COMMUNICATION INSTRUMENTS USED BY THE ENGINEERING AND QUANTITY SURVEYING PROFESSIONS AND THEIR COMMUNICATION CAPABILITIES IN THE CONSTRUCTION INDUSTRY

F.H. Berry and AHJ du Toit
University of the Free State, Bloemfontein, South Africa
BerryFH.SCI@ufs.ac.za

ABSTRACT

Poor documentation in respect of clarity and understandability may have a negative influence on the effectiveness of decisions and the decision-making process in construction projects, and therefore, communication and communication instruments used by engineers and quantity surveyors need to be up-to-standard and effective in respect of property development.

By means of a questionnaire the performance of the engineering and quantity surveying professions was measured in terms of effective verbal, written and contractual communication as well as the communication instruments used by them in property development or construction projects. The research undertaken further focussed on the ability of the engineer and quantity surveyor to take a leading role in construction industry communication.

Results show that the two professions communication skills compare well, but that improvements to some communication instruments are desirable. Solutions to communication problems are proposed.

Key words: Communication instruments, communication capabilities, contracts, quantity surveying, engineering, tender documents, construction industry.

INTRODUCTION

John Rawson (2006: Online) used the example of the ancient Babylonians who decided to build a very high tower so that they could reach heaven and win universal acclaim. The Almighty is said to have taken a dim view of these mortal goings on and confused the language of the builders. No one person could understand another. The project failed and the Tower of Babel has become synonymous with failed and over-ambitious projects. The confusion of language has a resonance with today's construction professionals.

Most property developments or construction projects are dependent on good communication between the involved parties. Lack of communication between the parties could decrease the effectiveness of decisions or the decision making process, thereby decreasing the effective use of capital. Regardless of their individual knowledge and skills, success is unlikely if there is a lack of communication between these role players.

Rawson (2006: Online) also noted that taking the time and making the effort to communicate well is often not a priority on a construction site. Poor communication leads to misunderstandings, mistakes, delays and even accidents and can be financially costly.

In the construction industry, information needs to be available and communicated quickly and easily, that is at the right time and in the right location for maximum benefit and project efficiency (Alexander, Coble, Crawford, Drogemuller, Leslie, Newton, Wilson & Yum Kwok-Keung, 1998: Online). Both quantity surveyors and engineers are major role players as communicators on construction projects, and the successfulness of a project can be influenced by their communication capabilities or lack thereof.

The aim of this research was to determine the communication networks between quantity surveyors and engineers as well as identifying problem areas and proposing possible solutions.

IMPROVED COMMUNICATION CAPABILITIES AND COMMUNICATION INSTRUMENTS BETWEEN QUANTITY SURVEYORS AND ENGINEERS COULD MAKE COMMUNICATION MORE EFFECTIVE

The communication process and transfer of information is essential in co-ordinating and controlling projects in the construction industry (Emmitt & Gorse, 2003:11)

The communicator must not only work in their field of study, but must have the required knowledge (Himstreet & Baty, 1973:3-4). Both the quantity surveyor and the engineer are specialists in different fields with widely differing skills. Therefore an informed decision can only be made when the relevant specialist knowledge is utilised (Emmitt & Gorse, 2003:56).

The amount of information, the urgency of the information and the efficiency and effectiveness of communication between the relevant parties needs to be established for successful communication channels. During construction, communication problems can mean expensive

delays. The construction industry is highly fragmented and operates in a very competitive environment. This diversity limits efficiency and effective communication (Construction Agency Coordination Committee (CACC), 2004: Online)

By understanding the communication processes, investigating tendencies and proposing improved professional consultants, communication capabilities and -instruments, the professional consultant's position may improve and communication in the construction industry may become more effective. The identification of healthy communication practices and the application thereof may lead to better relationships within the construction industry.

The communication process and transfer of information is essential in co-ordinating and controlling projects in the construction industry (Emmitt & Gorse, 2003:11)

Figure 1 shows the parties involved in a project and the potential to influence that project. The interaction between the various parties may be dependent on the professional consultants to ensure that the necessary information is produced and used successfully.

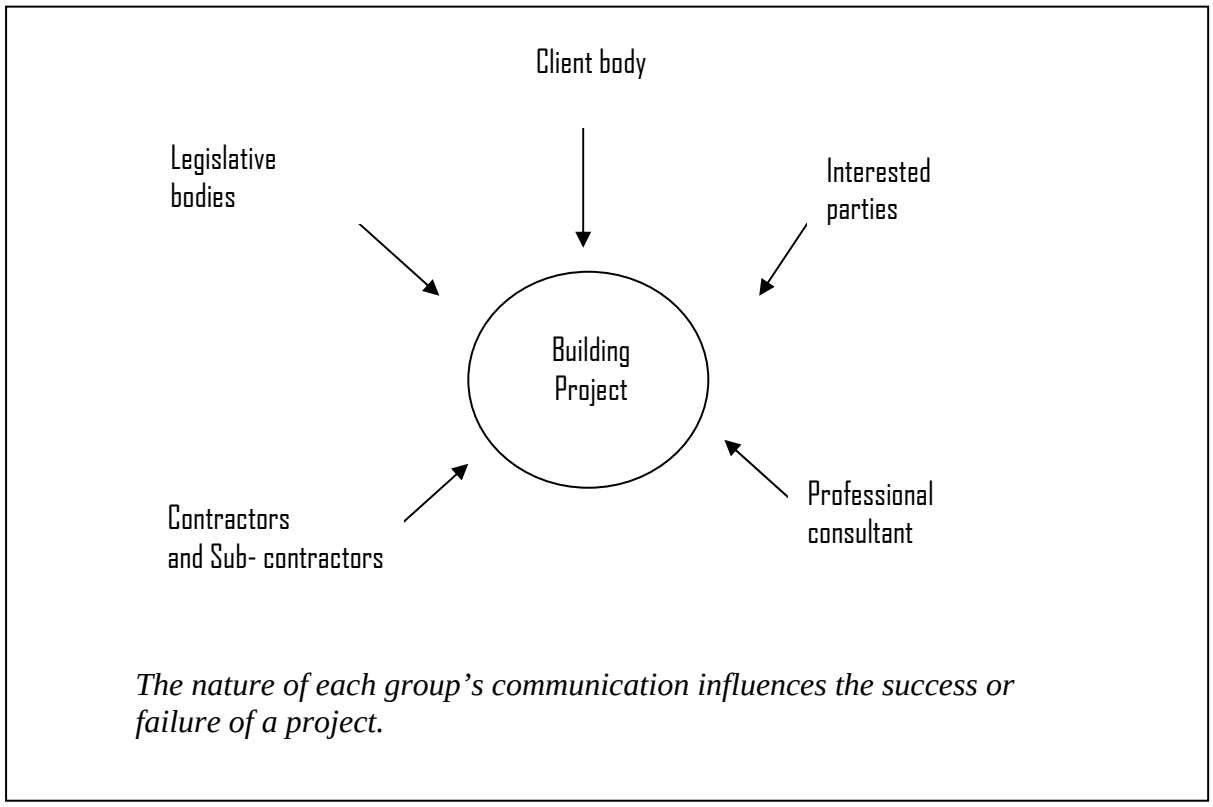

Figure 1: Influential parties to the building project.
Source: Emmitt & Gorse (2003:8)

OVERVIEW OF ELEMENTS TO EFFECT GOOD COMMUNICATION

To effect healthy communication, it is important to investigate the different elements. People not only communicate by language, but by presentation, behaviour, conduct and personality (Sieff, 1990:38-39).

Information/documentation is a key enabler to the running of any project. Structured communication channels will dictate how project documentation is to be passed amongst project parties (Sommerville, Craig & McCarney, 2004: Online).

The same word can be interpreted differently by people; even the word communication can mean different things to different people – which, given the need to pass information on clearly and concisely, is unfortunate (Rawson, 2006: Online)

According to Lee Hopkins (Online) there are seven essential elements to successful business communication:

- **Structure:** The structure of the communication is fundamental to how easily it is absorbed and understood by the audience
- **Clarity:** Be clear about the message and the meaning of the message
- **Consistency:** Be consistent with the decision making as consistency creates trust
- **Medium:** There are a myriad of ways to deliver a message, the trick is to use the right medium with the greatest accuracy
- **Relevancy:** Address only the relevant issues to the current problem
- **Primacy:** The opening and closing of your communication are the most easily remembered and therefore the most essential elements
- **Psychological rule (also known as the Rule of 7 ± 2):** Limit your communication between nine and five key points as they are most likely to be remembered

Own identity must not be discarded, because this is associated with credibility. Pascal (in Decker, 1989:91) views natural style's effect as follows:

> "When we encounter a natural style we are always surprised and delighted, for we thought to see an 'author' and, found a man".

Verbal communication

Knowledge is an important element that ensures effective verbal-, written- and contractual communication. A person cannot maintain a certain level of communication if he/she does not have the required knowledge.

Even though a person may have the required knowledge, it could be difficult to impart their ideas with the necessary conviction and credibility. It is important that the listener is convinced of the viewpoint and believes in the proposed matter.

Credibility, sincerity and integrity is the key to effective communication and should be clear, observable, visual, verbal and vocally absorbed by the listener. The messenger can ensure his/her total communication packet by preparation, as stated by Bernard Baruch (in Decker, 1989: 27-35), "The ability to express an idea is well nigh as important as the idea itself."

Through speaking we try to eliminate misunderstandings. The importance of aspects may differ between the parties. Architects and construction managers find face-to-face communication to be the most effective type of communication media (Emmitt & Gorse, 2003:119).

Written communication

After verbal ability, the other important attribute of man is the ability to write. The communicator must make sure that their written meaning and aims are understandable to the reader. The problem arises when questions arise that cannot be solved or explained immediately.

According to Emmitt & Gorse (2003:124), written reports, letters, minutes of meetings, etc are essential for the smooth running of projects and will be used as evidence in the event of a dispute. Compared with oral communication, all written communication should be more concise, more discreet, more accurate and free of ambiguity to the reader.

The aim of writing in business differs because objectivity is strived for. In commerce the main aim is to ensure that the receiver understands precisely what is written, because time is money in business. The fewest possible words that are clearly presented is the aim in written communication (König, Conradie, Geyer, Van der Westhuizen, Albertyn, De Bruyn, Valkhoff & Van Schalkwyk, 1993:105).

Written communication guarantees that everyone concerned has the same information. It provides a long-lasting record of communication for the future. To be effective, written communication should be understandable, brief, truthful and comprehensive.

According to Sillars (1994:161) every letter communicates two messages, namely information for the receiver and an indication of the sender. The outlay clarity, accuracy of expression and inclusion of all the relevant detail is important to help the reader formulate an impression of the writer. In business this could have a large impact, especially if the letter content is selling goods or services.

There are basic principles in letter writing. A good letter balances the three equally important entities, courtesy, clarity and conciseness (Sillars, 1994:172).

Contractual communication

Written communication principles are also relevant in contractual communication principles. Malherbe and Lipshitz (1978:72) stipulate the following principles that are fundamental when drawing up a contract:

- "there must be agreement between the contracting parties to create a legal and binding contractual relationship embracing rights, responsibilities, prerogatives and privileges"
- "The parties must be at one as to the consequences contemplated by such agreement or in other words, as to their intention in the application of agreed contractual relations"

It should be noted that contract documents refer to the project contract, instructions, conditions, drawings, specifications and addenda. Quality is also related to communication and well-communicated contract documents are the key ingredient to ensuring that the required project quality is met. Inefficiencies in contract documents issued by consultants are a form of miscommunication and can lead to significant quality problems (Maslej, 2006:18,21).

Loots (1985:3) argues that “the success or failure of a construction contract is greatly dependent on the managerial effort expended by the employer and his architect, project manager, consulting engineer or quantity surveyor when formulating and awarding a contract.”

THE RESEARCH PROJECT

Introduction

The opinions of relevant parties in the building-, property development- and construction industry, on what good communication entails, was determined and interpreted. The effectiveness of the professional engineers’ and quantity surveyors’ communication capabilities and communication instruments, the gaps in present communication processes, and areas for improvement, according to respondents, were also established.

Methods

A survey was conducted to establish the current comparison between the engineering and quantity surveying professions in respect of their communication capabilities and communication instruments in the construction industry. Professionals (architects, engineers and quantity surveyors) were requested to respond to the questionnaire. More than a thousand questionnaires were sent to these professionals in the RSA. The response rate was less than 10% overall. The profile of the response rate is architects 38.1%, quantity surveyors 33.3% and engineers 28.6% which indicates a reasonable balance between professionals responded to the questionnaire.

Data was analysed using an excel spreadsheet with standard statistical functions.

FINDINGS

Communication capabilities

Respondents reported the communication capabilities and insight into construction business of professionals in private practice, with respect to verbal, written and contractual communication as shown in Figure 2.

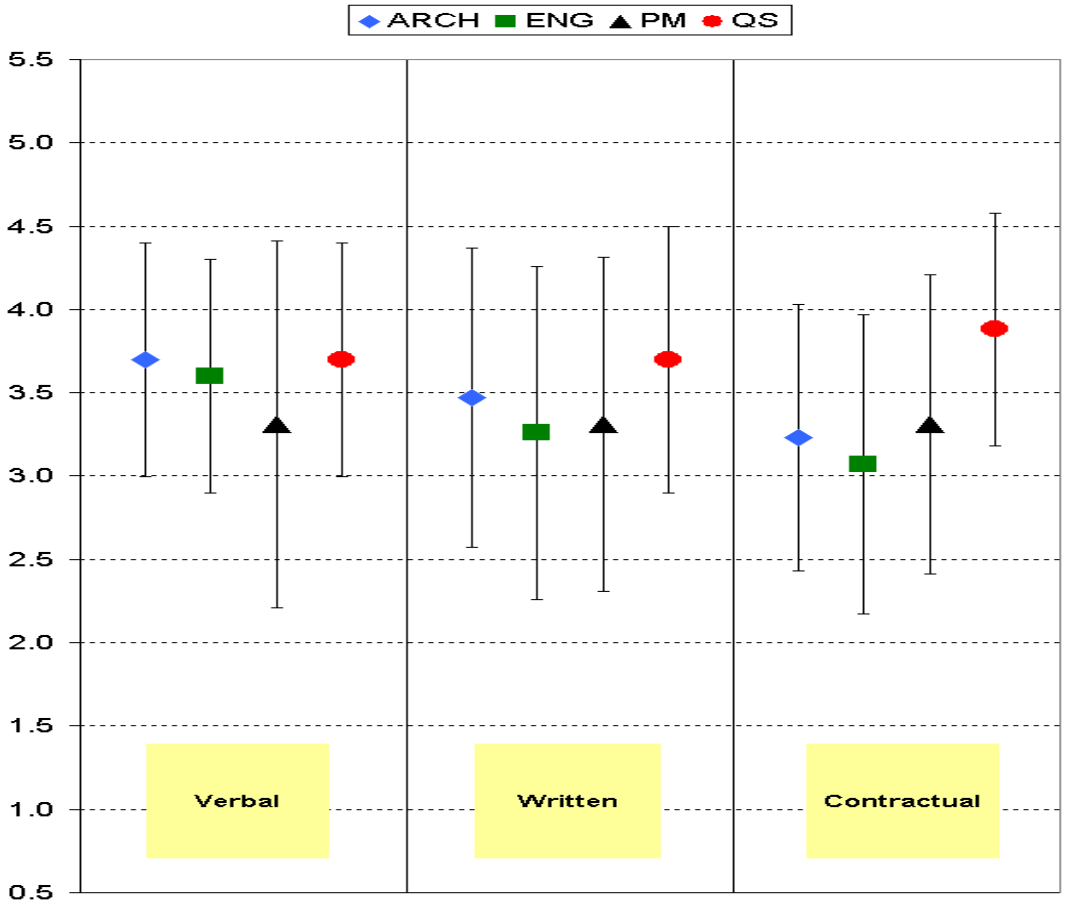

Figure 2. Communication capabilities and insight into construction business of the professional consultants. Source: (University of the Free State, Department of Quantity Surveying and Construction Management, 2007) (Ratings: 1= low, 3= intermediate, 5 = high)

The respondents rated the quantity surveyors' verbal, written and contractual communication skills good to very good, better than the skills of the engineer.

It is important to take note that the quantity surveyors contractual communication is adjudicated to be higher than that of the engineer or the architect and project manager. This is to be expected due to the fact that the project managers were not part of the respondents profile and this article does not deal with the project managers.

Results indicated that the overall opinion on engineers' and quantity surveyors' communication capabilities, respondents from an engineering background, rated the engineer slightly above average, slightly better than quantity surveyors in verbal communication but weaker in written and contractual communication.

In comparison, respondents from a quantity surveying background rated the quantity surveyors communication skills very good overall and better than the communication skills of the engineer with a significant margin between these professionals (average 1.3) in contractual communication.

Importance of communication instruments used for projects

The aim of the study was also to assess the communication instruments that architects, engineers and quantity surveyors normally use for projects in the construction industry as shown in Figure 3.

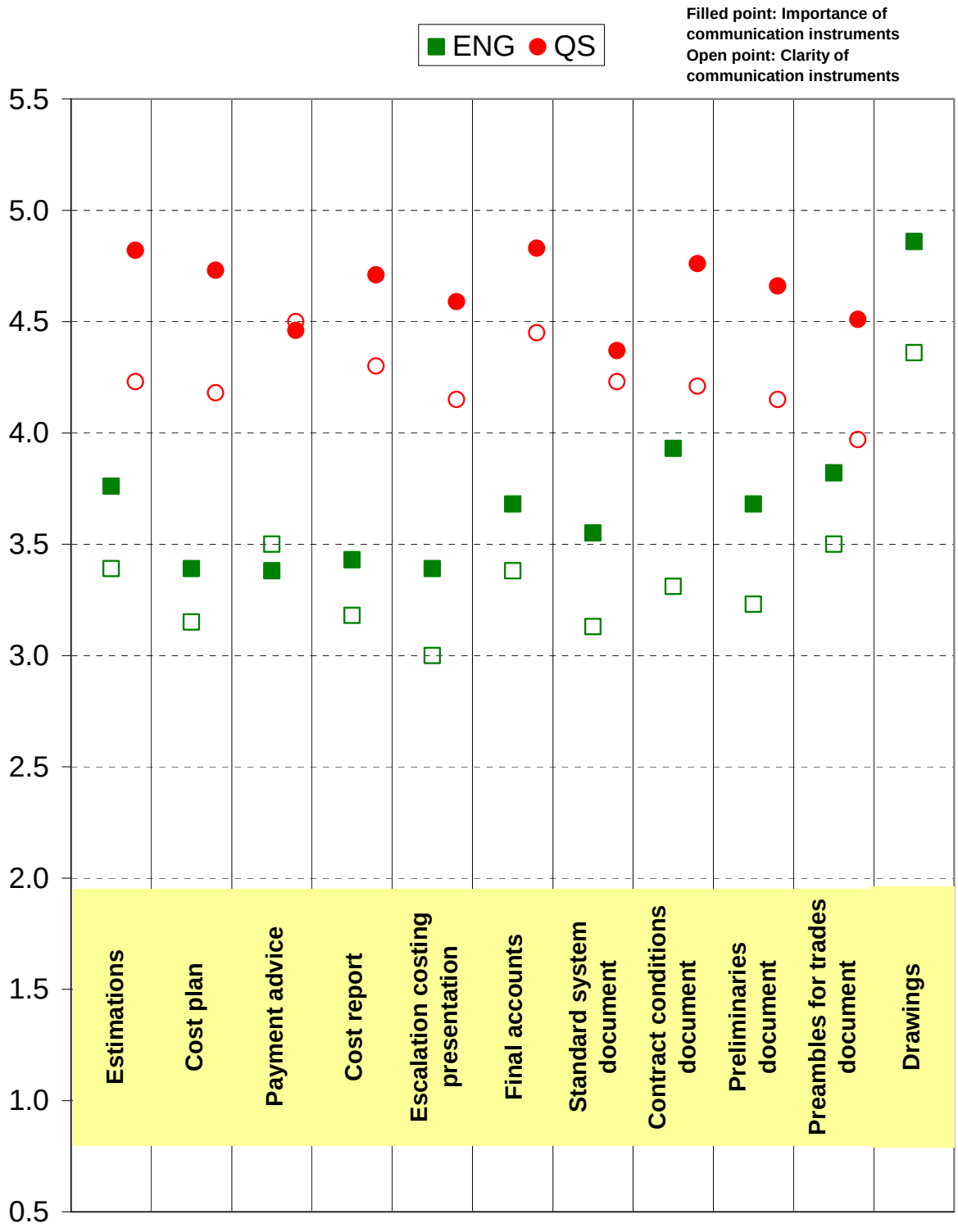

Figure 3. Importance and clarity of communication instruments used by practicing professionals for projects. Source: (University of the Free State, Department of Quantity Surveying and Construction Management, 2007) (Ratings: 1= low, 3= intermediate, 5 = high)

The importance of estimations, cost plans, cost reports, escalation costing presentation, final accounts, contract conditions document, preliminaries documents and preambles for trades document, as communication instruments of the quantity surveyor were identified as extremely positive and rated above 4.5.

The payment advice and standard system document were also experienced in a positive manner as communication instruments of the quantity surveyor, but although highly rated, were considered by the respondents to be least important and rated slightly below 4.5.

Drawings as communication instruments of the engineer were identified as extremely important and rated almost 5.

Results on the importance of engineering communication instruments indicated that respondents have a less positive opinion of the importance of the communication instruments used by engineers when compared to the importance of the same communication instrument used by quantity surveyors.

On the importance of engineering and quantity surveying communication instruments, results indicated that the overall opinion of respondents from an engineering background rated the communication instruments used by engineers of lesser importance than the same communication instruments used by quantity surveyors. The cost reports, preliminaries document and preambles for trades document as communication instruments of engineers were considered by the respondents from an engineering background to be least important on average as indicated in Figure 3, which represents the overall opinion of architects, engineers and quantity surveyors .

In comparison, respondents from a quantity surveying background have a less positive opinion of the importance of the communication instruments used by engineers when compared to the importance of the same communication instruments used by quantity surveyors.

The cost plan and preambles for trades document, as communication instruments of quantity surveyors, were considered by the respondents from a quantity surveying background to be less

important than the averages as indicated in Figure 3, which represents the overall opinion of architects, engineers and quantity surveyors.

Clarity and understandability of communication instruments used in projects

The communication instruments usually used in projects were tested for clarity and understandability as was shown in Figure 3.

The preambles for trades as communication instrument used by quantity surveyors, although rated high, were considered by the respondents to be not fully clear and understandable and rated slightly below 4.

Results on the clarity and understandability of the engineering communication instruments showed that the respondents have a less positive opinion of their communication instruments when compared to the same communication instruments used by quantity surveyors.

The escalation costing presentation, as communication instrument, used by engineers was considered by the respondents as not fully clear or understandable, with a rating of 3.

On the clarity of engineering and quantity surveying communication instruments, results indicated that respondents from an engineering background show a less positive opinion on the clarity of the communication instruments used by engineers when compared to the clarity of the same communication instruments used by quantity surveyors.

Respondents from an engineering background have a more positive opinion on the clarity of the communication instruments used by engineers when compared to the averages as indicated in Figure 3 which represents the overall opinion of architects, engineers and quantity surveyors.

In comparison, respondents from a quantity surveying background have a less positive opinion of the clarity of the communication instruments used by engineers when compared to the clearness of the same communication instruments used by quantity surveyors.

Respondents from a quantity surveying background have a less positive opinion on the clarity of the communication instruments used by quantity surveyors when compared to the averages as

indicated in Figure 3 which represents the overall opinion of architects, engineers and quantity surveyors.

Important elements in effective verbal communication in the construction industry

Verbal communication usually takes place in site- or consultant meetings. The elements used in verbal communication are given in Figure 4 and show to what extent the engineers and quantity surveyors meet the requirements as adjudicated by the respondents.

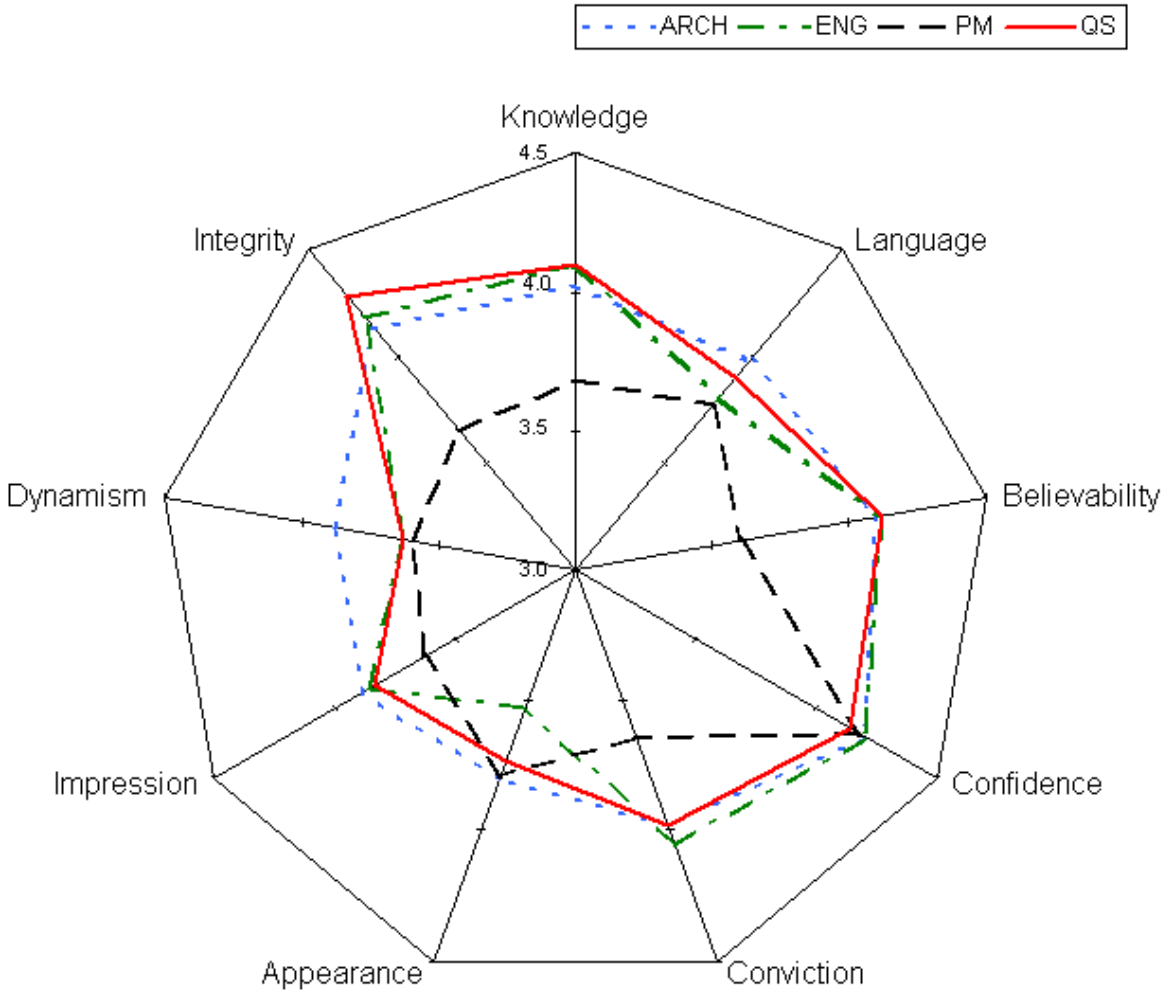

Figure 4. Professional's compliance with elements necessary for effective verbal communication at site meetings, consultants meetings, etc. Source: (University of the Free State, Department of Quantity Surveying and Construction Management, 2007) (Ratings: 1= low, 3= intermediate, 5 = high)

In all aspects of effective verbal communication, engineers received a high rating by respondents, but appearance was rated least with an average of 3.53. The engineers' integrity

average rated 4.2, believability rated 4.1 and confidence rated 4.2, which were high ratings and may be seen as very positive.

In the overall opinion on all elements necessary for effective verbal communication, results indicated that respondents from an engineering background rated the engineers and quantity surveyors almost the same. However, dynamism, impression and appearance, as aspects of effective verbal communication of engineers, were rated by the respondents from an engineering background, as better than the averages as indicated in Figure 4 which represents the overall opinions of architects, engineers and quantity surveyors.

In all aspects of effective verbal communication, quantity surveyors received a high rating by respondents, but dynamism was rated least with an average of 3.63. Quantity surveyors' integrity (average 4.3) and believability (average 4.12) was rated high and can be seen as a plus for the construction industry.

Results indicated that the overall opinion on all elements necessary for effective verbal communication, respondents from a quantity surveying background rated the quantity surveyor slightly better than the engineer except in confidence and conviction as elements necessary for effective verbal communication.

Respondents from a quantity surveying background have a less positive opinion on all elements necessary for effective verbal communication except appearance when compared to the averages as indicated in Figure 4 which represents the overall opinion of architects, engineers and quantity surveyors.

Important elements regarding written communication

Estimations, payment advice, cost reports, letters, etc. form the main instruments of written communication used by engineers and quantity surveyors.

Figure 5 represents the elements needed for effective written communication and the respondents' opinions thereof.

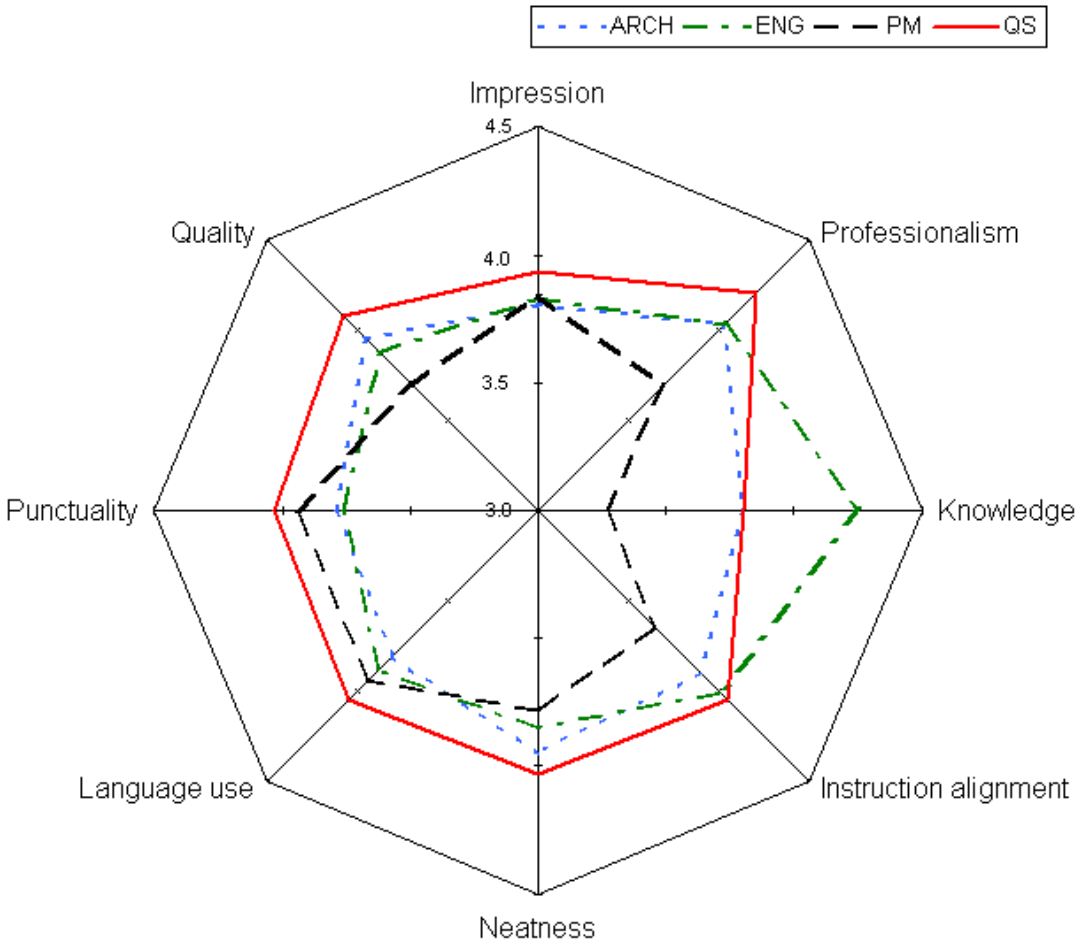

Figure 5. Professionals compliance with elements necessary for effective written communication (letters, reports etc.) Source: (University of the Free State, Department of Quantity Surveying and Construction Management, 2007) (Ratings: 1= low, 3= intermediate, 5 = high)

Engineers were rated high overall by the respondents, in the written communication category with the strongest element being scientific knowledge (average 4.25) and the weakest element being punctuality (average 3.76). Respondents rated the engineer higher than the quantity surveyor in scientific knowledge.

Results indicated that the overall opinion on all elements necessary for effective written communication, respondents from an engineering background rated the quantity surveyor slightly better than the engineer, except in scientific knowledge and impression as elements necessary for effective written communication.

Respondents from an engineering background have a more positive opinion on all elements necessary for effective written communication except instruction alignment when compared to the averages as indicated in Figure 5 which represents the overall opinion of architects, engineers and quantity surveyors.

Respondents rated Quantity surveyors high overall in the written communication category. The strongest elements, with averages above 4, being professionalism, punctuality, instruction alignment and quality, with the weakest element being scientific knowledge (average 3.8). Respondents rated the quantity surveyor higher overall in all elements of written communication when compared to the engineers, except in the element of scientific knowledge.

Results indicated that the overall opinion on all elements necessary for effective written communication, respondents from a quantity surveying background rated the quantity surveyor slightly better than the engineer except in scientific knowledge as elements necessary for effective written communication.

Respondents from a quantity surveying background have a less positive opinion on all elements necessary for effective written communication compared to the averages as indicated in Figure 5 which represents the overall opinions of architects, engineers and quantity surveyors.

A previous study found that the absence of written communication impedes the understanding of information given. This study found that quantity surveyors realised the importance of written communication in the construction process. (Bowen, et al., 2006:26)

Important elements in contractual communication

Documents like drawings or bills of quantities are the main contractual communication instruments and are needed for effective contractual communication. Engineers and quantity surveyors compliance with elements necessary to ensure effective contractual communication, according to the respondent's answers, are given in Figure 6.

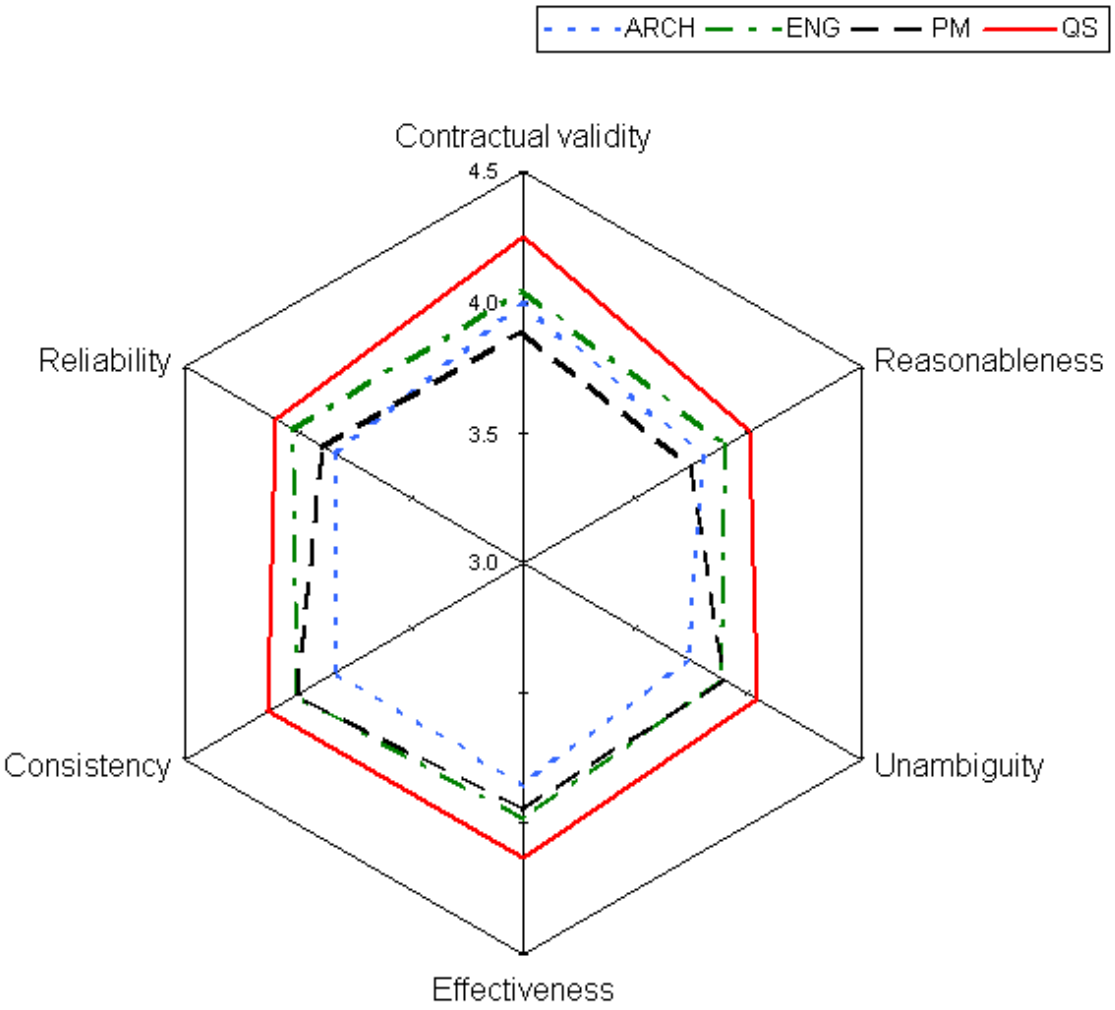

Figure 6. Professionals' compliance with elements necessary to ensure effective contractual communication (drawings, bill of quantities etc.). Source: (University of the Free State, Department of Quantity Surveying and Construction Management, 2007) (Ratings: 1= low, 3= intermediate, 5 = high)

Engineers were judged to have a reasonably good knowledge of contractual communication with their weakest element being unambiguity (average 3.89) and their strongest, contractual validity (average 4.05).

Results indicated that the overall opinion on all elements necessary for effective contractual communication, respondents from an engineering background rated the engineer slightly higher than the quantity surveyor in all elements necessary to ensure effective contractual communication.

Furthermore, respondents from an engineering background rated the engineer almost exactly the same as the averages indicated in Figure 6, which represents the overall opinion of architects, engineers and quantity surveyors.

Quantity surveyors were adjudicated to have an excellent knowledge of contractual communication with their weakest element being reasonableness (average 4) and their strongest, contractual validity (average 4.25).

Quantity surveyors were clearly rated higher overall in all elements of contractual communication.

Results indicated that the overall opinion on all elements necessary for effective contractual communication, respondents from a quantity surveying background rated the quantity surveyor better than the engineer in all elements necessary for effective contractual communication.

However respondents from a quantity surveying background have a less positive opinion on all elements necessary for effective contractual communication, except unambiguity, compared to the averages in Figure 6 which represents the overall opinion of a architects, engineers and quantity surveyors.

Communication complications arise when contractual information is not adequate (Emmitt & Gorse, 2003:14). Respondents demonstrated in this study that a sound knowledge of contractual information is an excellent basis from which to minimise communication misunderstandings in construction.

According to Loots (1984:3) “the basis of a successful contract is established by the preparation of concise, unambiguous conditions of contract that give a clear picture of the division of responsibility between the parties.”

LEADERSHIP SKILLS

Respondents reports on the leadership skills of engineers and quantity surveyors, with respect to their ability to take a leading role in construction projects, as well as how equipped they are to handle the project management of construction projects is shown in Figures 7 and 8 respectively.

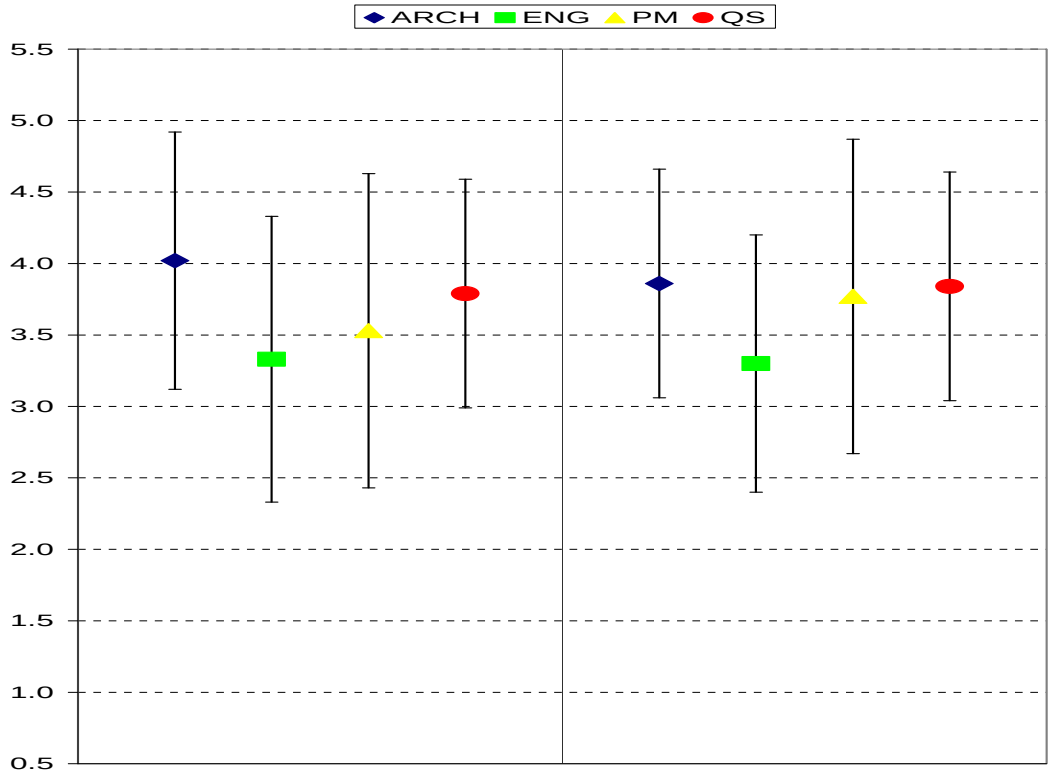

Figure 7. The professionals ability to take a leading role in construction projects. Source: (University of the Free State, Department of Quantity Surveying and Construction Management, 2007)

(Rating: 1 = low, 3 = intermediate, 5 = high)

Figure 8. How equipped are professionals to handle the project management of construction projects. Source: (University of the Free State, Department of Quantity Surveying and Construction Management, 2007)

Respondents rated the quantity surveyors ability to take a leading role in construction projects as very good, but better than the engineers' ability to take a leading role in construction projects.

The respondents rated quantity surveyors as very good at being able to handle the project management of construction projects, and also better than engineers in this field.

Results indicated that respondents from an engineering background rated the engineer better than the quantity surveyor in both their ability to take a leading role and how equipped they are to handle the project management of construction projects – compared to the averages indicated in Figures 7 and 8 which represent the overall opinion of architects, engineers and quantity surveyors.

In comparison, respondents from a quantity surveying background rated quantity surveyors and engineers slightly better in both categories, on their ability to take a leading role and how equipped they are to handle the project management of construction projects, compared to the averages indicated in Figures 7 and 8, which represents the overall opinions of architects, engineers and quantity surveyors.

CONCLUSION

Verbal, written and contractual communication abilities of the quantity surveyor have relatively good status within the construction industry.

Communication instruments used by quantity surveyors were very positively experienced and considered important while the importance of the same communication instruments used by engineers were less positively experienced.

Drawings as communication instruments used by engineers were identified as extremely important.

The clarity and understandabilty of the communication instruments used by quantity surveyors were positively experienced, but the same communication instruments used by engineers were not considered to be as clear or understandable relative to the quantity surveying communication instruments. Drawings as communication instruments used by engineers were identified as extremely clear and understandable and must be seen as extremely positive for the construction industry.

Compliance with the elements necessary for effective verbal communication of the quantity surveyor, and engineer were rated the same.

The necessary compliance with elements for effective written communication of the quantity surveyor was rated higher than that of the engineer.

The quantity surveyor was clearly rated higher than the engineer in compliance with elements necessary for effective contractual communication.

RECOMMENDATIONS

It is recommended that

- institutions which present programmes in engineering and quantity surveying lay more emphasis on the verbal, written and contractual skills of students.
- Institutions which present modules in building contract law improve these modules to benefit the professionals in the building industry.
- Engineers should take advantage of the opportunity to make up possible lost ground to the quantity surveyor in respect of building.
- Quantity surveyors and engineers improve their communication skills to perhaps take up the position of principal agent and therefore play a more prominent role in respect of leadership in the building industry.

REFERENCES

Alexander, J., Coble, R., Crawford, J., Drogemuller, R., Leslie, H., Newton, P., Wilson B. & Yum Kwok-Keung. 1998. Information and communication in construction: Closing the loop [online]. Available from: http://itc.scix.net/cgi-bin/works/Show?w78-1998-4 [Accessed 10 January 2008]

Bowen, P., Cattell, K., Michell, K. & Kabayanondo, E. 2006. The effectiveness of construction project briefing as an interpersonal communication process. *Acta Structilia,* 13(2), 19-38.

Construction Agency Coordination Committee (CACC). 2004. Information Technology [online]. Available from: http://ieeexplore.ieee.org/Xplore/login.jsp?url=/eil3/1764/4535/00180756.pdf?isnumber=&arnumber=180756 [Accessed 13 January 2008]

Decker, B. 1989. How to communicate effectively. London: Kogan Page

Emmitt, S. & Gorse, C. 2003. *Construction communication.* Oxford: Blackwell Publishing Ltd.

Himstreet, W.C. & Baty, W.M. 1973. *Business communications – principles and methods.* 3rd ed. Belmont CA: Wadsworth Publishing Co.

Hopkins, L. The Seven Essential Elements To Successful Business Communication [online]. Available from: http://www.streetdirectory.com/travel_guide/223/business_and_finance/the_seven_essential_elements_to_successful_business_communication.htlm [Accessed 13 January 2008]

Köning,G.M., Conradie, C.S., Geyer, N., Van der Westhuizen, E., Albertyn, S.E., De Bruyn, A.O., Valkhoff, J. A. & Van Schalkwyk, M.L. 1993. Communication in Commerce N4. Johannesburg: Lexicon Publishers.

Loots, P.C. 1985. Engineering and construction Ian. Cape Town Wetton Johannesburg: Juta & Co, Ltd.

Malherbe, G.de C & Lipshitz, M. 1978. *Malherbe & Lipshitz on building contracts*. Pretoria: National Development Fund for the Building Industry.

Maslej, M. 2006. Communication in the Construction Industry [online]. Available from: http://liad.gbrownc.on.ac/E-Journal/Thesis%20PDF/Final%20PDF/Marcin_Maslej.pdf [Accessed 13 January 2008]

Rawson, J. 2006. Improve communication in the construction industry [online]. Available from: http://www.infolink.com.au/articles/37/0C043237.aspx [Accessed 10 January 2008]

Scott, W.P. 1984. Communication for professional engineers. London: Telford.

Sieff, M. 1990. *Marcus Sieff on management: the Marks & Spencer way.* London: Weidenfeld & Nicolson.

Sillars, S. 1994. Success in communication. London: John Murray (Publishers) Ltd.

Sommerville, J., Craig, N. & McCarney, M. 2004. Document transfer and communication between distinct construction professionals [online]. Available from: http://www.rics.org/Practiceareas/Management/Businessmanagement/Communication/document_transfer_and_communication_between_distinct_construction_professionals_20040914.htlm [Accessed 10 January 2008]

University of the Free State, Department of Quantity Surveying and Construction Management. 2007. Survey on procurement, communication and dispute resolution. Bloemfontein: University of the Free State.