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HUMAN ERROR MANAGEMENT AND PROJECT PERFORMANCE IN PUBLIC INSTITUTIONS IN RWANDA. A CASE STUDY OF THE ICT CENTRALIZED PROCUREMENT PROJECT OF RISA.

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ABSTRACT

The main objective of this study was to assess the human error management practices and project performance in Public institutions in Rwanda. The study was carried out in the ICT Centralized Procurement Project of RISA as case study. This study followed the following objectives: To examine the effect of human error management practices (Human error acceptance, communicating about error, and support for error management) on the scope performance in ICT Centralized Procurement Project, to assess the effect of human error management practices on the time performance in ICT Centralized Procurement Project, and to determine the effect of human error management practices on the cost performance in ICT Centralized Procurement Project. The study was anchored on the Organizational learning theory, Theory of Change, and the Utilitarian Theory. Descriptive research design was used within this study, and the study population comprised 152 employees working on the project. The researcher used primary and secondary data in this study. A closed end questionnaire was utilized. The study used the random sampling method to select 110 respondents using the Slovin's Formula, 90questionnaires were returned back and they were effectively filled giving a response rate of 81.8%. Descriptive research design and correlation analysis were utilized to assess the data and results generalized for the entire population, while multiple regression was used to test hypotheses. To compute and analyze the data in this study, SPSS version 27 was used. Findings in Model 1 of the multiple regression revealed that Human error acceptance variables ((Knowledge, Personal innovativeness, and Team learning behavior) contributes to 81.4% on performance in ICT-CPP.) contributes to 81.4% on performance in ICT-CPP. The calculated F statistic of 7.370 and the calculated p-value of =.000 is less than the Critical p-value of =.05 level of significance, making the entire model significant. The results in Table 4.11 indicated that that 1 per cent increase in Knowledge, Personal innovativeness, and Team learning behavior will lead respectively to 0.400%, 0.082% and 0.610%

increase in scope performance of ICT-CPP. Findings in Model 2 of the multiple regression revealed that Human error management practices variables (Sharing error knowledge, Second error prevention and Quick detection and damage detection) contributes to 88.2% on performance in ICT-CPP. The calculated F statistic of 4.078 and the calculated p-value of =.000 is less than the Critical p-value of =.05 level of significance, making the entire model significant. Findings in Model 3 of the multiple regression revealed that Support for error management variables (Co-worker support, Supervisor support, and Effective error handling) contributes to 82.5% on cost performance in ICT-CPP. The calculated F statistic of 9.947 and the calculated p-value of =.000 is less than the Critical p-value of =.05 level of significance, making the entire model significant. The results in Table 4.17 indicated that 1 per cent increase in supervisor support and Effective error handling will lead respectively to 0.581% and 0.853% increase in performance of ICT-CPP, while 1% increase in Co-worker support will lead to 063% increase in performance but insignificant The study concluded that there is significant and positive relationship between Human error management practices and performance of ICT-CPP project. The study recommended that the project has to encourage proper initiatives which should lead to innovation, and thus allow performance in the project.

Keywords: Human error Management Practices, project, performance, public institutions

1.0 Background of the study

Just as with humankind, projects are constantly confronting a variety of errors made by individual employees, from the frontline employees to the top leader, teams and even the whole organization (Matthews, Love, Lavagnon, Ika & Fang, 2022). In many ways, the organizational landscape has undergone dramatic changes in the last two decades, and the rising dynamism, and complexity of the contemporary business environment couple with growing technological advancement poses new challenges and opportunities for effectively dealing with human errors within project management (Farnese, Zaghini, Caruso, Fida, Romagnol & Sili, 2019). Tripathi, Srivastava and Sankaran (2020) stated that given the significance of errors, the organization has two complementary approaches for dealing with errors namely error prevention (error avoidance) and error management. The former approach takes errors as negative, while the latter considers the error as valuable feedback for learning and focused on reducing the negative consequences arises from errors. In other words, human error management approaches view errors as constructive- that can foster positive outcomes for organizations such as learning, innovation, and performance (Lei, Naveh, & Novikov, 2016).

Several scholars worldwide have argued that the implementation of proper human error management practices in projects have positive impact on the performance. In the Netherland, De Vries, Tummers, and Bekkers (2018) argued that proper human error management helps in identifying potential risks associated with human error and implementing appropriate measures to mitigate those risks. The authors suggested to provide adequate training, establishing clear communication channels, and implementing error-proofing techniques to minimize the likelihood of human errors, which can result in reducing project risks and improved project performance.

In South Africa, Nkosi, Gupta and Mashinini (2020) stated that the manifestation of human error during the maintenance phase can impact the safety and performance of equipment in a number of

ways. Therefore, initiatives aimed at the identification and analysis of human error in maintenance are very important, since they can lead to the development of proper strategies for the reduction of human error. The authors found that using effective human error management, project managers can make sure that everyone in the project team is aware of their duties and has the abilities and knowledge needed to complete them correctly which could result in greater work quality, fewer errors and reworks, and ultimately better project results.

Regionally, specifically In Tanzania, Kisamo and Mokaya (2019) state that effective human error management promotes clear and open communication among team members, which reduces misunderstandings, miscommunications, and errors, therefore improving project performance. In Uganda, Gubala and Olawumi (2020) provide that human error management allows timely issue resolution in the project, which in turn prevents project delays and cost overruns, thus improving project performance. On the other hand, inadequate human error management can have negative impacts on project performance, such as increased rework, delays, and costs, decreased team morale, and damage to project reputation. In Rwanda, Umurungi and Rusibana (2021) stated that addressing human errors in a constructive and supportive manner can boost team morale and motivation as it was proved that when team members feel supported and empowered, they are more likely to take ownership of their work, be proactive in error prevention, and strive for better project performance.

1.2 Statement of the Problem

The Rwandan government is aware of the importance of enhancing public institutions' capacity to innovate and come up with solutions to the difficult problems facing Rwandan society because public sector problems tend to be complex, cross-border, and unsolvable by conventional government tools and approaches (NST1, 2017). The unique status of public institutions, which implies the good management of the people's property and whose penalties for this failure are often severe, even reaching the point of public vindictiveness, could also be a brake on the spirit of innovation, which frequently results in mistakes, among project managers in these institutions. What about the management of IT-related initiatives, a very innovative industry that sees advancements virtually annually?

The IT industry is a high-risk industry with complex and dynamic project environments creating an atmosphere of high uncertainty. As a result, many projects fail to meet time schedules, targets of budget, and sometimes even the scope of work, probably due to the mishandling of risk responsibilities (Umurungi & Rusibana, 2021). The Rwandan IT industry and specifically within the Public sector have emerged to be a major sector for economic growth and effective public service delivery. Despite its significance, there are a number of risks caused by the misallocation and/or mishandling of responsibilities leading to human errors, which tend to reoccur, impacting the project performance and delivery. Since IT projects are fragmented and several parties get involved in the process, it is important to explore risk handling responsibilities as perceived by both parties. There is a need to understand what the key players of projects perceive about these responsibilities in order to fairly allocate and or handle human errors responsibilities for improvement of project delivery in the future.

Innovation and error management are complementary because during the process of exploration and experimentation, new types of errors are being generated. If an organization exhibit human

error management practices, then efforts are being channelized to reduce the potential damages of errors and prevent the future occurrence of such errors (Hawwach, 2022).

And yet, to the best of our knowledge, no study has investigated a deliberately orchestrated cultural transition to this desirable error-management model and innovation. Only studies in risk management and the normalization of failure – and not error – has come close to this topic, explicitly evoking the issue of "reframing" a failure as a learning opportunity (Rwagasana, Wanyona & Kivaa, 2019).Therefore, this research aims to assess at which extent human error management practices may contribute to the project performance within Public project in Rwanda, by taking the ICT Centralized Procurement Project of RISA, as a case study.

1.3. Objectives of the Study

1.3.2. Specific Objectives

i. To examine the effect of Human error acceptance on the performance in ICT Centralized Procurement Project.
ii. To assess the effect of communicating about error on the performance in ICT Centralized Procurement Project.
iii. To determine the effect of support for error management on the performance in ICT Centralized Procurement Project.

2.1 Theoretical Framework

2.1.1. Organizational learning theory

Theories of learning via work describe how individuals learn through participation in routine tasks as well as social interactions and reactions in the workplace (Abubakre, et al., 2020). People define organizational learning culture as the process of finding and fixing mistakes. According to the definition of learning behaviors, they are "an continual process of reflection and action, characterized by asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions" (Mergel, 2018). Organizational learning is seen as a "essential capability" that supports their success in a more cutthroat environment (Anderson & Abrahamson, 2017).

According to organizational learning theory, learning must be the foundation for organizational capability (Torugsa & Arundel, 2017). In conclusion, organizational learning culture involves information exchange among organizations, teams, individuals, and the environment in addition to individual learning. To obtain learning results, organizational learning requires a relationship between organizational subsystems, structure, and culture as well as defined organizational goals, a sharing culture, and these factors (Anderson & Abrahamson, 2017). It appears that these firms are in the process of building a learning culture a culture that encourages the systematic and ongoing application of knowledge and information for improvement

2.1.2. Theory of Change

The concept of change is part of the program theory, which was developed in the 1990s as a development of the assessment theory (Farnese, *et al.*, 2019). A theory of change is a tool for developing solutions to difficult societal problems. It gives a complete picture of the short- and long-term changes necessary to achieve a long-term goal (Huang & Liu, 2017). It provides a guideline for how a project should run as a result, which can then be assessed and enhanced through

human error management practices. A theory of change is an additional explicit and quantitative explanation of change that forms the basis for planning, carrying out, and evaluating change. Most projects involve theories of change, despite the fact that they are frequently taken for granted. Having a defined foundation for project human error management practices is made easier by the concept of modifications. It is typically used by government to explain the long-term impact on initiatives when implementing a donor's project (Farnese, *et al.,* 2019).

This theory supports our study because it suggests that due diligence in project setup must be observed when it comes to implementing an human error management practices, whether in planning and coordination, staff capacity building, data demand and use, or even in research and surveillance. This should be done ethically with a view to minimizing likely adversity that may arise if is omitted.

2.1.3. Utilitarian Theory

Utilitarian theory holds that the greater good ought to be sufficient. One of the most widely accepted ideologies in the Anglo-Saxon culture has been utilitarianism. The British philosophers and economists Jeremy (1748-1832) and John (1806-1873), whose work had a considerable influence on contemporary economics in general, are its founders. Although this creates ethical questions, its core concept is that an action is right if it results in more good for the majority of those who are touched by it (Huang & Liu, 2017).

The utility measure, which is often used in economics as a parameter that quantifies the value of activities, is put at the core of utilitarianism's decision-making

2.2 Empirical Literature

2.2.1. Human error acceptance and the performance

In The USA, Matthews *et al*. (2022) explored the impact of culture at the sharp-end of production in a mega-project. The research addressed the following question: What type of error culture does the rankand-file workforce experience during construction, and does it help mitigate rework? We undertake an exploratory case study of an Alliance, which forms part of a transport mega-project. An error culture questionnaire is administered to the Alliance's subcontractors' workforce across four projects. The researchers find that an error management culture positively correlates with reductions in rework and holds a divergent relationship with an error aversion culture (0.88 ($F(90,1350) = 7.83$, $p = 0.00$). They further reveal a negative association between an error aversion culture and the ability to reduce rework (0.93 ($F(90,1440) = 11.66$, $p = 0.00$).. Consequently, they questioned the contemporary wisdom that assumes that error prevention should be combined with error management to create an adaptive culture, aiming to minimize the negative and maximize positive error consequences. We finally discuss the study's limitations and implications for future research examining error culture in construction projects.

In Ethiopia, Rafieyan *et al.,* (2022) tries to identify and evaluate the effective key factors leading to the occurrence of construction accidents caused by human errors in the development of industrial parks in Ethiopia. After a holistic review of the reported literature, four rounds of fuzzy Delphi survey were launched to capture the individual opinions and feedback from various project experts. Accordingly, 41 key factors affecting human errors in the implementation of industrial parks construction projects in Ethiopia were identified and classified into nine main groups of wrong actions, observations/interpretations, planning/processes, equipment, organization, individual activities, environmental conditions, rescue, and technology. Then, the step-wise weight

assessment ratio analysis (SWARA) method was adopted to rate and rank the identified factors of human errors in the implementation of IPCPs. The research findings indicated that among the elicited factors, time factor (0.1226), delayed interpretation (0.1080), and incorrect diagnosis/prediction (0.0990) are the three most crucial factors leading to human errors in the implementation of IPCPs. The results of this research study have provided various major project stakeholders with an effective decision-aid tool to make better-informed decisions in managing and reducing the occurrence of construction site accidents particularly caused by human errors associated with IPCPs.

Gubala and Olawumi (2020) aimed to establish a relationship between people's cultural attributes, multinational project management processes, project technologies and project performance in Uganda's energy sector concerning the practice during the implementation of the Power Sector Development Operation (PSDO) and Electricity Sector Development Project (ESDP) as case studies. The study employed a comprehensive survey design which mostly quantitative thus requiring the collection and analysis of data. It tangled both analytical and descriptive research designs. The research targeted 136 project beneficiaries or 'project clients' spread across the various target areas. Data was re-organized and software called the Statistical package. For social scientists (SPSS) was used to enter the data and analyze it, the results indicated a strong positive correlation people's cultural attributes and project performance, multinational project management processes and project performance and between project technologies and project performance($r = .535^{**}$ $p \leq 0.01$, $r = .758^{**}$ $p \leq 0.01$ and $r = .656^{**}$ $p \leq 0.01$) correspondingly. It was concluded that people's culture attributes, multinational project management and project technologies are pre-requisites for effective project performance in the Power Sector Development Operation Project and Electricity Sector Development project in Uganda and that Project technologies are a better predictor of project performance.

2.2.2. Communicating about error and Performance.

In China, Wang (2019) aimed at assessing the Importance of Error Management in Hospitality Organizations. The author Identified as two core components of the organizational error management, error management culture and error tolerance have been found to be effective managerial tools that shape employees' positive job attitudes and behaviors. The study examined the impacts of the error management culture on employees' emotional exhaustion and service recovery performance through two discrete emotional paths: gratitude and anxiety. Across three-wave data collected from 218 hotel employees, the results showed that anxiety and gratitude mediated the relationship between error management culture and emotional exhaustion ($r = .28$, $p < .01$). Moreover, employees' emotional exhaustion had a significant negative relationship with service recovery performance ($r = .42$, $p < .01$) rated by their supervisors.

In South Africa, Nkotsi *et al*. (2020) evaluated previous scholarly writings on human errors, to specifically establish the causes and impact of human error in maintenance. This study relies predominantly on the existing literature on human error in maintenance derived from published and unpublished research. The primary findings emerging from the research exhibit a number of key factors that cause a human error in maintenance such as poor management and supervision, organizational culture, incompetence, poorly written procedures, poor communication, time pressure, plant and environmental conditions, poor work design and many more. The literature review also revealed that human errors have a negative impact on safety ($t (2.506)$, $p = 0.014 <$

0.05), and efficiency of the equipment (t (2.636), p = 0.023 < 0.05). It was further discovered that equipment failures leading to accidents, incidents, loss of life and economic losses are the major effects of human error.

The purpose of Cherwenyi, Nambuswa, and Namusonge's (2018) study in Kenya was to ascertain the impact of project design flaws on project time run. To determine the relationship between each of the independent variables, data were analyzed using descriptive and inferential statistics, such as measures of relationship such Karl Pearson's coefficient of correlation and multiple regression analysis (project design errors, project scope change and procurement procedures). According to the study's findings, project design mistakes, the chosen predictor variable, account for 52.3% of the variation in project duration in Kenya. This indicates that the chosen predictor variable had a considerable impact on how the dependent variable was determined (project time run). However, there are still more factors that affect project time run that are not included in this specific model and which are responsible for the remaining 47.7% of the project time run variation..

Kanamugire and Irechukwu (2022) focused on the effect of project resource management on performance of construction companies in Rwanda with a case study of the Bakat Co Ltd with its project of Nyamata Hostel construction between 2017 and 2019. The study used planning theory, theory of change and theory of constraint. The researcher used mixed method approach by incorporating both quantitative and qualitative methods because of the numerical and non-numeric/narrative data that was used in analysis of findings. The target population included 85-project team comprising of Bakat Co Ltd with Nyamata hostel construction Project. The study used census where all 85 member Bakat Co Ltd with Nyamata hostel construction Project was sampled. Data was collected by use of questionnaires, coded and inputted in the SPSS. Data was analyzed using quantitative technique including frequency, percentage mean and standard deviation was used multiple regression analysis and correlation analysis where correlation coefficient to assess relationship between the two variables. The findings were presented in tables and chats. Project team incentives and financial resource planning had no significant effect on project performance of Nyamata Housing Project with 0.001>0.05 while Material resource planning has no significant effect on project performance of Nyamata Housing Project with p =0.004>0.05. It can be concluded that construction projects experience various problems and complex factors such as cost, duration, quality and safety.

2.2.3 Support for error management and Cost Performance.

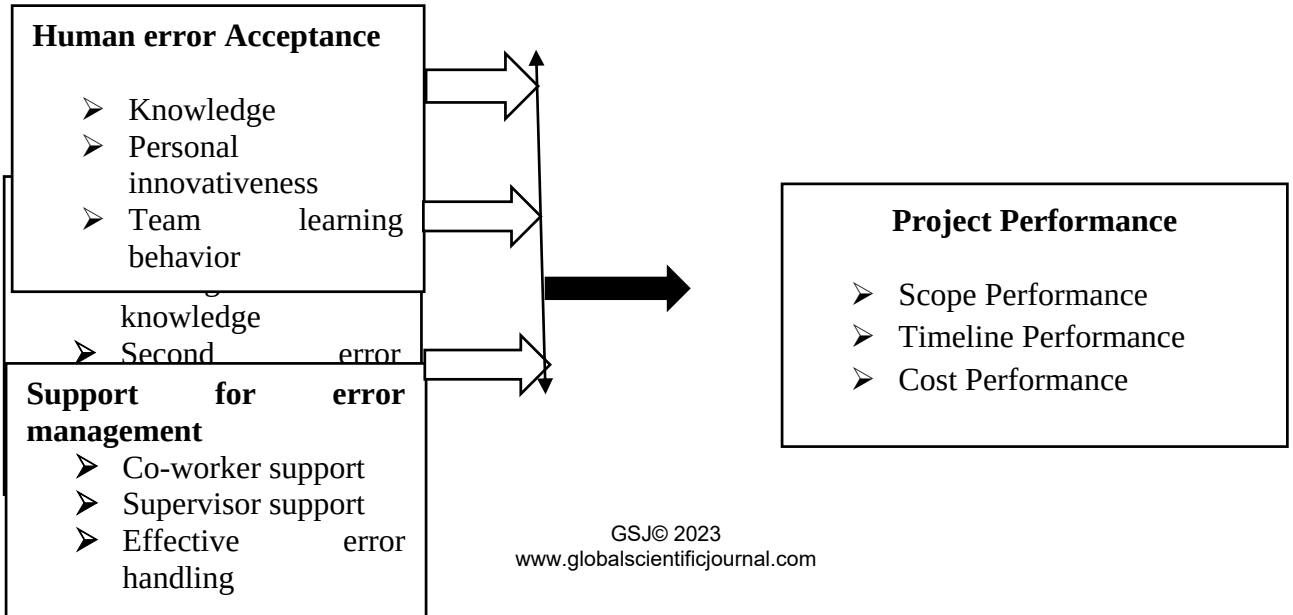
Guchait *et al* (2020) aimed to examine how organizational error management culture impacts organizational performance, management-team performance and creativity in the hospitality industry. In addition, this study examined the mediating effect of management-team learning behavior between error management culture and outcomes. Data were collected from general managers of 148 hotels in China using survey questionnaires. Results indicated that general managers' perceptions of organizational error management culture had a significant impact on all outcome variables. The results showed that the direct paths from error management culture to management-team learning behavior ($\beta = 0.73$; SE = .13; $t = 5.81$; $p < 0.01$) and management-team learning behavior to organizational performance ($\beta = 0.44$; SE = .19; $t = 2.22$; $p < 0.05$) were significant. Additionally, the specific indirect effect from error management culture to organizational performance through cost management learning behavior was significant ($\beta = .31$, CI = .08 to .60).

In Nigeria, Olaade *et al.* (2022) assessed the impact of design errors on the cost of building project and investigated remedial measures in eradicating design errors in building project. By using a questionnaire survey, quantitative data for design error effect on construction cost were obtained from industry-based professionals and revealed that design errors arose by a wide range of factors and the most occurred factors according to this study were; demand for speedy construction (RII = 0.819),, lack of detailed drawings (RII = 0.894), engaging unqualified designers (0.906), poor supervision/coordination (RII = 0.963), inadequate training (RII = 0.963), lack of systemic knowledge (RII = 0.988), errors in calculations (RII = 0.956),and the use of newly introduced materials (0.913). The study recommended that there should be proper provision of comprehensive information and employing of the right procurement method which would aid in minimizing design errors resulting to cost overrun in building.

Sospeter and Chileshe (2021) aimed at investigating the perceptions of contractors and consultants on the risk handling responsibilities in road projects in Tanzania. The primary data were collected from 80 registered foreign and local civil contractors and engineering consultants based in Dar es Salaam. Descriptive statistics and inferential statistics were used for the data analysis. The results show that both contractors and consultants ranked safety project provision and ensuring quality provision in terms of construction as shared risk responsibilities among contractual parties. The findings further show that consultant-related risk responsibilities are: safety provision (t (2.506), $p = 0.014 < 0.05$), the use of historical cost deviation (t (=2.116), $p = 0.038 < 0.05$), ensuring quality provision, and review of knowledge on budgeting (t (31) = p=1.928, $p = 0.058 > 0.05$).

Umurungi and Rusibana (2021) sought to establish the effects of electricity project monitoring and evaluation on project performance in Rwanda. The study carried out on 110KV Jabana-Mt. Kigali-Gahanga and associated substation in Rwanda energy group project. This study was guided by the theory of change, contingency theory and classical theory. The target population was 110, where a census was used. The research used an explanatory research design to establish the causal relationship of the variables under study. Data were collected using questionnaire and analysed using SPSS version 22. Findings revealed that Accountability of staff is not statistically significant on met target cost vis a vis the estimated cost. P..941>0.05. This is due to the fact that costs when incurred they can be used for other purposes rather than the intended objective (monitoring and evaluation).

Independent variables **Dependent variables**



3.0 Research Design

A research design can be described as the various approaches that the researcher uses to go around achieving A research design is a strategy for answering research question using empirical data. Creating a research design means making decisions about: the overall research objectives and approach. The type of research design to be used, sampling methods or criteria for selecting subjects (Zikmund, 2010). This particular research was considered survey descriptive research design because it intends to describe empirically the perceptions of the respondents on Human error management practices and project performance in Public project performance in the ICT CPP. Quantitative data were used to examine the respondents' perceptions using frequencies, means, and standard deviation. The target population is the group that the intervention is meant to research and draw findings from (Kothlar & Garg, 2014). The ICT Centralized Procurement Project (ICT CPP) of RISA being the case study within this research, the employee working on this project were the target population of the study, and the researcher looked forward to gather pertinent data on it in order of achieving the study objectives. According to RISA data, 152 employees worked on the ICT CPP on all levels, the sample size of the study was 110 while the sampling technique was random sampling techniques. The study used both primary and secondary data. Questionnaires were the primary tool for gathering primary data from respondents, and documentation techniques was utilized to get secondary data. A pilot study was conducted with the aim of testing the level of clear understanding of each of the statement contained in the questionnaire. This helped to measure if the meaning of the statements is properly communicated as originally planned in each construct. The essence of conducting a pilot study was to reduce the likelihood of making a research errors in formulation of questionnaire's construct (Saunder, 2012). The pilot study was conducted in Saltel company ltd, which is an ICT company. Therefore, copies of the questionnaire were distributed to 10 employees of Saltel Ltd, and this enabled the researcher to establish the appropriateness of the research tool. It also facilitated an assessment on the possibility of a full scale study in advance. Based on the pilot study and the instrument appraisal, the researcher revised and edit the questionnaire's statements that was not clear, while some of them were reworded especially those that will not properly be answered by the pilot study’s respondents as expected. Additionally, an after-test was used to confirm the validity of the survey. The validity range was between 0 and 1. Numbers 0 and 1 denote the presence or absence of mistakes, respectively. According to Zikmund (2010), validity is expected to be greater than 0.5.

Regarding the reliability of the research instrument, this study measured the instrument’s reliability by using Cronbach’s Alpha coefficient that shows the correlation of all items with one another. The instrument's questions were divided into possible groups by Cronbach's Alpha, which then calculated correlation coefficients for each group. This portion was handled by a computer algorithm, which will ultimately produce a single Cronbach's Alphas number that must be higher than 0.7. When this value is larger than 0.7, it shows that the scale's items have a higher degree of

internal consistency and that the research instrument being used is particularly dependable (Zikmund, 2010). The Statistical Product & Service Solutions (SPSS) version 27, a data analysis program, was used to compute and analyze the data in this study.

4.0 Findings and Discussion

Table 4.1: Correlation Coefficients

		Performance	X1	X2	X3
Performance		**1**	**0.612**	**0.839**	**0.773**
Human error acceptance	Pearson correlation	0.612	1	0.847	0.464
Communicating about error	Pearson correlation	0.839	0.847	1	0.635
Support for error management	Pearson correlation	0.773	0.464	0.635	1
	N	90	90	90	90

****. Correlation is significant at the 0.05 level (2-tailed).**

The study results presented in Table 4.1 shows that correlation between Human error management practices of ICT-CPP, whereas Human error acceptance has Positive moderate correlation (0.612**and P value =0.00) with Project performance. This suggests that improved Human error acceptance help to improve moderately Project performance. These findings are in line with Matthews et al. (2022) who reveal a negative association between an error aversion culture and the ability to reduce rework (0.93 ($F(90,1440) = 11.66$, $p = 0.00$).

Communicating about error has Positive strong correlation with Project performance (0.839 and P value =0.00) with Project performance. This suggests that improved communicating about error help to strongly improve Project performance. These findings concur with those of Wang (2019) aimed at assessing the Importance of Error Management in Hospitality Organizations and who found that employees' emotional exhaustion had a significant negative relationship with service recovery performance ($r = .42$, $p < .01$) rated by their supervisors.

Support for error management has Positive strong correlation (0.773 and P value =0.00) with Project performance. These findings are in line with those made by Guchait *et al* (2020) aimed to examine how organizational error management culture impacts organizational performance and who found that direct paths from error management culture to management-team learning behavior ($\beta = 0.73$; $SE = .13$; $t = 5.81$; $p < 0.01$) and management-team learning behavior to organizational performance ($\beta = 0.44$; $SE = .19$; $t = 2.22$; $p < 0.05$) were significant.

4.3.2. Diagnostics test of the regression model

After running the regression model, post-estimation tests were conducted to ensure that the model was a good fit and the estimates received from the model were efficient and reliable. This study satisfactorily performed conditional diagnostics statistical tests. The study tested for normality, and multicollinearity

4.3.2. 1.Multicollinearity test

Multicollinearity is the undesirable situation where the correlations among the independent variables are strong. Variance Inflation Factor (VIF) was used to assess multicollinearity in the multiple regression models. Zikmund, Babin, Carr and Griffin (2013) mentioned when there are two or more variables have a Variance Inflation Factor (VIF) of 5 and above, amongst them one should be removed from the regression analysis as this shows multicollinearity. Thus, in a study, if two or more variables have a Variance Inflation Factor of 5 or more than that one of them must be removed out if the same.

Table 4.2: Test for Multicollinearity

Model		Collinearity Statistics	
		Tolerance	**VIF**
	Human error acceptance	0.803	1.245
	Communicating about error	0.596	1.678
	Support for error management	0.461	2.167

Source: Researcher (2023)

Table 4.2, indicated that all the independent variables were not highly correlated with each other as indicated by the Variance Inflation Factors (VIF) of below five. Since all 3 variables has VIF which is less than 5 indicating that there is no multicollinearity. Therefore, all variable of predictors will be included in the model.

4.3.3. Multiple linear regression on Human error acceptance on the performance in ICT Centralized Procurement Project

The study sought to identify the effect of Human error acceptance on the performance in ICT Centralized Procurement Project in Rwanda by using multiple linear regression model to determine the effect of independent sub-variables on each dependent variable in ICT-CPP project. The regression models were run to test whether the model is significant or not. The statistical significance was verified by the Coefficient (β), t-statistic and Prob. In additional, statistically significant relationship between the dependent variable and independent variable from the model were accepted at 5% significance level. The analysis applied the Statistical Product & Service Solutions (SPSS) version .27 to compute the measurements of the multiple regressions for the study. Model relationship with Human error management these variables can be arranged in a function or equation as follows:

Scope Performance = $Y=\beta0+\beta1X1+\beta2X2+ \beta3\ X3 + \varepsilon$, Model 1

X1 = Knowledge (KNLG), =X2= Personal innovativeness (PI), X3= Team learning behavior (TLB), ε = error term

Table 4.3: Model summary on Human error Acceptance and project performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.905a	.819	.814	.1821

a. Predictors: (Constant): KNLG, PI, TLB

The results from the above table 4.3, the value of coefficient of determination (R-Square) was .819 (81.9%) and the adjusted coefficient of determination (Adjusted R square) was .814 (81.4%) an

indication that the variation of 81.4% in scope performance of ICT-CPP was due to changes in Human error acceptance, which implies that its three variables (Knowledge, Personal innovativeness, and Team learning behavior) contributes to 81.4% on performance in ICT-CPP. Since the variables in the model or not in count 100%, therefore there are other factors that influence scope performance of ICT-CPP projects that are not included in the model which account for 18.6%.

Table 4.4: ANOVA on Human error Acceptance and Performance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	22.093	3	5.523	7.370	.000b
	Residual	4.884	86	.033		
	Total	**26.977**	**89**			

a. Predictors: (Constant): KNLG, PI, TLB

b. Dependent variable: Performance

The results in Table 4.4 show that the model as a whole was significant at 5% level of significance. The calculated F statistic of 7.370 and the calculated p-value of =.000 is less than the Critical p-value of =.05 level of significance, making the entire model significant. Therefore, this implies that jointly the variables Knowledge, Personal innovativeness, and Team learning behavior had significant effect on the performance in ICT-CPP. Therefore, we could not accept the Ho1 stipulating that there is no statistical significant effect of Human error acceptance on the performance in ICT Centralized Procurement Project.

Table 4.5: Regression coefficients on Human error acceptance on performance

Model		Unstandardized Coefficients		Standardized coefficients	t	Sig.
		B	**Std. Error**	**Beta**		
	(Constant)	.287	0.081		3.566	.000
	KNLG	.400	0.080	.458	4.998	.000
1	PI	.082	0.137	.266	0.600	.008
	TLB	.610	0.150	.147	4.074	.000

a. Dependent Variable: Scope Performance

Table 4.5 provides the summary of results of regression analysis for the effect of human error acceptance on performance of ICT-CPP in Rwanda. The results indicate that knowledge ($\beta 1 = .400$; $t = 4.998$, p-value=0.000<0.05), Personal innovativeness ($\beta 2 = .082$; $t = 0.600$, p-value=0.008<0.05) and Team learning behavior ($\beta 3 = .610$; $t = 4.074$, p-value=0.000 <0.05) have positive and significant effect on performance in ICT-CPP. This shows that 1 per cent increase in Knowledge, Personal innovativeness, and Team learning behavior will lead respectively to 0.400%, 0.082% and 0.610% increase in scope performance of ICT-CPP.

The findings are in agreement with Matthews *et al.* (2022) who explored the impact of culture at the sharp-end of production in a mega-project, and found that error prevention should be combined with error acceptance to create an adaptive culture, aiming to minimize the negative and maximize positive error consequences.

4.3.4. Multiple linear regression on effect of communicating about error on the performance

The study sought to examine how communicating about error affect performance of ICT-CPP projects in Rwanda by using multiple linear regression model to determine the effect of each predictor. Model relationship with communicating about error variables can be arranged in a function or equation as follows:

Performance = $Y=\beta0+\beta1X1+\beta2X2+ \beta3\ X3 + \varepsilon$, Model 2

X1 = Sharing error knowledge (SEK), =X2= Second error prevention (SEP), X3= Quick detection and damage detection (QDD), ε = error term.

Table 4.6: Model summary on communicating about error and performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.950a	0.903	0.882	0.1119

a. Predictors: (Constant), **SEK, SEP, and QDD**

The results from the above table 4.6, the value of coefficient of determination (R-Square) was .903 (90.3%) and the adjusted coefficient of determination (Adjusted R square) was .882 (88.2%) an indication that the variation of 88.2% in performance of ICT-CPP was due to changes in communicating about error, which implies that its three variables (Sharing error knowledge, Second error prevention and Quick detection and damage detection) contributes to 88.2% on performance in ICT-CPP. Since the variables in the model or not in count 100%, therefore there are other factors that influence performance of ICT-CPP projects that are not included in the model 2 which account for 11.8%.

Table 4.6: ANOVA on communicating about error and Performance

Model		Sum of Squares	Df	Mean Square	F	Sig.
2	Regression	17.241	3	4.310	4.078	.000b
	Residual	1.854	86	.013		
	Total	**19.095**	**89**			

a. Predictors: (Constant): SEK, SEP, and QDD

b. Dependent variable: Performance

The results in Table 4.6 show that the model as a whole was significant at 5% level of significance. The calculated F statistic of 4.078 and the calculated p-value of =.000 is less than the Critical p-value of =.05 level of significance, making the entire model significant. Therefore, this implies that jointly the variables sharing error knowledge, Second error prevention and Quick detection and damage detection had significant effect on the performance in ICT-CPP. Therefore, we could not accept the Ho2 stipulating that there is no statistical significant effect of communicating about error on the performance in ICT Centralized Procurement Project.

Table 4.7: Regression coefficients on communicating about error on performance

Model	Unstandardized Coefficients	Standardized coefficients	t	Sig.

		B	Std. Error	Beta		
	(Constant)	. 490	0.050		9.878	.000
	SEK	.036	0.049	.135	0.720	.473
2	SEP	.364	0.084	.223	3.031	.003
	QDD	.605	0.092	.905	6.555	.000

a. Dependent Variable: Performance

Table 4.7 provides the summary of results of regression analysis for the effect of human error management practices on timeliness performance of ICT-CPP in Rwanda. The results indicate that Second error prevention (β2= .364; t= 3.031, p-value=0.003<0.05) and Quick detection and damage detection (β3= .605; t= 6.555, p-value=0.000 <0.05) have positive and significant effect on performance in ICT-CPP. While Sharing error knowledge (β1= .036; t= 0.720, p-value=0.473>0.05) have positive but insignificant effect on performance in ICT-CPP. This shows that 1 per cent increase in Second error prevention and Quick detection and damage detection will lead respectively to 0.364% and 0.605% increase in performance of ICT-CPP, while 1% increase in Sharing error knowledge will lead to 036% increase in performance but insignificant.

The findings are in agreement with Rafieyan *et al.*, (2022) tries to identify and evaluate the effective key factors leading to the occurrence of construction accidents caused by human errors in the development of industrial parks in Ethiopia. Their research findings indicated that among the elicited factors, time factor (0.1226), delayed interpretation (0.1080), and incorrect diagnosis/prediction (0.0990) are the three most crucial factors leading to human errors in the implementation of IPCPs.

5.0 Conclusions

On the basis of analysis of variances in Tables 10, 13, and 16, the study concluded that there is significant and positive relationship between Human error management practices and performance of ICT-CPP project. Therefore the study rejected Ho1 stipulating that there is no statistical significant effect of Human error acceptance on the performance in ICT Centralized Procurement Project. Therefore, objectives of this research were so achieved very well. The study also did not also accept the Ho2 stating that there is no statistical significant effect of communicating about error on the performance in ICT Centralized Procurement Project. And finally the study rejected the Ho3 which implied that there is no statistical significant effect of support for error management on the performance in ICT Centralized Procurement Project. Therefore, objectives of this research were so achieved very well.

5.3 Recommendations

In line with some weaknesses found within the research, the following recommendation is proposed to improve performance of public institutions projects in Rwanda:

1. The findings in Table 4.3 showed that most respondents disagreed that ICT-CPP management uses errors as learning opportunities and encourages exploration and experimentation, this indicated by a low mean of 2.97 and SD 0.46. Hence, the study recommends that ICT-CPP project has to implement strategies aiming at encouraging its employees to experiments various opportunities provided by the digital era, including accepting errors.

2. The same recommendation is provided also for the findings in Table 4.4, as it was revealed that most respondents disagreed with the statement implying that there is a high degree of personal initiative and experimentation which lead to innovation improvement in ICT-CPP. This was

indicated by the low mean 2.96 and SD 0.62. The project has to encourage proper initiatives which should lead to innovation, and thus allow performance in the project.

5.5. Suggestions for Further Studies

Based on findings of the study, future studies may concentrate on:

The study was carried out on ICT Centralized Procurement Project (ICT-CPP), thus the same study should be carried out in another project in Rwanda to find out if the same results will be obtained, or undertaking a comparative analysis with another project, or in another business sector as the manufacturing sector. This research has not yet expressed all variables related to Human error management that may have affected the performance in ICT-CPP project, then other researchers who are interested in similar problems are suggested to conduct a continuation research by adding variables. Further research should be also undertaken on the other variables of performance such quality performance.

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