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RESEARCH ARTICLE

Evaluating the relationship between communication management practices and project outcomes: a case study of Eswatini (Swaziland) construction industry

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Abstract

Communication management is viewed as an imperative factor associated with performance improvement in construction projects. In Eswatini, it is established that projects experience poor project delivery associated with poor communication management practices. This study seeks to elucidate communication management practices informed by local culture and relate it to project outcome. A questionnaire survey of practitioners registered with Eswatini construction industry council was adopted for the study. Data was collected from 66 respondents. Principal axis factoring established nine practices namely; information technology, communication technology, communication skills and competence, communication management plan, teamwork, clear channels within organisation's structure, project brief requirement management, project brief risk requirement management and context of environment as being key factors to project positive outcome. Spearman's rho established

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that a relationship exists between project outcome and three practices namely; information technology, communication management plan and clear channels within organisation's structure. The findings present key empirical evidence of the communication management practices that relate to project outcome in Eswatini. The study contributes on communication management practices in Eswatini and its relation on project outcome. Limitation of the study conclude that results and analysis cannot be generalised. However, the findings from the research provides opportunities for extensive further research recommendations to assess, refine and understand the effect of the variable's communication management practice to project outcome.

Keywords

Communication management practices; project outcome; construction projects; construction industry; Eswatini

Introduction

Effective communication continues to be one of the top challenges in the construction industry (Helms, 2017). Ineffective communication has been concluded to be the primary cause of one third of project failures (PMI, 2013). Priyadharshini and Kumar (2015) indicated that poorly managed communication process could lead to demotivated workforce, design errors, slowdown in entire job and failure in production. Furthermore, Olaniran (2015) study on the role of communication in the construction industry elucidates the effects of communication to be associated with instances such as unclear channels of information and late dissemination of instructions. According to PMI (2013), project communication management is significant to the stakeholders as it inflicts on the project outcome, programs, portfolios and subsequent business success. Further, Muszyńska (2015) indicated that communication management is a key knowledge area for project managers and construction managers. Furthermore, it helps people including highly skilled technical personnel to achieve the construction and engineering goals, in spite of it being described as a soft skill (Aulich 2013). However, reports on communication management practices in the construction industry of Eswatini revealed a dampening scenario. Communication seemed very alien to quantity surveyors and land surveyors. They believed that the technical skills are more important than the element of soft skills amongst the professionals (EAAES, 2014). Such a misconception and under-estimation of this vital knowledge area has become a serious challenge which lays significance on the quality of construction projects (Ayodeji, Aigbavboa and Dlamini., 2017). To reduce the communication challenges related to project performance, Perumal and Bakar, (2011) and Hoezen, Reymen and Dewulf (2006) specified the need to identify appropriate communication management practices in the construction industry. Hoezen, Reymen and Dewulf (2006) further suggested that communication processes are still far from optimizing their goals and hence the need for their improvement to reduce delays and lower expenses in construction projects. A study by Muszynska, (2017), identified communication management practices in Poland information technology (IT) projects used to develop a method of selecting project communication patterns most appropriate to the, characteristics of a given project, the team and environment. However, it did not incorporate the aspect of understanding which communication management practice relate to project outcome. Furthermore, this suggests the importance of implementing the communication management

practices that correlate with successful project outcome. This study aims to identify and establish which communication management practices that relate to project outcome. To achieve the objective, structured questionnaire survey based on communication management literature is used to solicit responses from construction practitioners registered with the construction industry council of Eswatini (CIC). It is anticipated that the recommendation of this study will enable industry practitioners to use it as a vehicle or model. This research intends to answer the following specific research questions:

- What are the communication management practices used in the construction projects of Eswatini?
- Is there a relationship between communication management practices and project outcome in construction projects of Eswatini?

To address these specific research questions, literature review was conducted on communication management practices in the construction industry that relate to project outcome. Hypothesis have been generated to ascertain and possible relationship between communication management practices and project outcome.

Literature Review

Various studies have been conducted focusing on communication management impact on project outcome which signifies the importance of this grey area (Chan, Scott and Chan, 2004; Walker and Nogeste, 2005; Prabhakar, 2008; Na Ronang and Phuenngam, 2009; Čulo and Skendrović, 2010; Naqvi, Aziz and Rehman, 2011; Ogwaeleka, 2011; Garbharran, Govender and Msani, 2012; Ofori, 2013; Yong and Mustafa, 2015). Most of the communication management practices have been drawn from the research work carried out by various authors. From this review of literature, it can be inferred that there are limited agreement amount authors about specific communication management practices. Moreover, the seems to be no consensus on the definition and measurement of communication practice leading to disregard on the research concept. However, Craig (2006) defends communication as a practice, where in that culture, the term *communication* (or its equivalent in some other languages is used to refer to a range of activities that involve talking and listening, writing and reading, performing and witnessing, or more generally, doing anything that involves “messages” in any medium or situation. Considering this view, eight communication management practices were identified that relate to project outcome, namely; information communication technology, communication skills and competence, communication management plan, teamwork, clear channels with organisation’s structure, stakeholder’s personality, project briefing and context of environment.

INFORMATION COMMUNICATION TECHNOLOGY (ICT)

Chissiakos (2007) discussed that more emphasis is to be given to ICT to surmount information and communication deficiency in construction projects. Pietroforte (2010) discovered that technology facilitates communication and interaction amongst project participants that could enhance productivity. Comparatively, Hijazi, Ghebeh and Zayed (2008) further augmented in the study of implementation of visual reality model language (VRML), that moving from “paperless” design in the construction industry was important to, reducing time and cost. Correspondingly, Peansupap and Walker (2005) explained that

technology provides benefits throughout the design, construction and operation phase of the project's life cycle. Considering this standpoint, the following null hypothesis is stated:

H_{01} : There is no relationship between information communication technology and project outcome

COMMUNICATION SKILLS AND COMPETENCE (CSC)

Zulch (2014) indicated that communication skills are essential to apprise stakeholders through transmission of real time information for efficient management of the project. Aiyewalehinmi (2013) revealed that training of project participants is necessary for on - site communication in order to ensure the construction project is successful. According to Kliem (2008), the ability to communicate is a crucial competence that project managers must possess to expect a successful outcome of their projects. Under this construct, the following null hypothesis is stated:

H_{02} : There is no relationship between communication skills or competence and project outcome

COMMUNICATION MANAGEMENT PLAN (CMP)

Garbharran, Govender and Msani (2012) advocated the necessity of communication management plan for timely flow of project information to project stakeholders during currency of the project. Čulo and Skendrović (2010) emphasized that a project specific communication management plan lays a good impact on a project. Meid (2015) advocated for an honest and open communication with view to improve organisations. Tipili, Ojeba and Muhammad (2014) reached to the conclusion that communication management plans established at the onset substantially improve the project performance. Tipili, Ojeba and Muhammad (2014) further emphasised that a regular review of the plan can reduce disruptions in project implementation and could improve projects. Gunasekaran and Morteza (2016) substantiated that a clear well- crafted communication management plan not only decreases the probability of failure of construction projects but adds value to the decision-making process during the life cycle. Taking this discussion into account, the following null hypothesis is postulated:

H_{03} : There is no relationship between communication management plan and project outcome

TEAMWORK (TMK)

Molwus (2014) discovered that project success requires teamwork, collaboration between the client, design and construction teams. According to Azmy (2012) and Khoshtale and Adeli (2016) in order to achieve project success, teamwork needs good communications. Mungeria (2012) imparted that effective teamwork that develops and promotes open and clear communications also boosts morale and enhances productivity which ultimately lead to saving time and money. Tipili, Ojeba and Muhammad (2014) asserted that ongoing communications between project stakeholders improved project outcome. Naqvi, Aziz and Rehman (2011) further elaborated that team management and the processes when managed in time lay good impact in project outcomes. Hence, the following hypothesis is stated:

H_{04} : There is no relationship between teamwork and project outcome

CLEAR CHANNELS WITHIN THE ORGANISATION'S STRUCTURES (COS)

Meid (2015) observed that mapping and aligning the organisation's structure with the project the roles and responsibilities helps in achieving substantial performance and efficiency. Perumal and Bakar (2011) elucidated that a proper project organisation structure (projectized organisation or matrix organisation) facilitates smooth flow of information which results into improved time, cost and quality management. Tipili, Ojeba and Muhammad (2014) further advocated that clear communication with well-defined roles of stakeholders drawn in the project plan improves success in the project. Čulo and Skendrović (2010) corroborated that information has a direct impact on the scope, time, cost, risk, or quality of a task and warrants escalation or acceleration through the appropriate communication channels. Nexus to above review, the null hypothesis is evolved as under:

H₀₅: There is no relationship between clear channels within organisation's structure and project outcome

STAKEHOLDERS PERSONALITY (SP)

Molwus (2014), explained that stakeholders' hypothesis, interests, powers and influence change over time. Hoezen, Reymen and Dewulf (2006) indicated that professional, responsible and clear minded stakeholders add enormous value to project outcome. Hence, the following null hypothesis was stated:

H₀₆: There is no relationship between stakeholders' personality and project outcome

PROJECT BRIEFING (PB)

Gunasekaran and Morteza (2016) discovered that stakeholders need to be updated continuously about the health of project and their work plans to bring harmony and coordination amongst each other. Tipili, Ojeba and Muhammad (2014) clarified that project briefings help overcome communications barriers and increase performance levels. Garbharran, Govender and Msani (2012) further expounded that a shared project vision with constant update as the project progresses, improves productivity and performance. The null hypothesis postulated is:

H₀₇: There is no relationship between project briefing and project outcome

CONTEXT OF ENVIRONMENT (CE)

Naidoo (2011) discovered aspects of the communications process. Kleim (2008) explained that communication is affected by the context of the environment. Mnkandla (2013) suggested that the context or environment within which a project is undertaken carries significant impact on project's successes as well as life cycle. Kliem (2008) and Louw and du Plooy-Cilliers (2005), discovered that the physical, social, historical, psychological and cultural context of environment can dictate the effectiveness of communication on project success. Hence, the following null hypothesis:

H₀₈: There is no relationship between context of the environment and project outcome

The communication management practices are shown hereunder, in Table 1:

Table 1 Communication management practices

Practices	Source
1.Information Communication Technology	Pietroforte (2010); Hijazi, Gehbeh and Zayid (2008); Chissiakos (2007); and Peansupap and Walker (2005)
2.Communication Skills or Competence	Zulch (2014); Aiyewalehinmi (2013); and Kleim 2008
3. Communication Management Plan	Gunasekaran and Morteza (2016); Meid (2015); Tipili, Ojeba and Muhammad (2014); and Čulo and Skendrović, (2010)
4.Teamwork	Khoshtale and Adeli (2016); Molwus (2014); Tipili, Ojeba and Muhammad (2014); Mungeria (2012); Azmy (2012); and Naqvi, Aziz and Rehman (2011)
5.Clear Channels within Organisation's structure	Meid (2015); Tipili, Ojeba and Muhammad (2014); Perumal and Bakar (2011); and Čulo and Skendrović (2010)
6.Stakeholders Personality	Molwus (2014); and Hoezen, Reymen and Dewulf (2006)
7.Project Briefing	Gunasekaran and Morteza (2016); Tipili, Ojeba and Muhammad (2014); and Garbharran, Govender and Msani (2012)
8.Context of an Environment	Mnkandla (2013); Naidoo (2011); Kleim 2008; and Louw and du Plooy-Cilliers (2005)

RELATIONSHIP OF PROJECT OUTCOME WITH COMMUNICATION MANAGEMENT PRACTICES

Success criteria for positive outcome explicitly depends upon efficient implementation of communication practices because of their much closed interdependency. Project success is based on managing expectations so as to complete the project on time, within approved budget and well-defined quality standards and specifications. These three parameters are referred as “Golden triangle” (Chan, Scott and Chan, 2004; Prabhakar 2008; Walker and Nogeste, 2008; Dookran 2012; Garbharran, Govender and Msani, 2012; Ofori 2013; Khoshtale and Adeli, 2016). However, nowadays, we know that determining whether a project is a success, or a failure is far more complex (Prabhakar, 2008). Yong and Mustafa (2015) clarified that the complexity is due to new discoveries such as health and safety, environment, sustainability and technical performance which are also used as measures with growing importance. Furthermore, review from other studies shows that limiting project indicators to time, cost and conformance to specifications, takes success as providing solutions to the briefings and design problems and ignores the differing interest in project stakeholders (Winch, 2010; Molwus, 2014). Molwus (2014) explained that project success is attained in construction when the project outcome (realised asset) has become a matter of fully matching the client's needs at the time of realisation. Regardless of no consensus on “what constitutes project

success?”, this study concurred with the general agreement of Prabhakar (2008) argument that although the schedule and budget performance alone are considered inadequate as measures of project success, they are still important components of the overall construct. Furthermore, expanded that the quality is intertwined with issues of technical performance, specifications, achievement of functional objectives and its achievement against these criteria will be most subject to variation in perception by multiple project stakeholders. In the study by Čulo and Skendrović (2010), it was discovered that efforts have turned towards using effective means of communication since communicating information has been identified to have some direct impact on scope, time, cost, risk or quality of a task. Furthermore, Miller (2016) argued that without effective civil communication and information exchange, construction projects could not achieve productive project outcome for cost certainty, timely delivery, quality products and services. Based on the review, five measures were established to define project outcome as indicated in Table 2.

Table 2 Project outcome

Project outcome measures	Source
1.Scope of works of the project was achieved	Miller (2016); Khoshtale and Adeli (2016); Yong and Mustafa (2015); Garbharran, Govender and Msani (2012); Dookran (2012); Čulo and Skendrović (2010); (Prabhakar 2008)
2.Quality of works of the project was achieved	Miller (2016); Khoshtale and Adeli (2016); Yong and Mustafa (2015); Garbharran, Govender and Msani (2012); Dookran (2012); Čulo and Skendrović (2010); (Prabhakar 2008)
3.Project risks minimised i.e. occupational accidents	Miller (2016) Khoshtale and Adeli (2016); Yong and Mustafa (2015); Garbharran, Govender and Msani (2012); Dookran (2012); Čulo and Skendrović (2010); (Prabhakar 2008)
4.Project was within time	Miller (2016); Khoshtale and Adeli (2016); Yong and Mustafa (2015); Garbharran, Govender and Msani (2012); Dookran (2012); Čulo and Skendrović (2010); (Prabhakar 2008)
5.Project was within budget	Miller (2016); Khoshtale and Adeli (2016); Yong and Mustafa, (2015); Garbharran, Govender and Msani, (2012); Dookran (2012); Čulo and Skendrović, (2010); (Prabhakar 2008)

Literature review has discussed the communication management practices and project outcome. This study anticipates that investigating the communication management practices that impact project outcome in the Eswatini context will enhance new perspective

with reference to communication management to construction project performance. The findings will further strengthen the significance of communication management practices towards a successful project outcome. in Eswatini. Further, add to the limited literature on communication management practice in the construction industry and enhance understanding of the communication management practices that impact on projects success outcome. The succeeding section presents the research methodology in order to analysis such issues.

Research Methodology

RESEARCH DESIGN

This study adopted a quantitative method, which is a deductive approach to test the theory i.e. hypotheses developed in the literature. Empirical testing was undertaken from a sample of practitioners registered with the Construction Industry Council (CIC) of Eswatini. Structured questionnaire was used for data collection of communication management practices and project success outcomes. Closed-ended questions were used to solicit the responses. The questionnaire indicated the level of agreement using the 5-point Likert scale where (1 = strongly disagree, 2= Disagree, 3= Neither agree nor disagree, 4= Agree, and 5=Strongly agree). Pre-testing of the questionnaires was adopted to capture more understanding on the appropriateness of the questions. A pilot study of 30 participants were selected and were similar to the characteristics of study population was performed in order to confirm that the questionnaire was clear and easily understandable. The questionnaire was pre-tested by survey unit of specific construction practitioners in specific construction projects. From the pilot sample, 13 participants responded representing 43% of the total number of respondents. Out of the 13, six responded with requests to refine the questions in certain section for more understanding. The remaining seven, completed the questionnaire suggesting clear understanding of the questionnaire.

DATA COLLECTION

The questionnaire survey was administered online through SurveyMonkey. This approach has been supported by Azmy (2012). An email with a brief introduction to research participants, along with survey's hyperlink was sent to practitioners registered with the Eswatini Construction Industry Council (CIC). The practitioners were; consultants, allied professionals and contractors. The consultants included architects, quantity surveyors and engineers (structural, civil, electrical and mechanical). The allied professionals have a direct relationship with the construction projects comprised of project managers, land surveyors, interior designers, property developers, geotechnical engineers, fire engineers, acoustic engineers, water engineers, environmental consultants and urban planners. Construction firms included civil, building, specialist, electrical and mechanical contractors. A random sample size of 264 was required from a population of 843 professionals registered with the CIC for a confidence level of 95 % and margin of error at 5%. However, since an online survey was conducted an additional 123 participants were included to cater for inactive emails. This resolution was based on Duncan (2008) rationale that if online surveys are used, the respondents are more likely to be participants who are familiar with and able to use the medium. Data collection was completed in two months, from March to April 2018. A total of 86 questionnaires were returned with 66 responses deemed usable accounting to a completion rate of approximately 77% and a response rate of approximately 22.22%. Therefore, the 66 useable questionnaires

were incorporated for data analysis. Wahab et al. (2010) indicates that the response rates for mailed questionnaires are usually low, thus, a response rate of 15% to 25% is still considered appropriate and acceptable whilst according to Fryrear (2015) a response rate of 10% to 15% is still considered appropriate. Therefore, the current response rate is appropriate for analysis.

DATA ANALYSIS

Data collected was analysed using the IBM Statistical Package for Social Sciences (SPSS), version 25. Descriptive and inferential statistics were used. This included exploratory factor analysis (EFA) and correlations. Principal axis factoring (PAF) was used to develop scales and measures to identify the underlying structure (Pallant 2013). The benefit of using PAF is that it verifies the conceptualization of each construct and examine whether there is more than one factor and whether the factor does represent the underlying respective construct (Azmy, 2012; Ngure, Kihoro and Waititu, 2015). Correlations analysis was used to describe the strength and direction of the linear relationship between two variables. Spearman's rank order correlations (non – parametric) was incorporated because ordinal (ranked) scale measure was used for the survey. Conclusive significance level was at p value of less than 0.05.

RESEARCH VALIDITY AND RELIABILITY TECHNIQUES

Content validity through literature review analysis was used to ensure that the questionnaire designed elicits answers from the research questions. This was also validated using the pilot survey with 30 randomly selected industry practitioners. 13 participants responded representing 43% of the total number of respondents. Out of the 13, six responded with requests to refine the questions in certain section for more understanding. The remaining seven, completed the questionnaire suggesting clear understanding of the questionnaire. PAF as a factor analysis (FA) approach was used to assess construct validity and seek to ensure that the research effort is measuring what it is supposed to measure according to its stated objective (Leedy and Ormrod, 2015). The correlations between the variables assessed the criterion related validity (Saunders, Lewis and Thornhill, 2007). For external validity, probability sampling of construction stakeholders from the CIC were chosen. All construction stakeholders had an equal probability of being included in the research survey. To attain internal reliability, Cronbach 's alpha measure was used to assess the items measuring the underlying constructs and a value of 0.70 or more is considered as a good level of reliability to the model (Pallant, 2013). However, in earlier studies Pallant 2013 cited that Briggs and Cheek (1986, p.22) argued that in case the internal reliability is below the threshold of 0.70, it might be appropriate to report the mean-inter correlation that should be within the range of 0.20 to 0.40. This was adopted in this current study. Table 4 shows the Cronbach alpha values and mean inter correlation values for the constructs.

PAF RESULTS OF COMMUNICATION MANAGEMENT PRACTICES IN CONSTRUCTION PROJECTS

Results from PAF presented analysis of structure factor loadings extracted from variables scores of the sample of construction stakeholders registered with CIC regarding the perception of communication management practices and project outcome in construction projects. Observations indicated that there is more than one factor underlying the constructs of information communication technology and project briefing. The conceptualisation of communication skills and competence, communication management plan, clear channels with

organisation's structure, teamwork, context of environment and project outcome was validated. Stakeholders' personality was excluded from analysis due to the survey item not meeting the threshold of the 5 cases for each item as indicated by Pallant (2013). The results are discussed and shown in Table 3.

INFORMATION COMMUNICATION TECHNOLOGY (ICT)

The correlation matrix of the 9 items were above 0.30 and higher, which indicated factor analysis was possible for the data. For measure of adequacy (MSA), most items showed adequate relationship above 0.60. Communalities at extraction showed a low 30% of common variance amongst the items. The KMO value was found to be 0.784 which was good and fit for factor analysis. The Barlett's test of Sphericity was significant at $P < 0.05$. The Eigen value criterion indicated two Eigen values greater than 1 which reflected the proportion of the variance explained by factors. This showed that there were two common factors. So, factor 1 was named "information technology" and second factor was named "communication technology". The proportion explained by factor 1 was of 45.39 % and factor 2 at 13.53%. The cumulative percentage explained by all factors was of 58.93%.

COMMUNICATION SKILLS AND COMPETENCE (CSC)

Correlation matrix of the 5 items were above 0.30 and higher, which indicated factor analysis was possible for the data. For MSA, most items showed adequate relationship above 0.60. Communalities at extraction showed an adequate 70% of common variance amongst the items. The KMO value was found to be 0.736 which was good and fit for factor analysis. The Barlett's test of Sphericity was significant at $P < 0.05$. The Eigen value criterion indicated one Eigen values greater than 1 which reflected the proportion of the variance explained by factors. This showed that there was one common factor. Varimax rotation showed no solution, indicating that all items loaded on one factor. So, factor 1 was remained "communication skills and competence." The proportion explained by factor 1 was of 58.78%.

COMMUNICATION MANAGEMENT PLAN (CMP)

Correlation matrix of the 7 items were above 0.30 and higher, which indicated factor analysis was possible for the data. For MSA, most items showed adequate relationship above 0.60. Communalities at extraction showed a good 50% of common variance amongst the items. The KMO value was found to be 0.841 which was adequate for factor analysis. The Barlett's test of Sphericity was significant at $P < 0.05$. The Eigen value criterion indicated one Eigen values greater than 1 which reflected the proportion of the variance explained by factors. This showed that there was one common factor. Varimax rotation showed no solution, indicating that all items loaded on one factor. So, factor 1 was remained "communication management plan." The proportion explained by factor 1 was of 59.84%.

TEAMWORK (TMK)

Correlation matrix of the 5 items were above 0.30 and higher, which indicated factor analysis was possible for the data. For MSA, all items showed adequate relationship above 0.60. Communalities at extraction showed an acceptable 30% of common variance amongst the items. The KMO value was found to be 0.691 which was adequate for factor analysis. The Barlett's test of Sphericity was significant at $P < 0.05$. The Eigen value criterion indicated one Eigen values greater than 1 which reflected the proportion of the variance explained by

factors. This showed that there was one common factor. Varimax rotation showed no solution, indicating that all items loaded on one factor. So, factor 1 was remained “teamwork.” The proportion explained by factor 1 was of 48.09%.

CLEAR CHANNELS WITHIN THE ORGANISATION’S STRUCTURE (COS)

Correlation matrix of the 5 items were above 0.30 and higher, which indicated factor analysis was possible for the data. For MSA, all items showed adequate relationship above 0.60. Communalities at extraction showed an acceptable 45% of common variance amongst the items. The KMO value was found to be 0.783 which was adequate for factor analysis. The Barlett’s test of Sphericity was significant at $P < 0.05$. The Eigen value criterion indicated one Eigen values greater than 1 which reflected the proportion of the variance explained by factors. This showed that there was one common factor. Varimax rotation showed no solution, indicating that all items loaded on one factor. So, factor 1 was remained “clear channels within organisation’s structure.” The proportion explained by factor 1 was of 54.61%.

PROJECT BRIEFING (PB)

The correlation matrix of the 9 items were above 0.30 and higher, which indicated factor analysis was possible for the data. For MSA, all items showed adequate relationship above 0.60. Communalities at extraction showed a fantastic 80% of common variance amongst the items. The KMO value was found to be 0.797 which was good and indicated that the data was fit for factor analysis. The Barlett’s test of Sphericity was significant at $P < 0.05$. The Eigen value criterion indicated two Eigen values greater than 1 which reflected the proportion of the variance explained by factors. This showed that there were two common factors. So, factor 1 was named “project brief requirement management” and second factor was named “project brief risk management”. The proportion explained by factor 1 was of 50.11 % and factor 2 at 18.90%. The cumulative percentage explained by all factors was of 69.02%.

CONTEXT OF ENVIRONMENT (CE)

Correlation matrix of the most items was above 0.30 and higher, which indicated factor analysis was possible for the data. For MSA, most items showed adequate relationship above 0.60. Communalities at extraction showed an acceptable 30% of common variance amongst the items. The KMO value was found to be 0.683 which was adequate for factor analysis. The Barlett’s test of Sphericity was significant at $P < 0.05$. The Eigen value criterion indicated one Eigen values greater than 1 which reflected the proportion of the variance explained by factors. This showed that there was one common factor. Varimax rotation showed no solution, indicating that all items loaded on one factor. So, factor 1 was remained “context of environment.” The proportion explained by factor 1 was of 51.78%.

PROJECT OUTCOME (PO)

Correlation matrix of the 5 items was above 0.30 and higher, which indicated factor analysis was possible for the data. For MSA, all items showed adequate relationship above 0.60. Communalities at extraction showed an acceptable 50% of common variance amongst the items. The KMO value was found to be 0.768 which was adequate for factor analysis. The Barlett’s test of Sphericity was significant at $P < 0.05$. The Eigen value criterion indicated one Eigen values greater than 1 which reflected the proportion of the variance explained by factors. This showed that there was one common factor. Varimax rotation showed no solution,

indicating that all items loaded on one factor. So, factor 1 was remained “project outcome”. The proportion explained by factor 1 was of 62.25%.

Notably, stakeholder’s personality (SP) was excluded from analysis because it did not meet the requirements of PAF that stipulated that suitability of analysis is limited to 5 cases for each item. The item stakeholder’s personality had only three cases, as shown in Table 3.

Table 3 PAF results after rotation of communication management practices and project outcome

Factor	Eigenvalue	Variance %	Measures	Factor loading
Information technology	3.63	45.39	Project management software is used e.g. Construction Computer Software (CCS) Internet and intranet are consistently available Video conferencing facilities are used Computer Aided Design (CAD) software is appropriately adopted	0.787 0.646 0.566 0.541
Communication technology	1.083	13.53	Building information modelling (BIM) software is appropriately adopted Virtual offices support software and portals is available Social media communication is used e.g. WhatsApp chatting platform Telephones with voicemail services are used	0.709 0.554 0.538 0.516
Communication skills and competence	2.351	58.79	Excellent verbal communication among project stakeholders Excellent written communication among project stakeholders Effective use of information communication technology among project stakeholders Proper interpretation of contractual matters is communicated Project team members have excellent listening skills	0.759 0.584 0.769 0.584 0.425

Table 3 continued

Factor	Eigenvalue	Variance %	Measures	Factor loading
Communication management plan	4.189	59.84	Communication requirements of the project team are critically analysed in the project Communication technology is used to deliver information Proper channels of information delivery are established in the organisation Every personnel are accountable for the information they are required to send The organisation clearly identifies the recipient of the information to be sent	0.750 0.804 0.772 0.823 0.664
Teamwork	2.405	48.09	There is effective communication and coordination within the project stakeholders Conducive working relationship between project stakeholders Group work effort enhances the quality of communication Strong inter-department alliance in the project enables communication to flow efficiently	0.669 0.491 0.623 0.599

Table 3 continued

Factor	Eigenvalue	Variance %	Measures	Factor loading
Clear channels within organisation's structure	2.730	54.61	Organisational and operational processes are in place Roles and responsibilities of project stakeholders are clearly defined There are clearly marked communication channels from superior to subordinates The line of authority is clearly specified for the project tasks to be accomplished Clear determination and limits of who will communicate with whom and who will receive which information	0.589 0.804 0.539 0.692 0.659
Project brief requirement management	3.007	50.118	A brief provides proper definition of client requirements A brief provides proper analysis of client requirements The changes to brief are properly managed	0.847 0.778 0.559
Project brief risk management	1.134	18.91	Project risk are properly communicated There is constant interaction amongst project stakeholders There is constant knowledge sharing amongst project stakeholders	0.744 0.709 0.503

Table 3 continued

Factor	Eigenvalue	Variance %	Measures	Factor loading
Context of environment	2.071	51.78	Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements Project stakeholders of different cultures are accommodated Conflicts are resolved from previous communication episodes There are good interpersonal relationships among project stakeholders	0.525 0.444 0.697 0.721
Project outcome	3.112	62.25	Scope of works of the project was achieved Project was within time Project was within budget Project risks minimised i.e. occupational accidents Quality of works of the project was achieved	0.756 0.657 0.695 0.775 0.748

Table 4 shows the Cronbach Alpha for the communication management practices and project outcome. A good reliability that ranged between 0.70 and 0.88 was established with an exception of one communication management practice that indicated inconsistencies below 0.70. Mean inter correlation was used to address the inconsistency and the output ranged between 0.30-0.50, indicating suitability for factor analysis.

Results of the relationship of communication management practices and project outcome. From the nine communication management practices ascertained with PAF. Analysis of Spearman rank order correlation matrix was established to determine the relationship of the communication management practices with project outcome as follows:

CORRELATION RESULTS FROM THE RELATIONSHIP BETWEEN COMMUNICATION MANAGEMENT PRACTICES AND PROJECT OUTCOME

Table 5 shows that six factors i.e. communication technology, communication skills and competence, teamwork, project brief requirement management, project brief risk requirement and context of environment did not have a relationship with project outcome. Their level of significance at $p \text{ value} \leq 0.05$ were greater, hence they were not significant. However, information technology, communication management plan and clear channels within organisation's structure were found to have a relationship with project outcome at statistically significant correlation, $p \text{ value} \geq 0.05$.

Table 4 Internal reliability

Communication management practices	Reliability Cronbach's alpha	Mean-inter correlation
Information technology (4 measures)	0.79	
Communication technology (4 measures)	0.80	
Communication skills and competence (5 measures)	0.75	
Communication management plan (5 measures)	0.88	
Teamwork (4 measures)	0.72	
Clear channels within the organisation's structure (5 measures)	0.78	
Project brief requirement management (3 measures)	0.80	
Project brief risk management (3measures)	0.70	
Context of environment (4 measures)		0.30-0.50
Project outcome (5 measures)	0.84	

FINDINGS FROM THE CORRELATION ANALYSIS

Using the communication management practices established from principal axis factoring, the relationship between communication management practice and project outcome was determined. Findings from Spearman's rank rho correlations established a positive and significant correlation between three communication management practices and the project outcome. The results from the correlation analysis are as follows:

Table 5 Correlation between communication management practices and project outcome

Variables	Sig. (2-tailed)	Correlation coefficient	
Information technology	0.037	0.259*	
Communication technology	0.573	0.071	
Communication skills and competence	0.072	0.225	
Communication management plan	0.016	0.297*	

Table 5 continued

Variables	Sig. (2-tailed)	Correlation coefficient	
Teamwork	0.069	0.227	
Clear channels within organisation's structure	0.033	0.265*	
Project brief requirement management	0.347	0.120	
Project brief risk management	0.507	0.085	
Context of environment	0.800	-0.032	

THE RELATIONSHIP BETWEEN INFORMATION TECHNOLOGY AND PROJECT OUTCOME

Table 5 indicates that a significant positive correlation was found between information technology and project outcome ($R = 0.259, p = 0.037 < 0.05$), suggesting that there is an existence of an association between the two variables.

THE RELATIONSHIP BETWEEN COMMUNICATION MANAGEMENT PLAN AND PROJECT OUTCOME

A statistically significant positive correlation was found between communication management plan and project outcome shown in Table 5. ($R = 0.297, p = 0.016 < 0.05$). There was a strong relationship between the two variables suggesting positive association.

THE RELATIONSHIP BETWEEN CLEAR CHANNELS WITHIN ORGANISATION'S STRUCTURE AND PROJECT OUTCOME

A relationship between clear channels within organisation's structure and project outcome was shown to be statistically significant ($R = 0.265, p = 0.033 < 0.05$). The relationship was a positive one, meaning association of the two variables.

In contrast, Table 5 also shows the results of a negative relationship between communication technology and project outcome; communication skills and competence and project outcome; teamwork and project outcome; project brief requirement and project outcome; project brief risk management and project outcome as well as context of environment and project outcome.

Discussion of findings

Firstly, *information technology* comprised of project management software is used e.g. Construction Computer Software (CCS), internet and intranet are consistently available,

video conferencing facilities are used and Computer Aided Design (CAD). Secondly, *communication management plan* included: communication requirements of the project team are critically analysed in the project, communication technology is used to deliver information, the organisation critically determines the objectives of communication, proper channels of information delivery are established in the organisation, every personnel is accountable for the information they are required to send, the organisation clearly identifies the recipient of the information to be sent and the organisation determines communication frequency to project stakeholders. Lastly, *clear channels with in organisation's structure* encompasses, organisational and operational processes are in place, roles and responsibilities of project stakeholders are clearly defined, there are clearly marked communication channels from superior to subordinates, the line of authority is clearly specified for the project tasks to be accomplished and clear determination and limits of who will communicate with whom and who will receive which information. Consequently, the findings from the correlation analysis align with two conclusions of communication management practices by Muszyńska (2015) study on the significance of communication management in project teams categorised as strategic and informational. The strategic category included clear lines and responsibilities established up front and incorporation of high-quality communication management plan as communication management practices. The informational category indicated shared virtual space/project knowledge centre i.e. websites/wiki, groupware and project tracking software, instant messenger, emails and go to meetings. It can be then suggested that the three communication management practices in Eswatini construction projects are consistent with project team communication management practices in Italy. Although, Muszyńska (2015) study did not reveal the analysis of the relationship of the communication management practices to project outcome. The same study cited White and Fortune empirical findings on practices in project management and listed critical success factors for a project. Clear communication channels were the 6th factor on the list.

Furthermore, Čulo and Skendrović (2010) established that if something impacts the scope, time, risk or quality task, this warrant escalating through appropriate channels. In the same study, it was revealed that before starting up a project, the project management should plan communication. The consideration of planning up front is understood to be a useful tool to ensure effective communication in the project to ensure the success of a project (Čulo and Skendrović, 2010). Molwus, (2014) explained that communication management plan is required, and it was essential to ensure good decision and integration throughout the project. Similarly, studies by Chassiakos (2007), focusing on best practices on using Information Technology (IT) in Canada and Jordan construction industry, established that when IT was adopted, it achieved better quality of work, work done more quickly, better financial control, better communication and faster and simpler access. From the same study, it was further referenced IT is necessary for delivering efficiency and improved project delivery in the construction industry.

Evidently, the three communication management practices established in this study have a major relationship to project outcome and attention must be drawn towards employing them to enhance project performance in Eswatini construction industry. Figure 1 presents a graphical presentation of the significant relationship of the communication management practices and the project outcome.

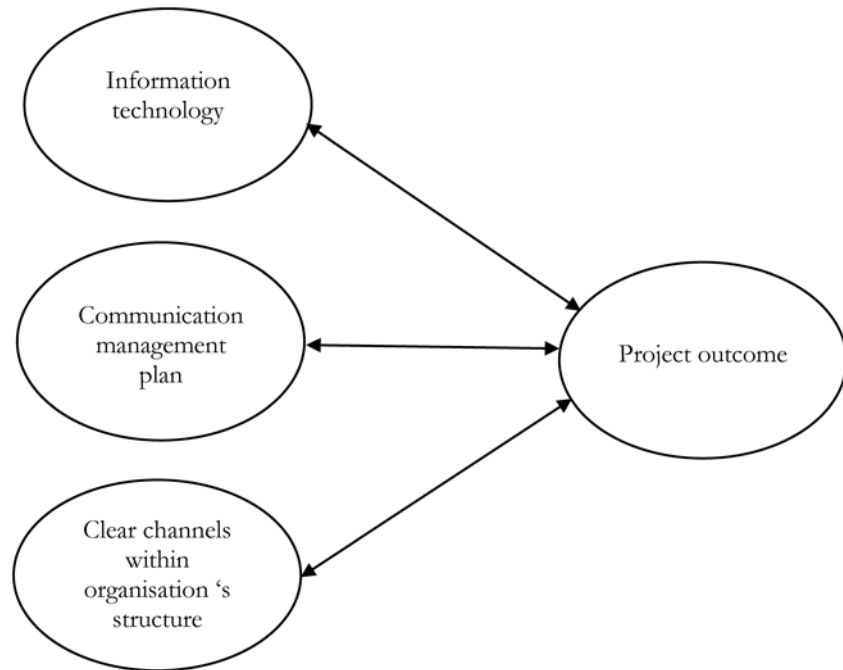


Figure 1 Empirical relationship between the communication management practices and project outcome.

Conclusion

Eswatini construction projects are faced with the challenge of poor project delivery and one of the problems that contribute to the negative performance is the communication practices partly influenced by the local context and the underplaying the critical nature of this soft skill compared to the technical skill. The purpose of this study was to establish specific and reliable communication management practices that relate to project outcome in Eswatini based on theoretical and empirical framework to provide insight to construction practitioners on which communication management practices relate to project outcome. This research presents results obtained through questionnaire survey from Eswatini. Using PAF, the researchers concluded the evidence of nine communication management practices contrary to the eight established in literature. The spearman's rho established that information technology, communication management plan and clear channels within organisation's structure had a relationship with the project outcome.

The study was conducted in the Kingdom of Eswatini, so the results are limited to the context of Eswatini, so similar studies in other countries could yield different results. The findings of this research were from registered practitioners of the construction industry council of Eswatini (Swaziland), unregistered participants were excluded.

Keeping in view the complexity of the execution of projects under virtual teams' environment, long supply chains, strikes and law and order situation, an efficient and fast communication management plans, means and technology be adopted in order to devise a speedy mechanism. It is recommended that future study be undertaken with a view to

polish and refine the existing communication management strategies, regimes, plans and knowledge base. Furthermore, it was found important that Eswatini practitioners incorporate the understanding that although communication is considered as soft skill, there are communication management practices linked to project outcome that buttress the significance of communication management in construction projects worth focusing on for construction projects improvement.

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