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Communication: The foundation of project management

BG Zulch*

Lecturer, Department of Quantity Surveying and Construction Management, University of the Free State, PO Box 339, Bloemfontein, 9300, South Africa

Abstract

The **purpose** of this research was to determine if communication might be a foundation area of project management, with the other cornerstone areas as derived from previous research and the rest of the areas, and the means of achieving the trade off, as pillars or support. The second purpose was to determine if communication might be seen as the area that combines and coordinates the various processes and project management activities. A research questionnaire was circulated to construction project managers, architects, construction managers, engineers and quantity surveyors. The questionnaire focused on the project management of a construction project manager in terms of its importance to the successful management of projects. The results of the survey were compiled and analysed. The **findings** of the research illustrate that the project managers' skill to communicate has an impact on the cornerstone areas of project management. Communication is needed to effectively communicate the areas of cost, scope and time, and quality, which are the results of the interrelationship between scope, cost and time. Communication is the function that integrates cost, scope and time to achieve a quality product and may be seen as having a foundation function. The **conclusion and recommendation** of this research paper is that communication is needed to effectively communicate the areas of cost, scope and time, and quality. Communication is the function that integrates cost, scope and time to achieve a quality product and may be seen as having a foundation function to support all the areas; the means that assist in achieving the cornerstone areas.

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* Corresponding author. Tel.: +27-51-401-3849; fax: +27-51-401-3324.
E-mail address: zulchbg@ufs.ac.za

1. Introduction

The Phoenicians developed the alphabet in 3500 BC [1]. The term communication originates from the Latin word *communicare*, which means ‘to make common’, and when communicating, a common understanding is created [9]. Barrett [3] defines communication as: “the transmission of meaning from one person to another or many people, whether verbally or non-verbally”. The single most significant factor affecting the success of a project is the communication ability of the project manager. If it seems true that everything rises and falls on communication and leadership, it stands to reason that leadership communication ability is the foundational skill that must be attained for a project manager to be effective.

This paper focuses on communication processes; planning of communication; communication planning, including the project organizational structure, project communication plan and lines of communication; as well as the internal and external communication levels of the project, project management, empirical findings and conclusion.

2. Communication processes

Communication is the process of acquiring all relevant information, interpreting this information and effectively disseminating the information to persons who might need it. Communication is of vital importance to everyone involved in, and influenced by, projects [12]. Bowen and Edward [4] define information as “data which have been processed and presented in a format which gives them meaning”.

Communication is so important to project success that it has been referred to as the lifeblood of a project by more than one practitioner [2]. Project team members need to collaborate, share, collate and integrate information and knowledge to realise project objectives. Therefore, it is necessary to understand the process of communication. At its most basic level, communication consists of three components: a transmitter/sender, a transmission channel/medium and a receiver. A fourth component, the medium of communication, is the code in which a message is transmitted [25]. The communicated message flows from the sender, encodes the message through the transmission channel/medium by a verbal or non-verbal method, to the receiver that decodes the message. To ensure effective communication, all components must function to prevent misunderstanding [29]. The sender is the starting point of the communication cycle and has a purpose to communicate. The reason for communication in project management may be a request for information, sending information, asking questions, giving an instruction, building teams or networking [6]. The success of communication mainly depends on the sender’s ability to speak, write, reason and listen competently [30].

Talukhaba, Mutunga and Miruka [26] agree on the fundamental role of feedback in communication. Where feedback is absent, delayed or not soon forthcoming, interventions are required to enhance communication. In their implementation, communicators need to constantly monitor and review the success of their communication processes and systems with a view to forming a basis upon which assessments can be made [26]. The receiver of the message should, therefore, confirm the understanding of the message, because without understanding, communication cannot be effective. This is also applicable to construction projects.

Ineffective communication can therefore also lead to misunderstanding in respect of construction projects. Inadequately defined tasks and critical processes, uncertainty regarding responsibilities, scope or objectives of construction projects may cause construction projects to fail. Managing a project requires constant selling and reselling of ideas, explaining the scope and methodologies of the project to diverse groups of people (the public, management, functional departments and other stakeholders), threatening or bargaining with service providers and suppliers, or negotiating to settle disputes or interpersonal conflict between project team members or other stakeholders [25].

3. Planning project communication

To understand the requirements of a project communication plan, two needs should be known: the need to understand what the project would require from its communication system and the need to know what communication methods and communication styles might be used to effectively address these requirements [25]. Greenleaf [24] states that the ways to promote communication are to ensure that reports reach members in time; to make use of planned times when members gather and speak; and to ensure that communication records are available for team members. Poor communication during projects affects the schedule, the cost, the safety of workers and the project quality [21]. Improved communication by the project manager may lead to less failure, innovation and technical solutions, positively influencing the quality and leading to better decision making [17].

4. Communication planning

The project manager and project office are at the heart of the project's information and control system. It is the project manager's responsibility to develop not only the project's organisational structure, but to develop the project's communication plan and lines of communication [6]. A formal communication plan should be compiled to identify how stakeholder opinions and actions will be managed [13].

4.1. Project organisational structure

Organisations are structured in such a way as to achieve the goals and objectives. There are two basic structures. Firstly, the bureaucratic structure that is arranged in a pyramidal hierarchy, with authority increasing from one level to the other, as one moves up in the organisation. The authority lies in the position rather than in the people who occupy it. Secondly, the matrix structure that breaks the unity of command where every employee has one person to report to. This structure allows flexibility and involvement, which leads to greater motivation and teamwork [30].

4.2. Project communication plan

The communication plan should outline the following:

- Who (lines of communication – sender and receiver – responsibility and authority)
- What (scope of communication and format)
- When (schedule)
- Feedback (confirms message received and understood – document control)
- Filing (retrieval, storing, disaster recovery)
- How (email, document, telephone, meeting, presentation) [5]

It is advisable that a communication plan is agreed upon in advance in order to provide a clear direction to all parties involved, particularly for complex projects [27]. The development of a communication plan should focus on facilitating the process of keeping the key stakeholders informed of the project's progress and to promote the project by making it visible at all times [7].

4.3. Lines of communication

At the start of a project, it is important to determine the lines of communication and the methods of managing information [14]. Smit and Cronje [23] propose two primary lines of communication, namely formal communication and informal communication.

According to Tubbs and Moss [28] formal communication flows in four directions. Downward communication starts at the top and flows down through the project levels to workers. The major purpose of downward communication is to provide information on goals, strategies and policies to subordinates. Downward

communication is likely to be filtered, modified, or halted at each level as managers decide what should be passed down to employees. Upward communication involves supplying information to the upper levels about what is happening at the lower levels. Horizontal/lateral communication takes place between people on the same level of the hierarchy and is designed to ensure or improve coordination of the work effort. It is formal communication, but does not follow the chain of command. Effective horizontal communication should prevent tunnel vision in the organisation. Diagonal communication takes place between people at different levels of the hierarchy and is usually designed to provide information, coordination or assistance to either or both parties. Gronstedt [15] adds external communication as a formal communication direction. It takes place between the project team and people who are not part of the project.

The position in the hierarchy of project management is important, because the position determines the skills needed to communicate effectively. The construction project manager needs to know how to communicate effectively with each team member at a specific level, therefore also needs different communication skills, such as writing, to communicate effectively. William [31] states that the best way to avoid disputes during and after a construction project is to provide open lines of communication between project stakeholders in order to solve problems and disputes quickly before they lead to costly arbitrations or litigation. Therefore, the flow of communication between different people on a project indicates the type of skill needed to communicate effectively, thus it seems that lines of communication in the project should be short and well established.

Informal communication uses channels such as the grapevine, rumours [28], informal social groupings and phatic communication [30]. The grapevine constitutes informal and unofficial communication in which information is based on facts or rumours. It may begin with anyone in the organisation and may flow in any direction. The grapevine's primary function is to disseminate information to employees (both managerial and non-managerial) that is relevant to the needs. Rumours and the grapevine are not the same. Rumours are information without a factual base [23]. Informal social groupings refer to groups formed among fellow workers during work time or after hours to discuss staff issues [30]. Phatic communication involves using words to convey feeling rather than meaning. Phatic communication contributes towards a culture of openness and cooperation between team members and the manager [30]. Informal communication takes place without influence from the project manager, but influences the project manager's effectiveness. The lines of communication, formal and informal, are also evidence of how communication takes place in the construction project industry. The construction project manager, as the communicator, needs communication skills, e.g. writing, questioning and negotiating, to communicate effectively.

5. Project communication levels

Dow and Taylor [10] suggest that construction project management communication takes place on two levels, namely internal and external communication levels.

5.1. Internal communication

According to Dow and Taylor [10] different methods of internal communication exist:

- Oral communication takes place in the form of meetings, discussion groups, talks, interviews, announcements and conversations, both face to face and over the telephone
- Written communication takes place by means of letters, emails, circulars, memoranda and minutes of meetings
- Non-verbal communication may convey powerful messages in the business world by means of gestures, appearance or attitudes
- Electronic communication makes it possible to send messages all over the world at a very high speed. Messages may be sent and received using computer terminals, electronic mail (email) and fax facilities
- Visual communication takes place by means of presentations, DVDs and videos.

5.2. External communication

According to Le Roux [20] every member of an organisation is involved in communicating with customers, shareholders, the media and members of the public on a daily basis. The external communication of each of these members of the organisation conveys a particular image of the organisation to the outside world. Communication does not function in isolation but within a process. It is thus important to review internal and external communication levels between members of an organisation in order to achieve a mutual goal or goals. The construction project manager needs skills to communicate effectively with both the internal and external parties involved in the project.

6. Project management

The single most significant factor affecting the success of a project is the leadership ability of the project manager [11]. Other basic management skills besides leadership make up the initial prerequisites of the project management skills set [16]. According to Hoard [16] project management skills can also be categorised as a hierarchy analogous to Maslow's hierarchy. The skills are shown as a pyramid, and the idea that lower skills must be satisfied before higher-level skills can be addressed is included in the model. The model consists of four levels from the bottom to the top. The first level constitutes leadership, the second level management, the third level shows the thirteen areas of the body of knowledge for construction project management and the top level shows project management maturity as result. (Model will be presented in presentation.)

According to Hoard [16] the meaning of the levels of the project management hierarchy of skills are as follows:

- The bottom level constitutes leadership. The suggestion is that leadership is the bedrock upon which all else must be built. Without a solid foundation of leadership skills, attempts to develop other management skills will be less than effective.
- Once the leadership level has been satisfied the basic management skills can be addressed. Included at this level are the skills of teamwork, communication, motivation and negotiation. These skills represent the essential skills necessary to work with people in an organisational context.
- Only after the skills of the basic management level have been achieved can the next level, project management skills, be developed. This level is represented by thirteen areas, the familiar nine knowledge areas of PMBOK in black and the four knowledge areas of construction project management, PMI, in red. At this level the project manager masters the practice of the project management and construction project management discipline.
- It is only after a firm foundation of skills has been established that the ultimate goal of project management maturity can be effectively achieved.

Various authors have criticised the model of Hoard [8]. The critique is that project leadership is placed at the upper end of the hierarchy and not at the bottom. They believe that a project manager first has to be a "great manager", before a project manager becomes a "great leader". Putting leadership before management is putting the cart before the horse. Leadership is not the starting point, but the end of the professional journey and should probably be the last step. Therefore, a change of the level of leadership from the bottom to the top level is needed. Leadership should be at the top of the hierarchy, starting from the fundamentals of management, project management and then leadership. Thus, a project manager first becomes a manager dealing with all the interrelated activities, then a project manager and ultimately a leader. Leadership is not the starting point but the end of the professional journey [8]. Further critique on the model of Hoard is that the thirteen areas are stacked, which might indicate a hierarchal dependency for each level upwards. However, some of the thirteen areas may indeed be stacked or have dependencies while others may not be dependent on the other areas. The solution for this critique is that the thirteen areas should not be stacked.

According to Lewis [18], the following critical elements are necessary to manage a project: time, cost, scope and quality. During the phases of a project the elements scope, cost and time are the cornerstones of the project. Kotzè,

Berry and Verster [19] propose that projects are run through effective communication. Cost, scope and time are the interrelated areas and change in one area affects the other two areas. Quality is the product of the interrelationship between scope, cost and time. Communication is the function that integrates cost, scope and time management to achieve a quality product. Communication is the area that integrates a project, and not solely integration, as illustrated in literature. Integration cannot be a trade-off between the areas without communication as support. Integration as an area cannot function without communication; thus, communication is seen as a more effective element that brings the areas together.

Based on the fact that communication brings the areas together, communication can be regarded as having a cornerstone function. The areas of project management, according to Burke [7], is the body of knowledge, which can be subdivided into core elements that determine the deliverable objectives of the project, namely scope, time, cost, and quality. The other knowledge areas provide the means of achieving the deliverable objectives, namely human resources, risk, procurement, integration and communication. The Construction Management Body of Knowledge [22] identifies four additional areas as part of achieving the objectives, namely occupational health and safety management, environmental management, financial management and claims management.

7. Method and empirical

A survey was conducted, sending questionnaires to a selected group of quantity surveyors, construction managers, engineers, architects and project managers. The number of questionnaires sent out was 302. The reason for choosing a questionnaire was because the data could be collected across the whole country. The total response rate was 32%. It is significant in respect of the reliability of the response rate that 72% of the responses received were from project managers. However, the responses from the project managers did not distort the response data. The questionnaire consisted of six sections with fifteen questions. For the purpose of this paper, the focus is on Section B, which consists of questions regarding project management communication in general and Section C, consisting of a question regarding the impact of project managers' communication skills on the success of the project management areas. The opinion of respondents was collected using a Likert scale of 1 to 5, where 1 is not important, and 5 extremely important. 'None' represents the 'not respond to the question'.

8. Findings

The purpose of the first question in Section B was to determine which communication method is regarded as the most important and is used most often in the construction industry. Although generally known, it is written and oral. All the different written methods are used during the execution of a project, but some of the methods dominate as method of communication. The importance of communication methods used is shown in Table 1. The 'none' responses were not taken into account in calculating the average.

Table 1: Importance of communication methods used

Importance of communication method	None	Response (%)					Average	Ranking
		1 Not important						
		5 Extremely important						
	1	2	3	4	5			
Written communication	2.1	0	0	11.3	21.7	64.9	4.5	1
Electronic communication	3.1	0	0	11.3	36.1	49.5	4.3	2
Oral communication	3.1	1.0	4.1	15.5	26.8	49.5	4.1	3
Visual communication	4.1	5.2	17.5	30.9	26.8	15.5	3.2	4
Nonverbal communication	4.1	18.6	19.6	28.9	20.6	8.2	2.7	5

The communication method with the highest ranking is written communication. Electronic communication is ranked second, oral communication third, visual communication fourth and nonverbal communication least important. The method of communication indicates the skills that a project manager needs to communicate effectively. The purpose of the second question of Section B was to determine the level of effectiveness of the communication method used in the construction industry. The methods are all used during the execution of a project, but some of the methods are more effective when used during the execution of a project. Written and electronic methods of communication have the advantage that a message can be read and corrected before finalised, but oral and nonverbal communication do not have the advantage of being able to correct the message. A project manager therefore needs skills to communicate effectively in conveying a message nonverbally and orally, because there is only one chance and no possibility of correcting the message. Table 2 shows the effectiveness of communication methods.

Table 2: Effectiveness of communication methods

Effectiveness of communication method	None	Response (%)					Average	Ranking
		1 Not important						
		5 Extremely important						
		1	2	3	4	5		
Electronic communication	3.1	1.1	1.0	11.3	33.0	50.5	4.2	1
Written communication	6.2	1.1	0	14.4	37.1	41.2	4.0	2
Oral communication	6.2	0	5.2	30.9	41.2	16.5	3.5	3
Visual communication	8.3	9.3	18.6	24.7	24.7	14.4	2.9	4
Nonverbal communication	8.2	16.5	21.6	37.2	13.4	3.1	2.4	5

Electronic communication is ranked the highest as effective communication method. The communication method ranked second is written communication with oral communication ranked third. Visual communication is ranked fourth and nonverbal communication is ranked fifth as effective communication method. Electronic and written communications are the most effective communication methods to use. The two methods both imply a written format, because a fax and email, although sent electronically, is written. The deduction can thus be made that written communication is the most effective communication method the project manager can use during the execution of a project and that oral communication is the second most effective communication method to use.

The purpose of the question in Section C was to determine the impact of the construction project managers' skill to communicate on the success of the project management areas. The second purpose was to determine if communication might be a cornerstone area of project management, with the other cornerstone areas as derived from previous research and the rest of the areas, and the means of achieving the trade off, as pillars or support. The third purpose was to determine if communication, in conjunction with integration, might be seen as the area that combines and coordinates the various processes and project management activities. Leadership is not an area of project management, but it is important to determine to what extent is it important for a construction project manager to be a leader in a project. Table 3 shows the impact of the construction project managers' communication skills on the success of the project management areas.

Table 3: Project management areas

Project management areas	Response (%)						Average	Ranking
	None	1 Not important 5 Extremely important						
		1	2	3	4	5		
Leadership	1.0	0	2.1	10.3	26.8	59.8	4.4	1
Project time management	2.1	0	2.1	11.3	26.8	57.7	4.3	2
Project quality management	3.1	0	1.0	14.4	26.8	54.6	4.3	2
Project cost management	1.0	0	1.0	14.4	29.9	53.6	4.3	2
Project communication management	2.1	0	1.0	9.3	35.1	52.6	4.3	2
Project risk management	2.1	1.0	1.0	14.4	36.1	45.4	4.2	3
Project scope management	3.1	0	1.0	13.4	39.2	43.3	4.2	3
Financial management	2.1	1.0	1.0	21.6	28.9	45.4	4.1	4
Project integration management	4.1	0	2.1	15.5	40.2	38.1	4.0	5
Claims management	1.0	0	6.2	20.6	35.1	37.1	4.0	5
Occupational health and safety management	1.0	1.0	5.2	23.7	35.1	34.0	3.9	6
Project procurement management	4.1	0	7.2	19.6	38.1	30.9	3.8	7
Environment management	3.1	2.1	9.3	29.9	33.0	22.7	3.6	8
Project human resource management	3.1	2.1	4.1	14.4	43.3	33.3	3.3	9

Respondents ranked the impact of the construction project managers' skill of communicating on the success of the project management the highest for leadership. The impact of the construction project managers' skill to communicate on the success of the areas time, quality, cost and communication management is ranked second. Scope and risk management are ranked third, fourth is financial management, fifth is integration and claims management, sixth is occupational health and safety management, seventh procurement management, eighth is environmental management and human resources is ranked ninth, with regard to the impact of the construction project managers' skill of communicating on the success of the project management areas. The construction project manager has to communicate effectively regarding cost, time and quality as three of the four cornerstone factors on which the success of a project depends, followed by scope. Time influences cost, and cost is communicated to the client, functionaries and stakeholders to execute the project within the approved budget and in time, according to the request of the client – the scope. The project manager needs to be a leader to communicate effectively with all parties. The successful execution of a construction project depends heavily on the construction project manager's abilities as communicator to lead the team and manage a construction project successfully.

Written communication is ranked as the most important communication method to use during the execution of a project. Written communication is concise, discreet, accurate and free of ambiguity and contributes to enhancing communication during the management of a project. Electronic communication is ranked as the second important method of communication to use during project management. Electronic communication involves sending messages at a high speed to all stakeholders involved in the project. Oral communication is ranked as third important communication method and involves both face-to-face and telephonic communication. Written and electronic communication are both in the same format, thus oral and all written forms of communication are the most important methods to be used by the construction project manager as the communicator during the execution of a project. Written communication enhances the effectiveness of communication, as it is proof of what was done during the management of a project.

Electronic communication is ranked as the most effective communication method. Ranked secondly, is written and thirdly, oral communication as effective methods of communication used in project management. To be effective, written communication is important, as it is the record for future reference and accessible repeatedly. Because of the accessibility of written communication, it is an effective method of communication between the project manager and the stakeholders to enhance project communication. The impact of the construction project managers' communication on the success of a project is the highest in the project management areas time, quality, and cost, and communication management. Leadership is important to communicate effectively with all parties involved during the management of a project. Communication regarding cost is important and the skills to communicate about aspects of cost influence the success of a project. If communication about time is not effective, it will influence the project, as well as cost management. The communication about quality management is important; if not effective, it will influence the project as well as cost and time management.

Thus, effective project communication by a project manager, as the leader of the project, will influence all other areas positively and will contribute to the effective management of the whole project. Communication is the foundation of the cornerstones of the project management areas cost, scope, time and quality as well as for the means to achieve the trade-off of the project management areas human resources, risk, procurement, integration, claims, finance, health and safety, and environmental management.

9. Conclusion and recommendations

The communication methods that are the most important to use during the execution of a project are written, oral and electronic communication, of which written and oral communication are regarded as the most effective communication methods. The construction project manager has to communicate effectively regarding cost, time and quality as three of the four cornerstone factors on which the success of a project depends, followed by scope. Time influences cost, and cost is communicated to the client, functionaries and stakeholders to execute the project within the approved budget and in time, according to the request of the client – the scope. The project manager needs to be a leader to communicate effectively with all parties. The successful execution of a construction project depends heavily on the construction project manager's abilities as communicator to lead the team and manage a construction project successfully. Therefore, a communication foundation model is proposed.

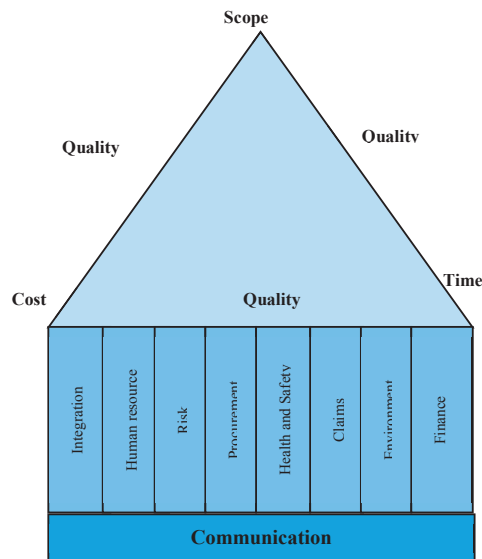


Figure 1: Communication foundation model

The project managers' skills to communicate have an impact on the cornerstone areas of project management. Communication is needed to effectively communicate the interrelated areas of cost, scope and time, and quality, which is the result of the interrelationship between scope, cost and time. Communication is the function that integrates cost, scope and time to achieve a quality product and may be seen as having a cornerstone function. It is recommended that project managers may use the module in the sense that communication is the foundation that supports the pillars and cornerstones for achieving the project objectives.

References

- [1] About.com. The history of communication. [online]. Available from: <http://inventors.about.com/library/inventors/bl_history_of_communication.htm>. [Accessed 12 September 2008]; 2012.
- [2] Awati K. Obstacles to project communication. [online]. Available from: <<http://www.projectsart.co.uk/obstacles-to-project-communication.html>>. [Accessed 27 July 2010]; 2010.
- [3] Barrett DJ. Leadership communication. Boston: McGraw Hill Education; 2006.
- [4] Bowen PA, Edwards PJ. Interpersonal communication in cost planning during the building design phase. *Construction Management and Economics*, 14(5); 1996. pp. 395-404.
- [5] Burke R. Project Management Planning and Control Techniques. 4th ed. Chichester: Wiley; 2003.
- [6] Burke R. Introduction to project management: one small step for the project manager. [S.l.]: Burke Pub; 2007.
- [7] Burke R. Fundamentals of project management: tools and techniques. Ringwood: Burke Pub; 2010.
- [8] Choo G, Harris J, Clarke I, Steeger B, McIver B, Schroeder M. Hierarchy of skills: laying a foundation for PM Maturity. [online]. Available from: <<http://www.gantthead.com/content/articles/176281.cfm>>. [Accessed 12 April 2011]; 2003.
- [9] Clearly S. (ed.). Communication A Hands-On Approach. 2nd ed. Landsdowne: Juta & Co. Ltd; 2008.
- [10] Dow W, Taylor B. Project Management Communications Bible. Indiana: Wiley Publishing Inc; 2008.
- [11] Egeland, B. *Project communication series: PM communication skills*. [online]. Available from: <<http://pmtips.net/project-communication-series-pm-communication-skills/>>. [Accessed 12 April 2011]; 2010.
- [12] Emmitt S. Managing interdisciplinary projects: a primer for architecture, engineering and construction. London: Spon Press; 2010.
- [13] Engelbrecht A. Managing the media. The role played by the media as a channel for project communication on public infrastructure projects. *The project manager*, 4. 2010. p. 26-33, March.
- [14] Fisk ER, Reynolds WD. Construction project administration. 9th ed. New Jersey: Prentice Hall; 2010.
- [15] Gronstedt A. The Customer Century: lessons from world-class companies in integrated marketing and communications. New York: Routledge; 2000.
- [16] Hoard CA. Hierarchy of skills: laying a foundation for PM Maturity. [online]. Available from: <<http://www.gantthead.com/content/articles/176281.cfm>>. [Accessed 12 April 2011]; 2003.
- [17] Hoezen MEL. The problem of communication in construction. In: International conference on adaptable building structures, Eindhoven 3-5 July 2006. Enschede: University of Twente, pp. 14-19. [online]. Available from: <<http://alexandria.tue.nl/repository/books/612493-3.pdf>>. [Accessed 12 April 2011]; 2006.
- [18] Knipe A, Van der Waldt G, Van Niekerk D, Burger D, Nell K. Project management for success. Sandown: Heinemann; 2002.
- [19] Kotzé BG, Berry FH, Verster JJP. Communication as a crucial element in project management. In Proceedings CD: 12th Pacific Association of Quantity Surveyors (PAQS) Congress on Construction in challenging environments, Edmonton 16-18 June 2008. Canada: PAQS; 2008.
- [20] Le Roux EE. (ed). Business management: a practical and interactive approach. 2nd ed. Sandton: Heinemann Higher and Further Education; 1999.
- [21] Maslej M. Communication in the Construction Industry. [online]. Available from: <http://liad.gbrownc.on.ca/E-journal/thesis%20pdf/final%20pdf/marcin_maslej.pdf>. [Accessed 15 August 2011]; 2006.
- [22] Project Management Institute (PMI). Construction extension to the PMBOK guide third edition. 2nd ed. Newtown Square, Pa.: Project Management Institute; 2008.
- [23] Smit PJ, Cronje GJ de J. Management principles: a contemporary edition for Africa. 3rd ed. Cape Town: Juta; 2002.
- [24] Spears LC. (ed.). Reflections on leadership: how Robert K. Greenleaf's theory of servant-leadership influenced today's top management thinkers. New York: Wiley; 1995.
- [25] Steyn H. (ed.). Project management: a multi-disciplinary approach. 2nd ed. Pretoria: FPM Pub; 2008.
- [26] Talukhaba A, Mutunga T, Miruka CO. Indicators of effective communication models in remote projects. *International Journal of Project Organization and Management*, 3(2). 2011. p. 127-138.
- [27] The Chartered Institute of Building (CIOB). Code of Practice for Project management for Construction and Development. 4th ed. CIOB: Chichester: Wiley-Blackwell; 2010.
- [28] Tubbs SL, Moss S. Human communication: principles and contexts. 11th ed. Boston, Mass.: McGraw-Hill; 2008.
- [29] Van der Walt A, Strydom JW, Marx S, Jooste CJ. (eds.). Marketing management. 3rd ed. Kenwyn: Juta; 1996.
- [30] Van Staden E, Marx S, Erasmus-Kritzinger L. Corporate communication: getting the message across in business. Pretoria: Van Schaik; 2002.
- [31] William T. Construction Management. USA: Delmar Cengage Learning; 2010.