DEVELOPMENT OF RESEARCH INSTRUMENT FOR PROJECT MANAGERS' PERFORMANCE MEASURES IN MASS HOUSE BUILDING PROJECTS

D.K. Ahadzie[1], D.G. Proverbs and P. Olomolaiye , DG

School of Engineering and the Built Environment, University of Wolverhampton, Wolverhampton, WV1 1SB, West Midlands

The choice and design of an appropriate research instrument (RI) marks an important milestone in any research programme. Here, the development of an appropriate RI towards project managers' (PMs) performance measures in mass house building projects (MHBPs) is described. The underlying conceptual framework is designed to reflect the various project phases, namely: conceptual, planning, tender, procurement, construction and operational. However, here, the RI is developed for only the construction phase. Adopting positivism, the dependent and independent variables have been operationalised to reflect repetitive management intuition in MHBPs. Given that the RI is to be applied in the context of a developing country, the operational measures have also been developed to reflect the appropriate project conditions prevailing. Subsequently, pilot study was undertaken in Ghana, a sub-Saharan African (SSA) country. The feedback suggests the RI is potentially rigorous for eliciting the relevant information. While the paper focuses on MHBPs, there are useful lessons for application in the wider context, in particular, towards mapping performance measures onto projects of unique characteristics.

Keywords: conceptual framework, Ghana, mass house building projects, project managers, research instrument.

INTRODUCTION

Research instruments (RIs) are templates used to elicit relevant information for providing answers to research questions (Wilkinson, 2003). In theory, there are many options available to satisfy various research needs. Indeed, while there are many alternatives to choose from, selecting a potentially useful option requires careful thought and planning (Fellows and Liu, 2003). The irony is that, there is no option per excellence (Wilkinson, 2003). Nevertheless, some RIs are better suited for tackling specific issues than others. In a good research, the choice should be appropriate, reasonable and explicit (Denscombe, 2003). Failure to ignore these fundamentals can lead to very poor research. Above all, this may open the research findings to criticisms and doubt (Denscombe, 2003). Here, the conceptual framework underlying the development of an appropriate RI in a study, seeking to develop a model for predicting the performance of project managers (PMs) in Ghana is presented (see e.g. Ahadzie *et al.*, 2004; 2005). Given that different projects types may require different skills and capabilities on the part of PMs (see e.g. Ogunlana, 2002), here, the emphasis is on mass house building projects (MHBPs). However, while the focus is

[1] divinedka10@yahoo.com

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on these projects, there are important things to be learnt, in particular, towards mapping PMs' performance measures onto projects of unique characteristics.

A working definition of MHBPs including a literature synthesis of the knowledge and skills that enhance management intuition in that sector is first presented. A literature synthesis of the fundamental issues relating to the choice and design of RIs is also provided. Thereafter, the underlying conceptual framework is described followed by the RI design. Hence, piloting of the RI is also described. Subsequently, feedback from the piloting is presented. In conclusion, it is contended the feedback suggests the RI is potentially rigorous towards eliciting the relevant information in MHBPs.

LITERATURE REVIEW

Mass house building projects

While the term mass house building projects are widely used in the construction industry, extensive review of the literature reveals a lack of technical definition. Here the term is defined as "the mass construction of standardised house-units in large quantities often in the same location and at the same period in time" (Ahadzie *et al.*, 2006b). MHBPs are often speculative in nature and would take the form of terrace, multi-storey or tower blocks, maisonettes, semi-detached, and/or detached residences.

While management principles have universal application in construction, MHBPs in particular requires further intuition to help engender superior performance. This is because the processes often involve packaging the works into manageable sets of tasks in repeated sequences (see for instance, Ashley, 1980; Dhaneskar, 2000; El-Rayes, 2000). Thus, the operations involved in MHBPs can be visualised as a series of processes, each having identical claims on services and resources. Consequently, it is generally acknowledged that, the key to achieving project management and/or project success is for PMs to have the requisite knowledge and skills that enhance management intuition in repetitive construction planning (see e.g. Ashley, 1980; Enhassi, 1997; Dhaneskar, 2000)

Research Instruments

Various RI exist for eliciting data (see e.g. Wilkinson, 2003; Denscombe, 2003; Fellows and Liu, 2003). The research paradigm underlying the study is an important consideration for making an appropriate choice (Bailey, 1987; Walliman, 2003). Ultimately, this influences whether quantitative or qualitative data is required, which in turn influences whether for instance, an interview, open-ended questionnaires or structured questionnaires would be required. According to Miles and Huberman (1994) developing a conceptual framework for the study is potentially useful in deciding which paradigm to follow. Further, they note that the conceptual framework forces the researcher to be rational and systematic about the constructs and variables to be included in the RI.

THE CONCEPTUAL FRAMEWORK

Figure 1 is the conceptual framework underlying the design of the RI. The framework is based on the contention that, a potentially robust performance measurement system should reflect both performance behaviours and outcomes (see e.g. Ahadzie *et al.*, 2006a). Subsequently, for this purpose, behaviour is considered as what people do while at work, and performance is behaviour with evaluative component, (positive or negative) for achieving organizational effectiveness (Campbell, 1983; Motowidlo *et*

al., 1997). Alternatively, performance outcomes are things or conditions that are changed by performance and consequently either contribute to or detract from organizational goal accomplishment (Motowidlo *et al.*, 1997). Subsequently, the framework purports that PMs' performance measures should conceptually and operationally be based on both performance behaviours and outcomes (see e.g. Ahadzie *et al.*, 2006b). Given that the factors influencing project success may differ at the various project phases (see for instance, Lim *et al.*, 1999), the framework further purports to measure the PMs' performance by establishing the behavioural attributes that best predict overall performance outcomes at the various project phases, namely: conception, planning, tender, procurement, construction and operational (Ahadzie *et al.*, 2006b). Indeed the introduction of behavioural metrics is important towards the psychological understanding of selecting and predicting the PMs' performance (Motowidlo *et al.*, 1997; Scullen, 2003). Furthermore, linking these behavioural measures to the various project phases offer potential opportunity for continuous performance improvement throughout the whole project lifecycle.

Drawing on this multidimensional approach, the main themes in the framework have been identified as: contextual performance behaviours, task performance behaviours and the overall performance outcome (figure 1). The distinction in the behavioural measures has been the subject of discussion in earlier publications presented by the authors (see for instance Ahadzie *et al.*, 2005; Ahadzie *et al.*, 2006). Whilst task performance behaviour bears a direct link to an organizations technical core, contextual performance behaviours must be present within the social/psychological environment for the successful completion of the technical functions. Furthermore, while task performance behaviours will arise from job descriptions and work assigned to individuals, contextual performance behaviours arises out of volition and predisposition. The constructs of task performance behaviours have been identified as cognitive ability, job knowledge, task proficiency and experience whilst those of contextual performance are represented by job dedication and interpersonal facilitation (Motowidlo *et al.*, 1997; Conway, 1999) (Figure 1)

RESEARCH INSTRUMENT DESIGN

The constructs highlighted in the conceptual framework form the basis for developing the operational measures involved (see Table 1). Using an extensive taxonomy of generic managerial skills (see for instance Johnson *et al.*, 1997; Dainty *et al.*, 2003), the operational measures have particularly been designed to reflect management intuition for engendering improved performance in MHBPs. The works of Ling (e,g. Ling, 2003), in regards the design of potential proxies for contextual and task behavioural measures have also been pivotal here. Given that human performance can be predicted using mathematical logic (see for example Murphy *et al.*, 1982; Conway, 1999), positivism as a research paradigm is adopted. It is therefore contended that, structured questionnaires would be an appropriate RI to help gather the quantitative data involved. There are three main parts to the questionnaire, namely demographic, dependent and independent variables. Due to restrictions on the length of the paper, the RI has been excluded, however an abridged version of the operational measures involved, in particular, the dependent and independent variables are presented in table 1. The demographic section seeks for background information from potential participants on their classification; how long they have been in business; the type of mass house building projects (MHBPs) they have implemented over the years. The dependent variables seeks for information on what performance criteria are considered

important for assessing the success of MHBPs, while the independent variables requests for information on what contextual and task behavioural criteria are considered important for evaluating the performance of project managers in MHBPs. The demographic information will be coded using descriptive statistics while the dependent and independent variables would be coded using a five-point Likert rating scale (see for instance, McIver and Carmines, 1980)

Given that the RI is to be implemented in Ghana, the operational measures have also been designed to reflect the challenges PMs face in the construction industry of sub-Saharan African countries (see e.g. Faniran *et al.*, 2000: Ayirebi-Dansoh, 2005). For instance, in Ghana, artisans and/or labour-only-subcontractors often engaged on MHBPs have very limited access to formal apprenticeship, which tends to affect, in particular, their organizational skills (see e.g. Amoa-Mensah, 1999; 2002). Furthermore, while these artisans may be skilful in their crafts, they often do not appreciate the potential importance of the principles of construction economics and management. Besides, the construction environment is also characterised by inherent difficulties such as; a relatively weak resources supply base, excessive bureaucracy, financial uncertainties and high inflation. Infrastructure such as transportation networks, telecommunication and power supply systems are also relatively inadequate. Thus, the operational measures have largely been designed to reflect these challenges towards ensuring appropriate technology transfer. Thereafter, pilot study was undertaken to help establish whether the RI is potentially rigorous to work in the intended manner.

THE PILOT STUDY

Using purposive sampling techniques, the RI was sent to 10 members of the Ghana Real Estate Developers Association (GREDA) who specialises in the construction of MHBPs. All the 10 participants were selected based on their track record for successfully implementing MHBPs in Ghana in recent times. This included one participant credited to be a pioneer in project management practices in MHBPs in Ghana (see Ahadzie *et al.*, 2004). All 10 questionnaires were fully addressed and sent by e-mail to a representative at the Dept of Building Technology, Kwame Nkrumah University of Science and Technology (KNUST), who made arrangements for direct delivery (i.e. by hand) to the addressees and subsequent collection. Each questionnaire was accompanied by a cover letter explaining the purpose of the pilot study. Subsequently, the respondents (who for this purpose were senior managers and/or managing directors of their respective companies) were asked to critically appraise the questions and provide feedback as to the relevance and sensitivity of the questions, length, and time for completing and suggestions for improvement. Within a period of three weeks, all 10 completed questionnaires were retrieved and then posted back (by registered mail) to the UK (taking two weeks for delivery)

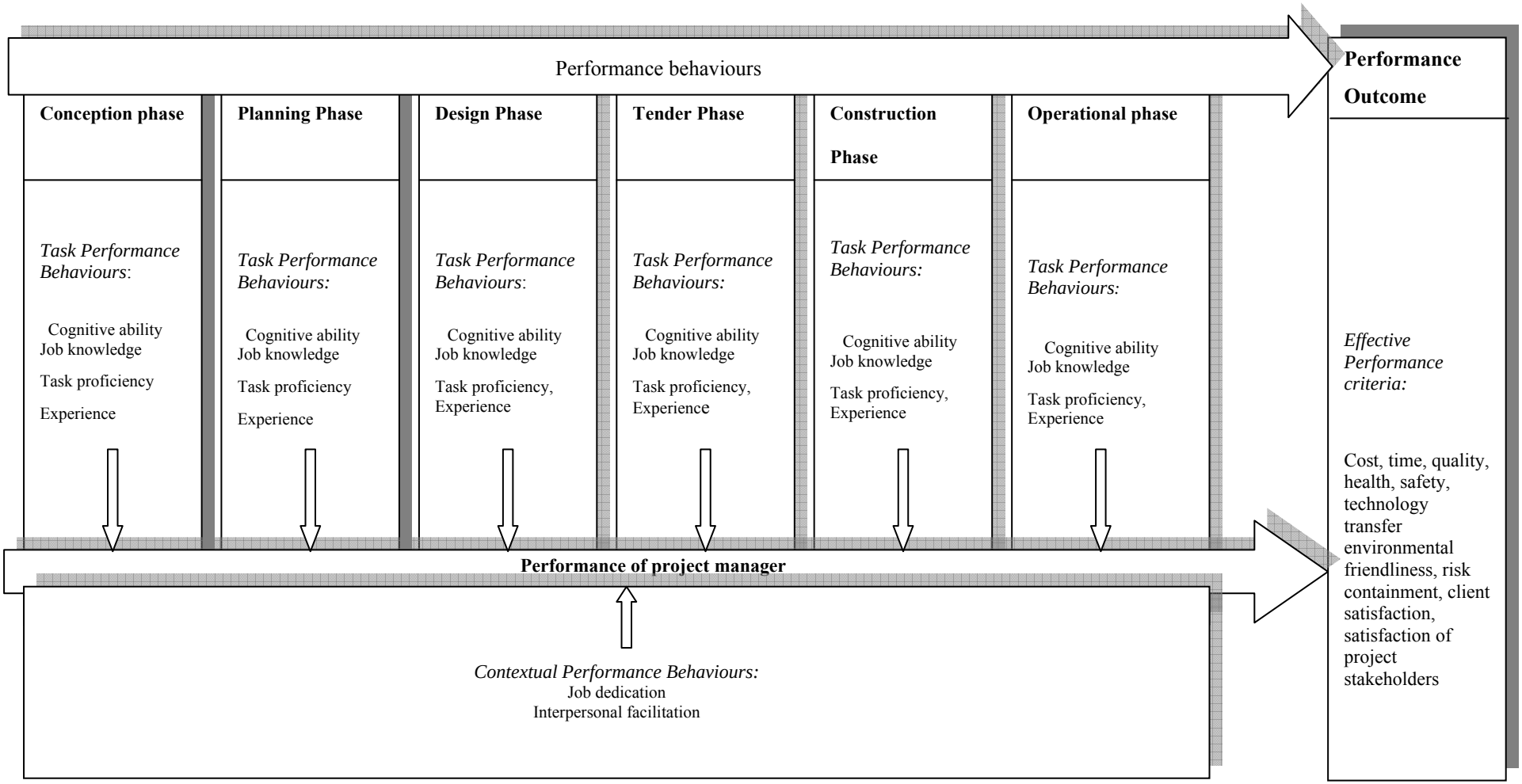

Figure 1: Conceptual framework for predicting the performance of project managers at various project phases

Table 1: Abridged Version of Operational measures

Dependent variables	Independent variables
Performance Outcome • Overall project cost • Cost of individual house-units • Overall project duration • Rate of delivery of individual house-units • Project quality • Quality of individual house-units • Overall Customer/client satisfaction • Customer/client satisfaction on individual house-units • Overall Risk containment • Risk containment on individual house-units • Overall Environmental impact • Environmental impact of individual house-units • Overall health and safety measures • Health and safety measures on individual house-units • Technology transfer	**Contextual performance behaviours:** **Job Determination** • Perseverance in pushing artisans/works contractors to achieve overall project objectives. • Persistence in pushing artisans/works contractors to overcome obstacles. • Dedication to helping artisans/works contractors to achieve all programmes • Ability to adapt/make the best out of difficulties faced by artisans/works contractors at project sites • Developing a sense of conscientiousness towards artisans/works contractors. • Commitment towards overall project objetives **Interpersonal Facilitation** • Effective time management on all project sites. • Providing timely information for artisans/works contractors. • Volunteering to help artisans/works contractors solve personal problems • Showing compassion and sensitivity towards problems faced by artisans/works contractors. • Ease with which artisans/works contractors are able to approach project manager with their problems. • Ability to arrive at effective solutions to conflict while maintaining good relationships. • Being aggressive on artisans/works contractors towards achieving project objectives. • Being honest with artisans/works contractors on their performances. **Task performance behaviours:** **Cognitive ability** • Ability to envisage problems on all house-units under construction. • Ability to provide alternative solution to problems encountered on all house-units under construction. • Ability to maintain emotional stability when dealing with problems on all house-units under construction. • Ability to recall progress of works on all house-units **Job Knowledge** • Knowledge of appropriate construction technology for repetitive works. • Knowledge of appropriate cost saving techniques for repetitive construction works. • Knowledge of appropriate labour management techniques for repetitive construction works. • Knowledge of appropriate programme for delivering repetitive construction works • Knowledge of appropriate quality management techniques for repetitive construction works. • Knowledge of appropriate site layout techniques for repetitive construction works. • Knowledge of appropriate progressing techniques for monitoring repetitive construction works. • Knowledge of appropriate materials management system for repetitive construction works. • Knowledge of appropriate health and safety issues for repetitive construction works. • Knowledge of appropriate risk management measures for repetitive construction works. • Knowledge of appropriate environmental impact assessment for repetitive construction works. • Knowledge of appropriate technology transfer for repetitive construct **Task proficiency** • Technical quality of programme for delivering *overall house-units.* • Functional quality of programme for delivering *overall house-units.* • Technical quality of programme for delivering individual house-unit.

Table 1: Abridged Version of Operational measures

Dependent variables	Independent variables
	• Functional quality of programme for delivering individual house –unit. • Technical quality of cash-flow programme for the construction of *overall house-units.* • Functional quality of cash-flow programme for the construction of *overall house-units.* • Technical quality of cash-flow programme for the construction of individual house-units. • Functional quality of cash-flow programme for the construction of individual house-units. • Technical quality of specifications provided for the construction of *overall house-units.* • Functional quality of specifications provided for the construction of *overall house-units.* • Technical quality of specifications provided for the construction of individual house-units. • Functional quality of specifications provided for individual house-units. • Technical quality of programme for achieving *overall* customer/client satisfaction. • Functional quality of programme for achieving *overall* customer/client satisfaction. • Technical quality of programme for achieving customer/client satisfaction on individual house-units. • Technical quality of risk containment programme for the construction of *overall house-units.* • Functional quality of risk containment programme for the construction of *overall house-units.* • Technical quality of risk containment programme for the construction of individual house-units. • Functional quality of risk containment programme for the construction of individual house-unit • Technical quality of environmental assessment programme for the construction *overall house-units.* • Functional quality of environmental assessment programme for the construction of *overall house-units.* • Technical quality of environmental assessment programme for the construction of individual house-units. • Functional quality of environmental assessment programme for the construction of individual house-units. • Technical quality of health and safety measures for the construction of *overall house-units.* • Functional quality of health and safety measures for the construction of *overall house-units.* • Technical quality of health and safety measures for the construction of individual house-units. • Functional quality of health and safety measures for the construction of individual house-units.
	Experience • Experiences in managing MHBPs. • No. of years of practice in construction. • Experiences in achieving success in the management of MHBPs. • Experiences in managing MHBPs of similar nature. • Experience in any type of construction project. • Membership of appropriate professional body.

Source: Ahadzie *et al.* (2006b)

FEEDBACK FROM PILOT STUDY

Tables 2 to 6 present a summary of the feedback from the respondents. Table 2 indicates whether the respondents had any difficulty in understanding any of the

questions. All 10 participants responded "No". However, some respondents did report marginal problems in relation to three questions out of the total of 90. In one case, they drew attention to two of the questions, which had deliberately been repeated. Whilst some signposted to show it was repetition, others ignored one of them or gave both questions the same rating. This generally suggests that the respondents took the necessary care in completing the questionnaires. In another instance, a question eliciting the average number of house-units respondents often undertake failed to place a time limit. Consequently one respondent suggested that the question should read, "average number of house-units per year." The necessary corrections have since been made in the RI. Table 3, is in response to whether any part of the questionnaire is sensitive. All 10 respondents agreed that there was no issue of sensitivity. Similarly in table 4, all respondent agreed that the questions asked were relevant to project management practice in the Ghanaian housing industry.

Table 2: Understanding the meaning of all questions

Response	Yes	No	Total	Details
Proportion	100%	0%	100%	Some marginal comments to three questions out of about 90
Number	10	0	10	

Table 3: Sensitivity of the questions

Response	Yes	No	Total
Proportion	0%	100%	100%
Number	0	10	10

Table 4: Relevance of questions to project management practice in Ghana

Response	Yes	No	Total
Proportion	100%	0%	100%
Number	10	0	10

Table 5: Time used in completing questionnaires

Time	Up to 15 minutes	16 to 30 minutes	31-45 minutes	46-60 minutes	Over 60 minutes
% time taken	0%	40%	50%	10%	0%
Number	0	4	5	1	0

Table 6: Reasonability of time for completing questionnaire

Response	Yes	No	Total
Proportion	100%	0	100%
Number	10	0	10

Table 5 provides result of the time the respondents used in completing the questionnaires. For a questionnaire of about eight pages and involving 90 questions, the completion time spanned between 16-60 minutes with about 90% completing within 16-45 minutes. The indication is that the questionnaire should not take more than 60 minutes to complete which seems reasonable given the length and total number of questions involved (see Bailey, 1982; Oppenheim, 1992; Wilkinson, 2003). Indeed, all the respondents had no problem with the time used in answering the questions, which suggest the length of the questionnaire seems appropriate (Table 6).

Apart from the feedback provided, a careful scrutiny indicates that the substantive, questions were all answered by the respondents though some provided ticks while they were specifically asked to circle the appropriate rating. Nevertheless, the indication is that the response categories were clearly signposted to facilitate ease of completion, relevant to the central theme and potentially interesting. It is interesting to note that when respondents were asked to make general comments for improvement, three of them made suggestions relating the role of the PM in auditing design and putting in place effective payment systems for contractors. These are issues relating to the design and procurement stage and thus outside the scope of this paper. However, it does emphasise the contention of the authors that PMs' performance measures should ultimately be linked to the various project phases (Figure 1). Whilst it is not the intention to draw any firm conclusions here, generally the feedback has been very helpful and suggests that the RI is likely to work in the manner intended.

CONCLUSION

The conceptual framework underlying the choice and design of a RI is described for a study seeking to develop a model for predicting the performance of PMs in MHBPs in Ghana. Adopting positivism; a multi-dimensional approach for predicting managerial performance; management intuition for repetitive construction practice, the RI for the construction phase, in particular, has been presented. Subsequently the operational measures involved have been identified. Using purposive sampling techniques the RI was piloted in Ghana using 10 experienced members of the GREDA. The feedback suggest that the RI addresses relevant issues in MHBPs in Ghana, is easy to understand and above all potentially useful for eliciting the relevant information.

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