CONSTRUCTION TRAINING: A LINKAGE TO PRODUCTIVITY IMPROVEMENTS

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The problems of low labour productivity levels and training participation within the British construction industry are not new. Over the last few decades, these issues fuelled much research interests within the United Kingdom. Empirical evidence seem to suggest that there is a relationship between training and productivity. Yet, much research tended to focus on each of these two areas in isolation and very few actually attempted to link training and labour productivity together. This proposed research aims to do just that. The paper builds up a case for the linkage between training and labour productivity by extensively reviewing past literature within these two areas. The review highlights limitations of past studies and establishes two fundamental gaps. First, a great emphasis of past research is placed on the conversion process in an input-output framework rather than the input, labour. Second, past research seldom addresses the issue of workmen's abilities when analysing labour productivity. Finally, the paper presents a proposed methodology, comprising a mixed methodology, to attempt to quantify and qualify this hypothesized relationship.

Keywords: labour productivity, training, performance measurement, resources

INTRODUCTION

Productivity is widely known as a relationship between the inputs and the outputs, often crudely expressed as the outputs divided by the inputs. Indeed, productivity is an extremely vital performance measurement tool within the construction industry, as well as the economy on a whole. According to Lowe (1987), "the importance of productivity growth to an individual enterprise, an industry, or an economy is something on which most economists would agree." Arditi and Mochtar (2000) reaffirms that "the output of the construction industry constitutes one-half of the gross capital and 3 – 8% of the gross domestic product (GDP) in most countries, productivity improvement in the construction industry may have a significant impact on improving GDP." Notwithstanding its importance, several governmental and institutional reports over the last fifty years such as Banwell (1964), Latham (1994) and more recently Egan (1998), amongst others, have criticized on the sub-optimal performance of the British construction industry. As a result, this period saw a great interest within the area of construction productivity by many researchers, many of whom were concerned with the reasons behind the low levels of productivity in the British construction industry. Yet, despite the many recommendations put forward by these researchers, the problem still persists. As Lee *et. al.* (2000) lament, "the transference of performance research … into construction has not been apparent."

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There is also a deficiency in construction skills training investment within the construction industry. Prior research had highlighted the various shortcomings of the training provision within the industry. For example, Callender (1992) analysed the inadequacy of the National Vocational Qualifications (NVQs) system. Clarke and Wall (1998a) and the Construction Industry Board (CIB) (1998) also attributed such reasons as the traditional skill boundaries and the ineffectiveness of the professional institutions as well as the Construction Industry Training Board (CITB) to be the causal factors of this deficiency. Whilst these tend to focus on the supply side of training, other researchers and practitioners attempted to suggest reasons for the poor demand for training by construction firms, which include the high costs of training, the shift towards self-employment and the inability to attract new blood into the industry [e.g. Hoare (1997), Winch (1998)]. Underlying these reasons, Chan *et. al.* (2001) suggested that training participation is low because employers simply do not see the benefits of training.

At first sight, there seem to be parallels between the level of training investment and organizational performance. Yet, construction researchers rarely link the two together. It is therefore the intention of this proposed research to investigate the relationship between training and performance. This paper, unlike most mainstream academic papers, does not involve any research findings. Rather, it is an exploratory paper that revisits the issue of construction productivity, in particular labour productivity, and reviews the current state of affairs of construction productivity research. The paper builds up a case for this proposed research as it highlights the limitations of past research, with the aim of drawing the readers' attention to the urgent need for the consideration of the effects of training on construction labour productivity.

CONSTRUCTION PRODUCTIVITY

Olomolaiye *et. al.* (1998) define productivity to be the *rate to measure* the output of the factors of production over a defined time period, a measure of *how well the resources are utilized* as well as the *force behind the production itself*. Indeed, when searching the literature, one can clearly categorize past research along these three distinct areas.

Rate to Measure

Early research was aimed at defining productivity and its methods of measurement. Oglesby (1988) offered three methods of productivity measurement, namely economic productivity, physical productivity and partial productivity. In essence, these methods relate back to the original equation of outputs divided by inputs mentioned earlier, and they measure the efficiency of the inputs utilized. Of the three, partial productivity (often known as labour productivity) – the ratio between outputs expressed in specific physical units and inputs expressed in man-hours – had, hitherto, been a commonly used yardstick. Lowe (1987) contended that "labour productivity, and to a lesser extent, capital productivity are widely used as measures of economic efficiency…". This is unsurprising since construction is such a people-oriented industry, although critics e.g. Rendall and Wolf (1983) viewed the more widespread use of labour productivity as a consequence of the difficulty or impossibility of quantifying other determinants of productivity, not because labour is the best input element for productivity measurement. Nonetheless Langford *et. al.* (1995) believed that the input, labour, is a crucial aspect to consider when planning to improve productivity.

Albeit the importance to measure, such rates of measurement would bear no industrial significance if they were to be considered alone. Motwani *et. al.* (1995), assert that although methods of measurement are important in analysing construction productivity, "it is the identifying and evaluating of the critical factors which influence productivity that provides a challenge." Baines (1997) also acknowledged the usefulness of financial measures, but urges the need to interpret these results which "disentangles the effects of the various influencing factors". Furthermore, Sanger (1998) and Parker (2000) maintained that financial measures may be unreliable due to three reasons – (i) the difficulty to measure "like for like"; (ii) the tendency to reflect upon what had already happened and do very little to show what is likely to happen, and; (iii) the failure to include the less tangible factors.

The utilization of resources

Apart from *efficiency* measurement, productivity may also be viewed from another dimension, *effectiveness*. According to Drucker (1977), efficiency relates to doing things right, and effectiveness relates to doing the right things. Whilst a lot of work had been done to understand if construction is doing things right, not much research actually deal with how things are being done on construction sites. Perhaps the most significant study in this area is work-study. Harris and McCaffer (1995) define work-study as "the technique used to record work procedures, to provide systems of analysis to develop improvements" and states that this technique is widely accepted in the manufacturing industry, and is also being adopted more frequently by the construction industry. Indeed, work-study extends the analysis of construction productivity to include not only the measurement aspects, but also the feedback towards gaining an improvement.

However, the adoption of work-study into construction seems incomplete. According to the British Standards Institution's (1969) definition of work-study, there is reference made to the examination of human work in all contexts. Yet, this examination within construction tends to focus mainly on the tasks of construction, but fails to address the issue of workmen's abilities, i.e. the methods employed. To portray this in a simple example, let us say work-study is being conducted on the task of making a cup of coffee in the morning. The analysis may conclude by suggesting a quicker method of making that cup of coffee by using an electric kettle instead of boiling water over the stove. However, the assumption underlying this recommendation is that the person knows how to use the kettle in the first place.

On the contrary, research done in the manufacturing industry actually tried to examine the issue of workmen's abilities and the effects on performance. For instance, Steedman *et. al.* (1991), in a comparative analysis of the manufacturing industry between Britain, Germany and France, traced the differences in the skill levels and indicated that "the provision of the right mix of supervisory skills and technical support is crucial to the smooth running of the production", thus signifying the need to consider both the abilities, and the deployment of that, of the workforce.

One may ask why the manufacturing industry is used to compare with the construction industry. Indeed researchers like Clarke (1992), had drawn similarities between manufacturing processes and modern construction processes of assembling and fitting together parts of a building. However, the difference in output rates, as seen in figure 1 below, has been rather overwhelming.

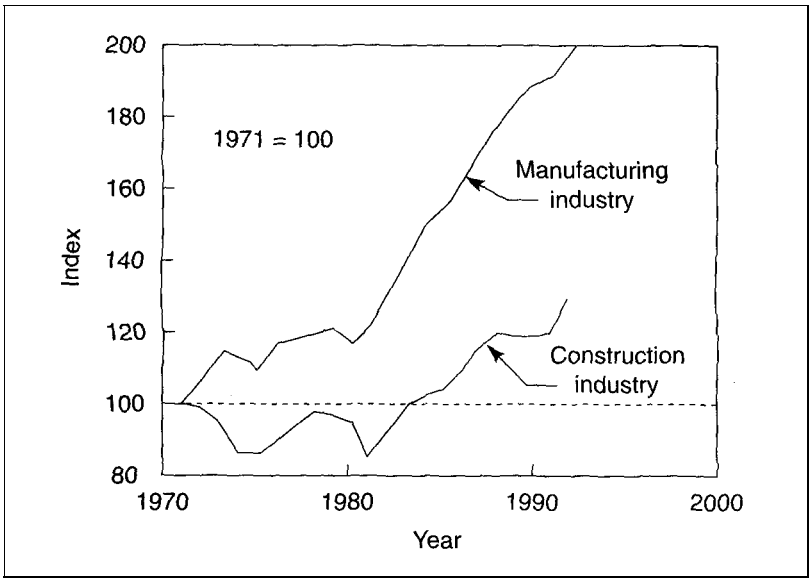

Figure 1: Comparison of Labour output trends in the UK, 1972 – 1992
[Source: Olomolaiye, *et. al.*, (1998)]

Force behind the production itself

Many construction researchers, intrigued by the findings of low labour productivity, had in the past attempted to identify the factors affecting productivity. For example, Parker (1980) suggested that the amount and quality of communication that flows between the managers and those executing the work could alter productivity levels. Borcherding *et. al.* (1980) [see also Maloney (1981)] conducted an empirical study of the effects of motivation on productivity. Construction operations were also found to be an important factor, as evident in analyses carried out by Tavakoli (1985), as well as the investigation of learning curves, i.e. the effects of repetitive tasks, by Thomas *et. al.* (1986). Maloney *et. al.* (1987) looked at the management function during an investigation of the influence of the foreman on productivity; whilst Herbsman and Ellis (1990) added that administrative factors also bear an effect on construction productivity. It is clear that these, and many more research, seemed to be 'searching' for factors in an isolated manner. In reality, construction activities are more co-ordinated, rather than isolated. Thomas *et. al.* (1989) consolidated the various factors and developed the factor model of labour productivity, as illustrated in figure 2 overleaf. Basically, this model reiterates the relationship between the input and output factors, and bears great similarities to the 'open conversion' model of productivity developed by Drewin (1982).

The issue of labour in labour productivity

Having reviewed the literature on construction productivity, it is clear that there is great emphasis placed on the processing of the inputs, rather than the inputs themselves. There is also little mention made of how the differences in the workmen's abilities account for differences in productivity levels. These seem strange given that the issue in question is labour productivity. As the Movement for Innovation (M^4I) (2000) report, A Commitment to People "Our Biggest Asset", commented on the limitations of construction research, "although these (referring to the development of products, processes, supply chains, partnering etc.) are important factors, change and improvement will only happen through people, and in particular the efforts of all people working in the industry – it is they who ultimately determine practice and

performance." The keywords are therefore people and their efforts. Perhaps, the expectancy model cited by Maloney and McFillen (1987), who were researching into the motivation of construction operatives, is the only model that expressed the issue of workmen's abilities. (See figure 3 below.)

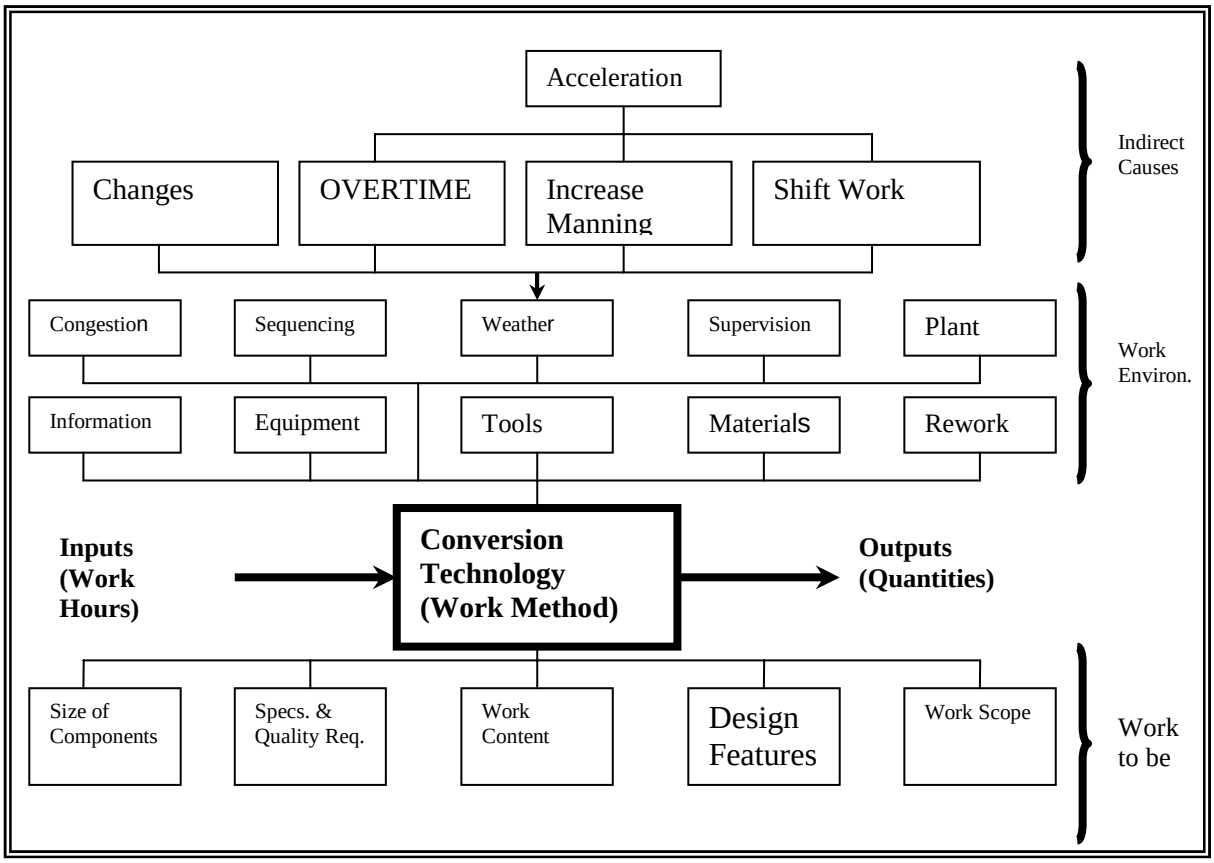

Figure 2: Factor Model of Construction Labour Productivity
(Source: Thomas and Zavrski 1999)

CONSTRUCTION TRAINING IN BRITAIN

Clarke (1992) defines training as "the individual experience or transmission of knowledge of specific tasks". This simply refers to the process of learning or teaching a skill. As mentioned earlier, construction skills training participation in Britain is low, as Egan (1998) laments, "… the industry invests too little in… development and training." Over the last twenty years, there had been much research attempting to diagnose the training provision and to understand the reasons for the low participation. Clarke and Wall (1998a), and subsequently CIB (1998), reviewed the training provision for the various construction trades in Britain and concluded that the infrastructure for training is available, but commented on the less than optimal utilization of such a provision. They believed that the problems with crafts training were fundamentally due to three main reasons. First, there is the fact that the construction industry is locked up within the traditional skill boundaries, although Clarke (1992) amongst others had explicitly identified the changes within the construction labour process. Second, the current system of awarding and recognizing qualifications from training is non-rigourous and inadequate, and third, the demand for skills and training by both the employers and employees is exceptionally low. This poor demand is partly due to the industry's inability to attract new blood into the

industry (Delargy, 2000 and others), which is a possible result of the greater number of opportunities elsewhere as suggested by Mason *et. al.* (1992). Other critics, e.g. Pitt (1995), Howes (1997) and Mc Namara *et. al.*(1998), felt that encouraging such vocational training as construction skills training to be provided by tertiary institutions and universities does not provide a panacea to the problem, as they remain skeptical and argued that there is a mismatch between the current academic provision and industry.

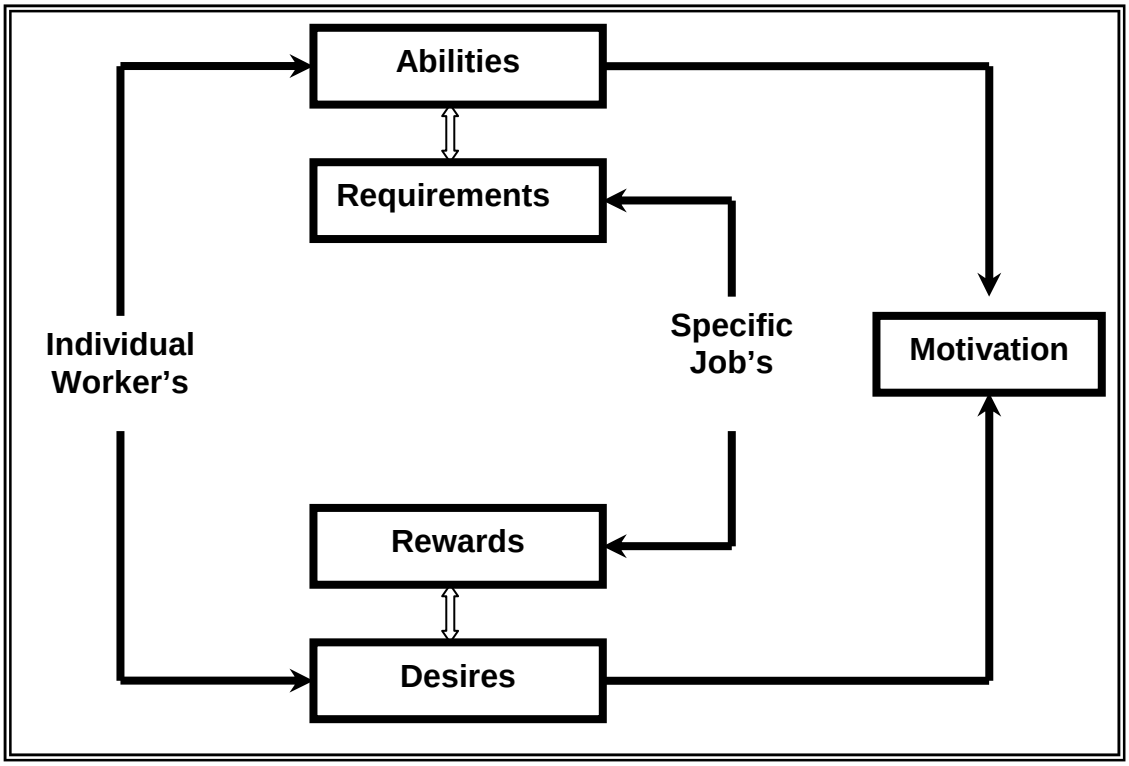

Figure 3: Worker – Job-match Model
(Source: Maloney and McFillen 1987)

Correlation between Training and Productivity

Besides identifying the problems of training and attempting to explain the rationale behind them, much research into training were also concerned with the effects of training. This resulted in a number of research comparing across countries, as well as across industries.

Clarke and Wall (1996, 1998b and 2000) studied the housebuilding sectors of Britain, Germany and the Netherlands, and noted that the two continental European countries tend to have a better edge in terms of employment, costs of supervision, organizational and technical complexity and productivity. Clarke and Wall suggested that one of the possible reasons for this comparative advantage is the statutory emphasis on vocational qualifications, which manifested in the differences in training provision.

These recommendations were also not dissimilar to those derived from comparative studies made in the manufacturing industry. Various studies were conducted to

compare productivity levels and vocational training within British Manufacturing with those within continental Europe, e.g. France, Germany and the Netherlands. [Steedman and Wagner (1989), Van Ark (1990), Steedman *et. al.* (1991) and Mason *et. al.* (1992), Mason and Van Ark (1995)] These studies reaffirmed that training improvements were vital for raising productivity levels.

Although these studies made reference to differences in the training systems, the case was still not strong enough as these studies only infer that low labour productivity levels in Britain were a consequence of the lagging behind in training provision. However, there were other factors cited as well, such as the level of mechanization (e.g. capital intensive, age of machinery etc.) and the quality of the end products. Effectively, these studies merely offered an indication that training may improve productivity levels. Thus, it is still unclear as to whether translating these differences in training provision from the continent would have a positive impact on British construction, since many of these recommendations simply speculated the benefits derived from these changes.

Furthermore, past research focussed on the systems of training, rather than the content of training itself. Yet, it is believed that the system is adequate, and it is 'what is being delivered' that really requires a greater deal of concern. Clarke and Wall (1998a), when reviewing construction skills training in Britain reported that the CITB is increasingly becoming employer led when it comes to training decisions. However, in this specific report, Clarke and Wall qualified that training decisions tend to be based upon the wants and needs of the larger players, implying that the needs of the Small and Medium sized Enterprises (SMEs) tend to be neglected. Chan *et. al.* (2001) added that the problem lies mainly in the participation of training not the system of training provision, and suggested that the content of training is a possible reason for this poor uptake in training.

GAPS IN THE BODY OF KNOWLEDGE

Having reviewed the past literature, this section now attempts to identify the gaps in the body of knowledge, leading to the formation of the propositions for this proposed research.

Seymour and Rooke (1995) disputed the rationalist paradigm that governs conventional construction management research, "the problem is that (the rationalist paradigm) does not require researchers to question their own position… Instead, the researcher's values are regarded as either irrelevant or self-evidently correct." Therefore, it is felt that the first question to ask is not 'what do researchers think are the factors affecting labour productivity'. Rather, it should be 'what does the industry think are the factors affecting labour productivity'.

Thus, the first proposition relates to the investigation of the industry's perceptions on the factors affecting labour productivity.

> *It is believed that the British construction industry perceives the training of construction operatives to be a significant factor of construction labour productivity.*

The second proposition relates to quantifying the relationship between construction skills training and labour productivity.

> *It is believed that an increase in training participation would lead to an improvement in construction labour productivity.*

Apart from quantifying this relationship, it is felt that there is also the need to address the soft issues within the industry. As mentioned earlier, studies have shown that countries on the continent tend to perform better than that of British firms. One possible reason could be due to differences in culture and perceptions towards performance improvement. Therefore, the third proposition aims to show the significance of this possibility.

> *It is believed that cultural differences are essential in explaining differences in productivity levels.*

RESEARCH OUTCOMES

This section briefly presents the possible outcomes of this proposed research. Broadly, the outcomes can be categorized into *academic* and *industrial* outcomes. From an academic perspective, this proposed research aims to show that training is a strong causal factor of construction labour productivity, thus extending the existing factor model of labour productivity. To the industry, it is the intention of this research to show that a greater interest and an increase in training participation would bring about benefits to the industry, whether in terms of time, cost or quality. This would then hopefully improve the skills training crisis in Britain.

PROPOSED METHODOLOGY

The proposed methodology is of a mixed methodology, i.e. comprising both quantitative and qualitative methods. Before any further discussion may be established, it is important to define what quantitative and qualitative means. According to Fellows and Liu (1997), quantitative analysis relates to the gathering and analysing of factual data, deriving evaluation of results in the light of theory and literature. Qualitative analysis, on the other hand, relates to the gaining of insights and understanding of people's perceptions of the 'world'.

Since the primary aim of this research is to present a business case for training to the industry, it is felt that quantitative methods seem to be most appropriate to develop the case. However, one must never detach quantitative methods from qualitative methods. As Newman and Benz (1998) argued "the dichotomy (between quantitative and qualitative methods) is not consistent with a coherent philosophy of science." They then added, "the notion of a continuum is the only construct that fits what we know in a scientific sense." Tashakkori and Teddlie (1998) also indicated that "in the social and behavioural science… qualitative and quantitative methods are, indeed, compatible." Indeed, it is evident, from the review of past literature highlighted earlier, that the use of quantitative methods alone results in an incomplete analysis of a problem involving the human factor in the real 'world'.

There will be two main stages to this proposed research. (See figure 4 overleaf for a flowchart presentation of the proposed methodology.) The first stage basically attempts to identify the 'real' factors affecting labour productivity in construction. This involves tapping into the industry's perceptions and gathering of information as to what factors really affect labour productivity. It is therefore proposed to set up focus group discussions in the first instance to obtain such information. These are unstructured interviews conducted in a group setting (Tashakkori and Teddlie, 1998), primarily with a selected number of industrial partners. There are several advantages to conducting this in the first place. The most important reason for such an unstructured session is to get a further insight into the industry's perceptions without

leading the participants towards the beliefs of the researcher. By this way, it is hoped that the participants would offer their unreserved views on the issue concerned, and the researcher could benefit by gaining a rather true and fair view of the situation.

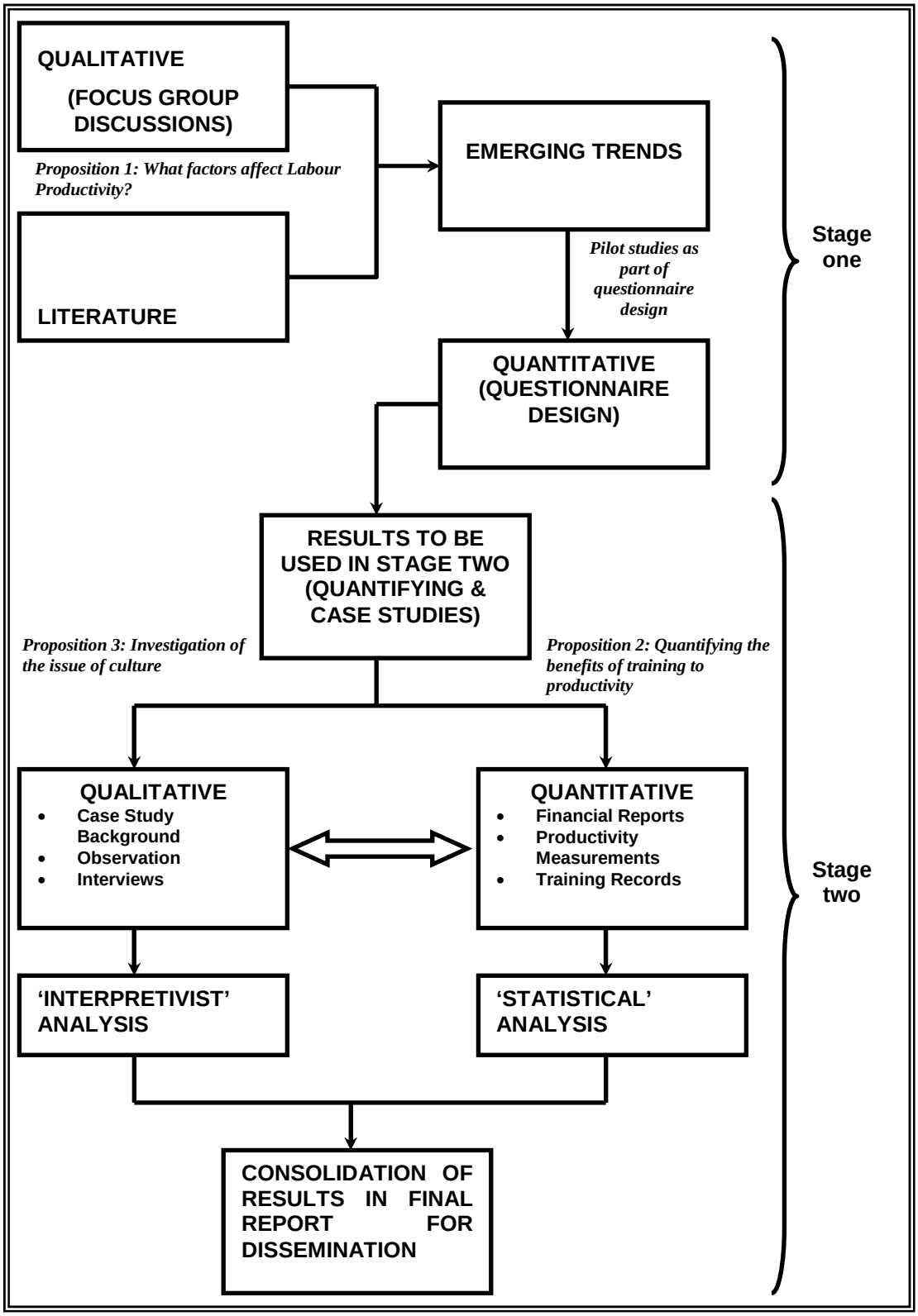

Figure 4: Flowchart representation of the proposed methodology

Note that this is a view, not a fact, as is central to any qualitative method. Second, by gaining the perceptions this way, it would enable the researcher to ask the relevant questions and refine the questionnaire to be sent to a wider sample population. Third, by tackling the research question in this manner, the researcher would increase the chance of attempting to show that training is a factor affecting labour productivity. Conversely, had the participants been given the research question initially, then there is the risk of encountering the infamous "Hawthorne" effect. Fourth, this offers the researcher a certain level of flexibility, should the result show that training is not a factor affecting labour productivity.

Once the focus group discussions had been completed, the emerging trends are recorded and these would form the basis of the questionnaire design. During the design of the questionnaire, academics and the industrial partners who participated in the focus group discussions would pilot the questionnaire. The questionnaires would then be sent to a random population throughout the United Kingdom.

It is worth to note that this proposed research project is a self-funded research project. Therefore, due to the financial constraints, the main research would be conducted within Scotland. However, the questionnaires should be sent throughout Britain to see if there are consistencies across the border.

After the questionnaire stage, the results would then be used for stage two of the proposed research. The data from the questionnaires effectively maps out the factors affecting labour productivity through the lens of the industry. The researcher would then be able to 'correlate' these factors and quantify the benefits with the relevant corporate information provided by the industrial partners. Concurrent to the quantifying process, field visits and observations and interviews would be carried out to gain a better perspective of the participants, as well as to gather information to compile the case studies for analysis. The results would then be consolidated in the final report to be disseminated to the industrial partners.

CONCLUSIONS

In conclusion, this paper reviews the literature of construction productivity and training within the British Construction Industry in light of the shortcomings over the last twenty years. The paper builds up a case for this proposed research and identifies the gaps in the body of knowledge based on the limitations of past research. It is suggested that a re-examination of the industry's perceptions towards productivity improvement is urgently needed. It is believed that construction skills training are vital towards improving productivity levels and it is the intention of this research to both quantify and qualify this hypothesis. This paper also presents a gist of the proposed methodology to be adopted.

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