statement. “This indicated that the respondents agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement”.

The fourth statement evaluated was “The budget for each phase of the project was essentially the same as planned" “where the respondents agreed with a mean of 3.88 and standard deviation of 1.041”. “This indicated that the respondents agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement.

The findings indicated that for the fifth statement that stated that "Stakeholders were satisfied with overall project outcomes" On average the respondents agreed with a mean of 3.85 and standard deviation of 1.055 with the statement. “This indicated that the respondents agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement”.

The sixth statement evaluated was “Waste management processes were optimized" “where the respondents agreed with a mean of 3.85 and standard deviation of 1.055”. “This indicated that the respondents agreed with the statement as indicated by the strong mean and heterogeneity of answers as indicated by the standard deviation where the respondents had different opinions of the statement.

Model Summary on project group dynamics for performance at Smart Waste Collection & Management project

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.911[a]	.829	.826	.485

a. Predictors: (Constant), Group_Dynamics

The results in table indicated that the Adjusted R^2 is .826 which means project group dynamics jointly affect project performance of Smart Waste Collection and Management projects in Gasabo District in this study”.

ANOVA[a] on project group dynamics for performance at Smart Waste Collection & Management project

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	54.721	1	54.721	232.886	.000[b]
	Residual	11.279	48	.235		
	Total	66.000	49			

a. Dependent Variable: Assessment of project performance

b. Predictors: (Constant), Group_Dynamics

The results in Table above show that the F-test is positive 232.886 and that it is significant at 5% because its significance level is .000[b] and therefore, based on the results on this test, we cannot accept the null hypothesis stating that” "Project group dynamics have no significant effect on performance at Smart Waste Collection & Management project". “This is due to the fact that the ANOVA results indicated that there is positive and significant effect on performance at Smart Waste Collection & Management project in this study”.

Coefficients[a] on project group dynamics for performance at Smart Waste Collection & Management project

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.140	.262		.533	.597
	Group_Dynamics	.995	.065	.911	15.261	.000

a. Dependent Variable: Assessment of project performance

The results from Table indicated that project group dynamics has a positive and significant effect on performance at Smart Waste Collection & Management project (β1= .995; t= 15.261; p-value < 0.05)”. “This means that 1% change in project group dynamics leads to an increase of performance at Smart Waste Collection & Management project”.

ANOVA[a] on stakeholder collaboration for performance of Smart Waste Collection & Management project

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	57.232	1	57.232	326.356	.000[b]
	Residual	8.768	50	.175		
	Total	66.000	51			

a. Dependent Variable: Assessment of project performance

b. Predictors: (Constant), Stakeholders_Collaboration

The results in Table showing that the F-test is positive 326.356 and it is significant at 5% because its significance level is .000[b] and therefore, based on the results on this test, we cannot accept the third null hypothesis stating that" "Stakeholder collaboration does have significant effect on performance of Smart Waste Collection & Management project". "This is due to the fact that the ANOVA results indicated that there is positive and significant effect on performance of Smart Waste Collection & Management project in this study.

Coefficients[a] on stakeholder collaboration for performance of Smart Waste Collection & Management project

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.138	.222		.624	.536
	Stakeholders_Collaboration	1.004	.056	.931	18.065	.000

a. Dependent Variable: Assessment of project performance

The results from Table indicated that stakeholder collaboration has a positive and significant effect on performance of Smart Waste Collection & Management project (β1= 1.004; t= 18.065; p-value < 0.05)". "This means that 1% change in stakeholder collaboration leads to an increase of performance of Smart Waste Collection & Management project".

Conclusion

The main objective of this research project was to analyse the contribution of Agile Project Management Practices to the performance of Smart Waste Collection and Management Project in Gasabo District. The specific objectives of the study were to determine how iterative practices affect project performance at Smart Waste Collection & Management project in Gasabo District, to investigate the relationship between project group dynamics and project performance at Smart Waste Collection & Management project and to analyze the extent to which stakeholder collaboration affects project performance at Smart Waste Collection & Management project. All objectives of the study were achieved.

The researcher rejected the hypothesis that iterative practices have no statistically significant influence on performance of Smart Waste Collection and Management project. For high uncertainty projects which are exploratory in nature because work has not been done before, they are characterized by increasing rates of change and complexity. The study therefore concludes that it is important to work in iterations to reduce risks associated with change. The current study provides an opportunity to understand the application of agile project management practices in the Smart Waste Collection & Management project in Gasabo District.

Recommandation

This research project focused on agile project management practices and performance of Smart Waste Collection and Management Project in Gasabo District. The researcher concludes by the following recommendations.

It is advisable for project managers in the Smart Waste Collection and Management Project and similar initiatives to embrace Agile project management practices. This may involve adopting iterative processes, feedback loops, and adaptability to enhance project performance and responsiveness to changing requirements. Project managers should also focus on team collaboration, communication and synergy among project team members.

It is essential to emphasize stakeholder collaboration at the beginning of the project. This includes building strong relationships with local community residents to ensure their active involvement, support, and alignment with project objectives.

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