PRODUCTIVITY IMPROVEMENTS: UNDERSTAND THE WORKFORCE PERCEPTIONS OF PRODUCTIVITY FIRST

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Abstract

Past productivity research has endeavoured to identify factors that affect construction labour productivity from a managerial perspective, resulting in an emphasis on shorter-term work content and work environment factors, rather than the general workforce. This study extends previous research efforts by establishing the perceptions of white-collar managers and blue-collar workers with respect to the factors that affect construction labour productivity. A questionnaire survey was administered to a purposive sample of 400 project managers and a convenience sample of 152 construction workers, eliciting current trends of their perceptions of 59 factors that were extracted from an extensive literature review and exploratory study. This was followed by the identification of good practice examples from site observations across two project sites. The findings found distinct differences between the two groups, with white-collar managers being more concerned with resource planning issues and the blue-collar workers placing more value on the utilisation of resources. Furthermore, the observations exhibited that integrating these differences through employee involvement led to productivity improvements.

(164 words)

Keywords: blue-collar, construction labour productivity, employee involvement, questionnaire survey, white-collar

Structured abstract (for Emerald database):

Purpose of paper: To establish the differences between the perceptions of white-collar managers and blue-collar workers with respect to the factors that affect construction labour productivity, and to show that integrating the differences could lead to productivity improvements.

Design/Methodology: A questionnaire survey administered to a purposive sample of 400 project managers and a convenience sample of 152 construction workers, eliciting current trends of their perceptions towards 59 factors that were extracted from an extensive literature review and exploratory study. This was followed by the identification of good practice examples of from site observations across two project sites.

Findings: The study found distinct differences between the two groups, with white-collar managers being more concerned with resource planning issues and the blue-collar workers placing more value on the utilisation of resources. Furthermore, the site observations demonstrated that integrating these differences through employee involvement could lead to productivity improvements.

Original Value: The study should extend previous productivity research, which had *hitherto* focussed on shorter-term work content and work environment factors from a managerial perspective, with relatively lesser focus on the perspective of the general workforce.

(175 words)

Introduction

Despite research over the last two decades into the factors that influence productivity, low productivity levels still persists in UK construction (Egan, 1998). Previous productivity research bore a strong positivistic tradition, often maintaining the managerial perspective. Arguably, this is inadequate to tackle such a complex phenomenon as productivity. This study re-examines construction labour productivity at the project level by investigating the perspectives of both white-collar managers and blue-collar workers, thereby moving beyond the egalitarian and reductionistic approach associated with the positivistic tradition (Seymour and Rooke, 1995).

There are two reasons for focussing on construction labour productivity in this study. First, construction is highly dependent on people's efforts. Second, construction labour productivity is a crucial performance measure of construction's core activity, i.e. on-site production of the built facility. This is in line with Groák's (1994) view that "the notion of the dominance of the project changes ideas […] on what we focus for productivity improvements (p. 290)". This paper illuminates one such focus as it reports on findings that suggest a need to consider and integrate any differences in the perspectives of white-collar managers and blue-collar workers to improve productivity.

The paper will initially review past productivity research, demonstrating the need to investigate the views of blue-collar workers. The methodology will then be explained before the key findings are discussed.

Review of construction labour productivity research

Past construction labour productivity research could be streamed into two main groups – work content factors related to the management of work methods, and work environment factors concerned with the motivation of workers.

Work content factors

The use of delay surveys (Tucker *et al.*, 1982) to establish causal factors of labour productivity has been common *hitherto*. Borcherding and Garner (1981), for instance, reported results of a longitudinal study, which employed the craftsmen questionnaire survey technique on over a thousand carpenters, electricians and pipefitters. Olomolaiye *et al.* (1988), Zakeri *et al.* (1996) and Kaming *et al.* (1997) also employed such surveys to investigate the work content factors influencing construction labour productivity in Nigeria, Iran and Indonesia respectively. Throughout these studies, material and tool unavailability, rework due to design changes, weather or poor workmanship, crew interference due to scheduling problems, craftsmen turnover and absenteeism were all recurrent problems that curtailed productivity.

Apart from the issues highlighted above, building designs also emerged as a critical factor. For example, Gray and Flanagan (1984) inferred that designs which considered the use of on-site technologies often resulted in higher labour productivity. Hinze and Parker (1988) also discovered the influence of design on the productivity of construction operations. Furthermore, Herbsman and Ellis (1990) defined two strains of "construction productivity influence factors" and broadly classified them as design-related and management-related.

The role of management also played a vital role in influencing construction labour productivity. Thomas *et al.* (1983) discussed different organisational structures for construction project management and highlighted the importance of authority and responsibility of the project manager in the decision-making process that would have a strong impact on achieving high labour productivity. Tavakoli (1985) similarly studied road construction projects and developed a quantitative analysis system aimed at enabling

the timeliness and accuracy of the decision-making process and productivity improvements.

However, there is often a desire to seek a causal link between factors and productivity through quantifying factors and measuring their impacts on productivity (Herbsman and Ellis, 1990; Thomas's *et al.*, 1990). This is arguably one of the pitfalls of the dominant positivistic paradigm in previous studies. The positivistic paradigm implies a reductionistic approach in the identification and isolation of the factors affecting construction labour productivity usually based on the researcher's interpretation (Seymour and Rooke, 1995) that often relates merely to the managerial perspective (Macarov, 1982). Moreover, the reductionistic approach in past productivity research is exhibited by the relatively narrow focus on certain construction operations (e.g. concrete works), thus failing to account for the entire construction process (Chan and Kaka, 2004). Therefore, conclusions made in past studies were limited in offering plausible recommendations for the improvement of construction labour productivity.

Work environment factors

Motivation plays a part in enhancing construction labour productivity (Smithers and Walker, 2000) and forms the basis for the identification of the work environment factors. For example, Laufer and Moore (1983) advocated the use of financial incentive programmes to improve construction labour productivity, reinforcing Maloney's (1982) thesis of driving forces that led to productivity improvements. Autonomy and comradeship (Edwards and Eckblad, 1984) were also found to be important aspects that add to the way construction workers were self-motivated about their work.

However, much work in linking motivation and productivity relied on Herzberg's two-factor theory of motivation (Smithers and Walker, 2000). This was thought to be

inadequate in understanding the blue-collar workers' perspective since Herzberg's sample involved mainly white-collar professionals (Mullins, 1996). Furthermore, Hofstede (1980) decried such motivational theories as merely describing the value system of the American middle class, thus building upon an earlier point made about the *ad nauseam* emphasis on the managerial perspective in the quest to improve productivity.

Previous researchers also employed the expectancy motivational model (see Laufer and Jenkins, 1982) to study the motivation of construction workers. For instance, the expectancy model was regarded highly by Thomas and Yiakoumis (1987) who tried to incorporate the model within their factor model of labour productivity. However, their desire to combine both expectancy model and factor model never materialised possibly because the factor model necessitated the quantification of all the factors under consideration (Thomas *et al.*, 1990). Yet, Laufer and Jenkins (1982) warned that the use of quantification in the expectancy model should mainly be for illustrative purposes since the complexities of human behaviour transcended that which a model could predict.

This study therefore does not aim to establish the causal link between factors affecting construction labour productivity. Rather, the study attempts to understand holistically the factors that influence construction labour productivity and extends the investigation beyond the perspective of white-collar managers.

Research methods

The research followed two phases. Phase one involved the administration of a questionnaire survey to white-collar managers and blue-collar workers to elicit their perceptions on factors that could lead to productivity improvements. Phase two entailed site observations conducted on two project sites to understand the practical manifestation of the factors that led to productivity improvements.

Questionnaire surveys

Arditi and Mochtar (2000) offered an analysis of current trends of construction productivity improvements gathered from results of longitudinal studies of the top 400 US contractors performed in 1979, 1983 and 1993. Surprisingly, no similar study existed in the UK. However, it was necessary that the US survey be modified to reflect any contextual differences between the US and the UK in the scope of research. This was dealt with at three levels: the *research scope*, *structure of the survey* and the *sample population*.

Research scope: The analysis by Arditi and Mochtar (2000) took the broader view of "total productivity where inputs include labour, materials, equipment, construction methods, and site management (ibid.)". However, the central tenet of this study is the firm belief that insofar as many factors affect the overall output of construction productivity, the construction industry is still very much a people-dependent industry. Furthermore, it was established at the outset that the study concentrated on construction labour productivity as opposed to construction productivity in its totality, and so, this was reflected in the design of the survey here.

Structure of the survey: The format of the surveys adopted in this research largely resembled that of the US survey, which was split into two distinct segments. The first segment gathered general descriptive information about the respondents and the organisations they represented. These included, for instance, the respondents' age, job function and work experience, as well as the type of business, annual turnover, geographic location, employment of personnel and equipment use of the respondents' organisation.

The second segment covered the respondents' view as to what aspects of their on-site labour would have a great impact on improving construction labour productivity. A total of 59 factors categorised within 11 sub-groups under four broad level classifications of *work content*, *work environment*, *workforce* and *regulatory* factors were identified with the help of a select group of academics and industrial practitioners. This evolved from the review of past research and the results of a series of exploratory interviews with site managers (see Chan, 2002). The classification of workforce issues was added to show the emphasis of such factors as site welfare, job prospects and skills training and qualifications. Such factors are difficult to quantify and so, largely glossed over in past research. A Likert scale of 1 to 5 (1 being "virtually no impact"; and 5 being "very high impact") was used to tap into the respondents' views as to the level of impact these factors had on improving construction labour productivity. An explanation of each factor was also given to the respondents. An opportunity for respondents to make any additional comments about the general topic of construction labour productivity was also provided at the end of the questionnaire survey.

Sample population: The US surveys had thus far been administered to white-collar managers from the top 400 companies. An attempt was therefore made in this research to broaden the sample to embrace the views from the Small and Medium sized Enterprise (SMEs), as well as the blue-collar workers. A purposive sample of 400 white-collar managers was selected, using the companies from the database of the Chartered Builder Scheme managed by the Chartered Institute of Building (CIOB). This was thought to be an appropriate avenue on two counts (see also Akintoye and Fitzgerald, 2000). First, for a company to register with the CIOB as a Chartered Builder, the principal activity of the firm must be in building. This was ideal since the chief unit of analysis throughout this research was the construction project at the building site level. Second, the database

containing a total of 413[1] companies at the time of the survey not only comprised the top 100 building contractors according to *Building* (2002b) but also SMEs. On the other hand, due to the difficulty in gaining access to the blue-collar workers, a convenience sample of 152 workers were obtained across three project sites in Sheffield, London and Edinburgh. Consideration was given in terms of the prospective respondents' attitude towards surveys. As such, postal surveys were sent to white-collar managers in summer 2002 whereas surveys were administered face-to-face for the blue-collar workers. The data collected was analysed using an array of descriptive and inferential statistical analyses, facilitated by Microsoft Excel and Statistical Package for Social Scientist (SPSS).

Site observations

Access was granted on two projects for the purpose of site observations (see Jorgensen, 1989) in order to understand the practical manifestation of the factors that affect construction labour productivity. Table I below provides a descriptive profile of the two projects.

"Take in Table I."

An iterative sense-making process of observing productivity levels of the two projects and identifying reasons for variations that occurred was pursued. Given the time constraints and limited access obtained especially in project B, we had to rely largely on the respective project teams for their input in terms of productivity levels. Interestingly, participants of project A claimed not to formally measure on-site productivity levels,

[1] There were a total of 413 companies in the CIOB database at the time of the survey. However, 13 companies were not used for the purposive sample of white-collar managers as they were duplicates of the same organisation.

indicating at best to base their judgement of productivity through the project managers' intuition centred around the project programme prior to our involvement. As such, participants from project A were keen to develop a formal productivity measurement system and hence our relatively longer involvement. On the other hand, participants from project B had already institutionalised a formal productivity measurement system called The Last Planner system[2].

In terms of making sense of the reasons for variations in productivity levels, we were fundamentally concerned with identifying key events that affected productivity as we attempted to draw a link between these events and productivity levels. It was therefore crucial that appropriate questions were being asked of the project participants in keeping track of events. Massey (1998) provided three basic questions that should be asked in observations, including "'What's going on here? How does this work? How do people do this?'" These questions were resolved mainly through our visual observations, such other sources as casual conversations with the workers and managers, and where available, evidential documents (e.g. programmes, minutes of site meetings etc.). The visual observational data collection was enabled by maintaining a research diary to keep track of occurrences. The use of a research diary was extremely useful, as Schwartz (1993) suggested that "the diary may play the role of a third person, an interlocutor listening to what you will never say to anybody". Furthermore, the diary allowed for self-reflection (Jorgensen, 1989), which essentially gave rise to the emergent themes reported in this paper.

[2] The Last Planner system was developed by Ballard (2000), which has since been increasingly utilised by the construction industry to implement the principles of lean construction. The system effectively tracks what can be done (the plan) and what is actually achieved in order to manage performance. Where productivity is concerned, the key performance indicator of percent-plan complete (PPC), i.e. how much of the planned work is actually achieved is a useful barometer for measuring productivity.

Research findings

This section will, in turn, report on the key findings from the questionnaire surveys and the emergent themes from the site observations.

Questionnaire surveys

From the white-collar sample, 86 companies responded to the questionnaires. Of the 86 companies, 7 companies did not offer any views for fear of disclosing sensitive information; 2 companies returned the questionnaire survey in its original form because the named person in the cover letter had left the organisation; and 2 others were deleted from the data set due to substantive missing values, thereby reducing the effective response rate to 19% (75 companies). A large majority of the white-collar respondents were highly experienced with 95% and 74% having more than 10 years and 20 years industrial experience respectively. Sixty- six percent of the respondent companies engaged in building works; 11% engineering; 34% house building; 26% conservation and restoration; 8% specialist works and 8% were not specified. The greatest concentration (43%) of respondent companies operated within the London and Home Counties region. Table II below summarises the key characteristics of the respondent companies. With 47% of the responding companies earning less than £5 million in annual turnover, the group of responding companies could be regarded as representative not merely in terms of geographic location, but in terms of size as well. This was distinctly different from the US surveys since the US surveys concentrated on the top 400 firms across the country. Moreover, the nature of the responding companies appeared to be consistent throughout the various categories highlighted in Table II below. For example, 46% of the responding companies employed less than 100 sub-contracting personnel at any given point in time, whilst 57% of the companies also employed less than 100 directly employed personnel. This implied that a majority of the responding companies could be classified as SMEs. Notably, the majority of the responding companies (91%) did not employ more than 25%

of their annual turnover in construction equipment. This supports the fact that British construction is an inadequately mechanised industry (Clarke and Wall, 1996).

"Take in Table II."

From the blue-collar sample, 152 responses were gathered, out of which 22 were deleted due to substantive missing values. The remaining 130 workers came from such traditional trades as joiners, steelfixers, scaffolders, bricklayers, roof sheeters and general labourers. A high proportion (60%) of the respondents was over 31 years of age. This differed from studies done in developing countries (see Zakeri *et al.*, 1996; and Kaming *et al.*, 1997) that reported a relatively lower age group (under 30) of respondents. A likely explanation for this phenomenon remained in the difficulties in recruitment and retention of young people in the construction industry. Furthermore, the fact that 70 respondents (54%) were directly employed labour – workers who probably worked for an organisation for a relatively longer period of time as compared to sub-contract labour – justified the age distribution. Eighty-nine respondents (69%) and sixty-four respondents (49%) possessed more than five years of work experience in the construction industry and the current trade respectively, suggesting that the workers surveyed would not only be knowledgeable about construction activities, but also familiar with the issues and problems relating to their trades.

Reliability tests of internal consistency yielded Cronbach's alpha coefficients of 0.93 and 0.95 for the 59 variables in the white-collar and blue-collar sample groups respectively, indicating a high level of internal consistency. Tests for normality were also run on SPSS on the total scores for each of the eleven sub-groups and these suggested a reasonably normal distribution.

Tables III and IV below illustrate the rankings of the individual factors and the four broad level classifications of factors by both samples respectively.

"Take in Table III."

"Take in Table IV."

From the individual rankings, it was evident that supervision, communication and level of site experience were three factors to consistently surface within the top ten factors perceived to have an impact on improving construction labour productivity by both sample groups. It was also interesting to note that simplicity of building design was ranked a high second by the white-collar respondents. This, together with supervision (rank 1) and level of site experience (rank 3), suggested the shortage and deficiency of skills and training of the workforce; whilst communication with sub-contractors (rank 5) reinforced the fact that the industry is reliant on subcontract labour.

A subtle difference of emphasis of individual items between the two samples could, however, be seen. So, whereas the white-collar respondents conferred more credence to more strategic planning and resourcing issues (e.g. availability of materials and staff, sequencing and interference, information flow), the blue-collar respondents were more interested in the operational use of the resources instead (e.g. utilisation of plant, construction technology involved, size of components). Quality requirements (rank 1) and specifications were also of top priority for the blue-collar sample, and alongside this was the tendency to stress on regulations (e.g. building regulations, health and safety and CDM). It was remarkably surprising to find that the blue-collar sample had deemed regulations to have a positive impact on improving productivity. Afterall, regulations are recognised to impede rather than enhance productivity, and so, the white-collar managers'

disdain for regulations is justifiable. However, recent anecdotal evidence suggested that contractors might be compelled to raise productivity levels before introduction of new regulations so as to avoid potentially negative ramifications to work progress (see *Building*, 2002a). This perhaps explained the blue-collar sample's perceptions of relatively higher impact regulations might have on improving productivity.

A further disparity could be found in the way respondents viewed skills training and qualifications. The blue-collar sample perceived skills training and qualifications to have a stronger impact on improving productivity than their white-collar counterparts (e.g. Secondary school qualifications, ranked 25 as compared to rank 53; modern apprenticeship, ranked 26 as compared to rank 34; CITB short courses, ranked 38 as opposed to rank 49; CSCS, ranked 41 as opposed to rank 56). Intriguingly, further and higher education qualifications including HNC/HND, NVQs/SVQs and degree qualifications were scored more favourably by the white-collar sample. This illustrated a slight contempt of these qualifications by the blue-collar sample and reiterated the lacklustre attitude towards training by the construction industry as a whole. Still, it was comforting to note that the blue-collar sample valued the Investors in People (IIP) initiative more than the white-collar managers, even though this was placed as the bottom ten in both samples in terms of its perceived impact on improving productivity.

These distinctions were also supported by the overall rankings of the four broad level classifications (Table IV). Work environment factors had emerged as top of the list for both sample groups. This was coherent to popular belief since work environment issues included factors conventionally known to be manageable such as site congestion, sequencing and interference, information flow, materials management and operation of plant and equipment. Whether it related to resource planning for the white-collar respondents or resource utilisation for the blue-collar respondents, these were

undoubtedly the aspects of work, which both samples should naturally feel they would have a certain degree of control over and thus influence the outcome productivity.

The blue-collar sample gave higher prominence to regulations than work content factors. This was probably due to the perception by the blue-collar respondents that work content issues were somewhat beyond their control. Afterall, work content issues largely related to the planning and technical aspects of construction – including the choice over the use of building components (i.e. its size, availability and use of new products) and technology involved, planning matters (i.e. resource allocation, cost control and scheduling), and aspects of building design (i.e. uniqueness, quality and specifications) – which blue-collar workers often do not have autonomy on. Moreover, blue-collar respondents would hold conservative beliefs regarding standardisation and prefabrication, due in part to bad experiences with systems building in the 1960s (Clarke and Wall, 1996) and, more likely, the need to conserve their status in terms of displaying traditional skills.

It is not at all incomprehensible as to why the white-collar sample rated work content factors more highly than the blue-collar sample. Although not necessarily manageable in terms of work environment issues, much of the work content factors signifies the crucial front-end of construction projects. Since the scope of change during the early stages of a project remains highly possible and most economical, the role of planning is therefore extremely vital in achieve high levels of productivity.

What was alarming, however, was the low ranking of workforce issues. One would have expected workforce issues to be top of management's priority, instead of a third ranking, given the labour-intensiveness of the industry. On reflection, however, the rise of self-employment and use of sub-contractors could surrender much of the workforce issues, in particular personnel management, to simply a case of hire and fire, with lesser concern for

the developmental aspects of on-site production staff. Furthermore, workforce issues such as job prospects, skills training and qualifications addressed the longer-term. Inherent within the questionnaire survey, therefore, was a conflict between improving construction labour productivity at the project level, i.e. the short-term, and investment in human resources, i.e. the longer-term. Thus, the findings from the surveys demonstrated that workforce issues, unlike the work content and work environment issues that could be clearly discerned in past research, tended to be embedded within the constructs of the respondents.

It was also observed that the blue-collar workers tended to be treated as a factor of production during the negotiation of access to the sites. Despite their management's apparent willingness to grant access to sites for the administration of the survey, it was on a "get them if you can" basis (usually during the workers' lunch hour), rather than actually allowing workers fifteen minutes off work to complete the questionnaire survey. Hence, the machine metaphor was rather prevalent, thereby explaining the confidence of the blue-collar workers when it came to workforce issues, especially in such issues as labour turnover (rank 47), job prospects (rank 48) and bonus schemes (rank 55), which they might again perceive to lack the right to exercise control over.

Figure I below shows the mean scores for the eleven sub-groups by both samples. This summarises the differences of opinion between the white-collar sample and blue-collar sample. Clearly, white-collar respondents gave greater prominence to the *building components*, *role of planning*, *site factors*, *site management* and *work time*. Incidentally, the scores in four of these five sub-groups, with the exception of *work time*, were significantly different (see Table V below) between the two samples. On the other hand, *plant and equipment*, *skills training and qualifications* and *regulations* were valued more

by the blue-collar sample. Indeed, it was only in terms of *building design*, *materials* and *personnel management* that a consensus seemed to exist.

"Figure I goes here."

"Table V goes here."

Surely, the pursuit of productivity improvements ought to demand the buy-in from the two camps of workers. It would be useless for project managers in isolation to construe issues such as standardisation, prefabrication and shift work as important if they were not then communicating these to the workforce, or worse, if there were resistance to these by the blue-collar workers. Similarly, the emphasis on skills training and qualifications by the blue-collar workers should point out potential areas of improvement from a perspective that the white-collar managers, especially those who have not come through a trades' background, might not fully appreciate from. The findings from the site observations should shed some light as to whether integrating differences between the two camps could lead to productivity improvements.

Site observations

This sub-section reports on key emergent issues from the site observations undertaken with a particular emphasis on how integrating the workforce could lead to productivity improvements.

Project A: Saving the site engineer who slipped up

Project A involved the construction of a multi-storey car park planned for completion at the beginning of May 2002. The project was a simple five-storey rectangular concrete frame building. However, an event occurred, which could potentially delay the entire

project delivery. This event related to an error committed by a site engineer, which accounted for a dip in productivity recorded in the middle of November 2001 (see plot 3-1 in Figure II below). The engineer concerned was a recent graduate engineer who formed part of a team of four site engineers. Because the engineer had graduated four months prior to the time of observation, she should have been mentored by a more senior, qualified engineer. However, time and resource pressures at other sites located near project A meant that the site engineers were often shared between the various sites. As a result, the engineer was left alone with another junior engineer to perform the preparation work (prior to the actual building work) for the third storey. However, the preparation work for the third storey was done inaccurately and the steelfixers and concrete labourers consequently built to a wrong engineering layout. Thus, this was a case of a dip in productivity caused by a lack of experience on the part of the junior engineers, and a lack of supervision.

"Take in Figure II."

It was only when the engineers moved on to the preparation of level four that the constructed third storey was found to be off the mark. This created an instance of rework, which construction workers normally frown upon. However, what was astonishing in the productivity graph was that despite the fact that this error affected the entire construction of level 3, the dip in productivity levels seemed to only affect plots 3-1 and 3-2. It was felt that this was due to the initial reaction of the project team to the unexpected crisis, which necessitated emergency planning. At that point, the planner had estimated that the rework would take a total of four weeks to perform on the basis of full-time allocation of the manpower to enact this rectification. This in turn would potentially cause a three-week delay to the overall programme. However, the overall project was delivered on time, i.e. May 2002. It was believed that the schedule acceleration in this instance was

made possible through the mobilisation, and more importantly the motivation, of the workforce for the same number of allocated workers had managed to perform the rework whilst concurrently moving on to level four.

It was observed that the general foreman was an effective motivator of the workforce by his ability to rally the workers together to explain the situation. The fact that "the engineers screwed up" appeared to have provided the impetus for the workers to somehow want to prove that they were better. Furthermore, instead of defending her position and appear confrontational, the engineer accepted responsibility for the error and this seemed to have fuelled the workers' desire to set things right. Despite this apparent 'them and us' situation between the engineers and the workers, we were reminded here of the Phelps-Brown (1968) report, which insisted, "criticisms ranged at the fragmented nature of the industry arise from a lack of understanding of its function (p. 170 – 171)". Arguably, the attainment of the workers' high productivity in rectifying the problem here was a testament of understanding and positively engaging with the age-old divide between the white-collar (i.e. the engineers) and the blue-collar (i.e. the labourers) workers.

Project B: Initiating into the family

Project B involved the construction of the headquarters of a commercial bank. As mentioned previously, the project team utilised The Last Planner system to keep track of productivity levels. Figure III below shows a graphical representation of project B's Last Planner activity completion for the four active work packages on site for the first 36 weeks of the project up to the point of our involvement in August 2003. Due to the limited access obtained for project B, it was not possible to observe and ascribe particular events to movements in productivity levels. Nonetheless, the documents from the progress meetings highlighted a number of common issues that were found by the project

team to cause variations in PPC levels. These included design changes, rework, materials, sequencing and interference, resource allocation and weather.

"Take in Figure III."

In spite of this, the overall productivity of the project was high. The average PPC achieved by each of the four work packages were 73%, 84%, 79% and 71% respectively. The overall average of 76% was therefore above the average observed by Ballard (2000) of around 50%. Undoubtedly, the tight monitoring of PPC levels and the proactive attitude towards analysing the reasons for non-performance contributed to the attainment of such high levels. Apart from the pre-determined list of reasons, it was firmly believed that the management of the workforce also held the key to success. Indeed, observations of the site induction sessions at project B provided interesting insights into the attainment of such high productivity levels.

While most induction sessions cover primarily the statutory health and safety aspects on construction sites, project B's induction sessions also acted as a means of initiating the worker into the family and reinforcing the company's commitment in investing in its people and facilities. This was the first time an initiative of this philosophy and size was undertaken on a British construction project. Two things struck as interesting about the induction sessions at project B.

First, the joint induction session was useful because it brought together the white-collar managers and the blue-collar workers together in a room to be inducted. What was crucial was the underlying intention of making the workers aware of other personnel working around them, i.e. establishing how each worker fit within the entire construction process. This was valuable since it drove across the importance of sequencing and interference and

combated the problem of workers cocooning within individual trade boundaries. Furthermore, the facilitator went round the room asking each individual to name one thing that would help improve their personal productivity. Fascinatingly, it was found that managers focussed on the timeliness of information especially of cost information (see Clarke and Herrmann, 2004), whilst the workers unanimously talked about the availability of tools and equipment. This reinforced the divide between managers and workers discovered through the questionnaire surveys, where the former tended to emphasise on issues relating to planning whilst the latter were mainly more concerned with operational detail.

Second, embracing the different views of all workers formed the purpose of perforated sheets found in an *aide memoir* issued to workers at the induction sessions. As part of the work improvement techniques, the sheets allowed workers to inform their superiors of positive instances on-site and to make possible improvement suggestions. Information from the completed forms were collated and discussed at daily foremen's meetings, weekly toolbox talks and where necessary, at directors' meetings. In order to encourage workers' contribution, an incentive in the form of a gift voucher by the project team for every ten implemented improvement suggestions was put in place. According to the project team, the induction sessions were essential for ensuring enthusiasm and commitment from the workers from the outset so as to create an exemplary project for the industry to follow (Walker, 2002). This was a major first step that brought about high productivity signified by the high average PPC levels obtained.

Implications

The literature surrounding construction labour productivity depicted in the review demonstrated that, up to now, the perspectives of blue-collar workers had been downplayed to emphasise the importance of work content and work environment factors

from a managerial perspective. This suggests that construction researchers' approach towards linking industrial relations and productivity improvements has been rather primitive in that the focus has mainly emphasised the managerial perspective. Such a unitarist viewpoint (Fox, 1966) fails to consider the perceptions of workers in tackling the productivity problem and mirrors several larger-scale studies in the 1980s into the causes of productivity differentials across industries and countries (Nolan and O'Donnell, 2003). With the decline in union recognition (see Clarke and Wall, 1996; Sisson and Storey, 2000) and the growth in self-employment in construction, the questionnaire surveys conducted in this study should provide a useful tool to gain insights into the perceptions of the blue-collar workers that have been given scant attention *hitherto*.

Unsurprisingly, differences between the perceptions of managers and workers emerged in this study. However, these differences could become more pronounced given the trend of more managers progressing through the graduate route. Undeniably, however, productivity improvements can only be achieved by the efforts of both white-collar managers and blue-collar workers (M^4I, 2000). Thus, findings from the questionnaire surveys are invaluable in identifying holistically the relevant issues to both managers and workers. Moreover, this, being the first of its kind in UK construction, could be repeated periodically to track future trends.

We have also attempted to highlight good practice examples via the site observations that linked the integration of differences between workers' and managers' perceptions to productivity improvements. The notion of employee involvement is not new. Nonetheless, following Blyton's and Turnbull's (2004) Cinderella analogy of employee involvement, Richardson (2003) indicated that employee involvement "repeatedly manages to attract a new audience (p. 374)"; in this study, construction. Yet, the project-based nature of construction where several disparate organisations often come together to

deliver a building imbues significant challenges for the industry to embrace involvement initiatives. Furthermore, the UK is often characterised as voluntarist in employee involvement (see Leat, 2003; Richardson, 2003; Edwards, 2003), even though the introduction of the European Communities Information and Consultation Directive in April 2005 (Blyton and Turnbull, 2004) would unquestionably affect construction organisations and compel them to work together with employees to establish the information and consultation arrangements that best suit their individual context. The site observations, therefore, provide useful practical examples, within the context of productivity improvements, to show how Marchington's and Wilkinson's (2002: 437) downward communication (e.g. induction sessions), upward problem-solving (e.g. suggestion schemes) and task participation and teamworking (e.g. problem-solving between site engineer and workers) could be employed at the construction project level in the pursuit of productivity improvements beyond Ramsay's (1977) superficial "tea, towels and toilets" syndrome.

Conclusions

In conclusion, this paper ascertained that the major shortcoming of past productivity research was the strong managerial focus in eliciting the factors that influence construction labour productivity. The study attempted to tap into the perceptions of both white-collar managers and blue-collar workers of various factors that were thought to have an impact on labour productivity. The factors were gathered through the literature review and an exploratory study and these extended beyond the established work content and work environment factors to include workforce issues. Through a questionnaire survey, it was found that white-collar and blue-collar workers were divergent in their emphasis of certain factors. Loosemore *et al.* (2003) pointed out that "the new rhetoric […] within the employee relations field concerns the need to build *partnerships* with employees in order to enhance business performance (p. 141: original *emphasis*)". This

new rhetoric of employee involvement is what is needed to integrate the differences between the white-collar and blue-collar workers, which we have attempted to illustrate through the emergent findings from the site observations.

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(6,987 words)

	Project A	Project B
Project Type	Multi-storey car park	HQ of a commercial bank
Contract Value	Not given	£335 million
Contract Type	Framework Agreement	Construction Management
Project Duration	Jun 2001 – May 2002	Jun 2002 – Aug 2005
Project Location	Glasgow	Edinburgh
Site Visit	108 hours over 18 days between October 2001 and February 2002	16 hours over 2 days in August 2003

Table I: Profile of the two projects observed

	Percentage of respondents		Percentage of respondents
Annual turnover		**Total no. of direct employees**	
Less than £5 million	47	Less than 100	57
£5 - £10 million	17	100 – 500	24
£25 - £50 million	8	500 – 1,000	7
£50 - £100 million	7	1,000 – 5,000	11
More than £100 million	21	More than 5,000	1
	100		**100**
Percentage of administrative personnel		**Amount of work (£) sub-contracted**	
Less than 25%	64	Less than £25 million	18
25% - 50%	18	£25 - £50 million	24
50% - 75%	9	£50 - £75 million	33
75% - 100%	9	More than £75 million	25
	100		**100**
Estimate no. of sub-contractors		**Value of construction equipment as a percentage of turnover**	
Less than 100	46	Less than 25%	91
100 – 500	24	25% - 50%	8
500 – 1,000	11	50% - 75%	1
1,000 – 5,000	14	More than 75%	0
More than 5,000	5		
	100		**100**
Percentage of construction equipment leased or rented			
0%	20		
Less than 25%	53		
25% - 50%	3		
50% - 75%	11		
More than 75%	13		
	100		

Table II: Breakdown of organisational profile respondents' employers (management personnel)

White-collar sample			Blue-collar sample		
Description	**Rank**	**Mean**	**Description**	**Rank**	**Mean**
Supervision	1	4.3784	Quality Requirements	1	3.9308
Simplicity of Building Design	2	4.3699	Health and Safety Management	2	3.9302
Level of Site Experience	3	4.3067	Communication within Gangs	3	3.9000
Information Flow	4	4.2000	Utilisation of Plant	4	3.8846
Communication with sub-contractors	5	4.0676	Health and Safety and CDM	5	3.8769
Delivery	6	4.0270	Building Regulations	6	3.7923
Availability of Materials	7	4.0270	Level of Site Experience	7	3.7891
Congestion	8	4.0135	Supervision	8	3.7462
Prefabrication	9	3.9589	Specifications	9	3.7308
Sequencing and Interference	10	3.9467	Procurement of Materials	10	3.7231
Standardisation	11	3.9324	Availability of Materials	11	3.7077
Procurement of Materials	12	3.8919	Welfare Amenities	12	3.7054
Availability of Staff	13	3.8784	Delivery	13	3.6822
Communication within Gangs	14	3.8767	Availability of Plant	14	3.6769
Weather	15	3.8667	Capacity	15	3.6692
Resource Allocation	16	3.8108	Availability of Components	16	3.6434
Rework	17	3.8108	Storage	17	3.6250
Communication with suppliers	18	3.8108	Information Flow	18	3.6077
Communication within Company	19	3.7838	Simplicity of Plant and Equipment	19	3.5769
Availability of Components	20	3.7671	Construction Technology Involved	20	3.5736
Scheduling	21	3.6892	Communication with sub-contractors	21	3.5581
Availability of Plant	22	3.6164	Congestion	22	3.5538
Utilisation of Plant	23	3.5946	Maintainability of Plant	23	3.5538
Working Hours (Include Overtime)	24	3.5467	Availability of Staff	24	3.5538
Specifications	25	3.5405	Secondary School Qualifications	25	3.5116
Quality Requirements	26	3.5270	Modern Apprenticeship	26	3.5077
Health and Safety Management	27	3.5135	Communication within Company	27	3.4961
Training Investment	28	3.4865	Size of Components	28	3.4921
Experience of Planner	29	3.4730	Rework	29	3.4646
Turnover	30	3.4730	Weather	30	3.4628
Level of Pay	31	3.4730	Experience of Planner	31	3.4615
Construction Technology Involved	32	3.4400	Working Hours (Include Overtime)	32	3.4609
Storage	33	3.3378	Level of Pay	33	3.4462
Modern Apprenticeship	34	3.3333	Packaging	34	3.4231
Capacity	35	3.3151	Resource Allocation	35	3.4000
Cost Control	36	3.3108	Equal Opportunities Act	36	3.3692
Maintainability of Plant	37	3.3108	Prefabrication	37	3.3622
Job Prospects	38	3.2973	CITB Short Courses	38	3.3231
Health and Safety and CDM	39	3.2933	Sequencing and Interference	39	3.3154
Simplicity of Plant and Equipment	40	3.2838	Simplicity of Building Design	40	3.2969
Travelling Time to Work	41	3.1892	Construction Skills Certification Scheme	41	3.2734
Shift Work	42	3.1467	Standardisation	42	3.2344
Size of Components	43	3.1351	Scheduling	43	3.2538
Uniqueness of Building Design	44	3.1233	EU Directive on Working Time	44	3.2481
Bonus Schemes	45	3.1096	Communication with suppliers	45	3.2093
Site Administration Duties	46	3.0800	Training Investment	46	3.1705
Welfare Amenities	47	3.0270	Turnover	47	3.1395
HNC/HND	48	3.0270	Job Prospects	48	3.1250
CITB Short Courses	49	3.0267	Uniqueness of Building Design	49	3.0846
Packaging	50	3.0135	HNC/HND	50	3.0806
NVQs/SVQs	51	3.0133	Investors in People (IIP)	51	3.0781
Degree/Postgraduate Qualifications	52	2.9730	NVQs/SVQs	52	3.0625
Secondary School Qualifications	53	2.8800	Travelling Time to Work	53	3.0077
New Products	54	2.8784	Shift Work	54	2.9603
Building Regulations	55	2.8667	Bonus Schemes	55	2.9225
Construction Skills Certification Scheme	56	2.8378	Degree/Postgraduate Qualifications	56	2.9127
Investors in People (IIP)	57	2.5067	Cost Control	57	2.8615
EU Directive on Working Time	58	2.2838	Site Administration Duties	58	2.7385
Equal Opportunities Act	59	2.1200	New Products	59	2.6202

Table III: Comparison of ranking of factors between the two samples

White-collar sample				Blue-collar sample			
	Rank	**Mean**	**Std. Dev.**		**Rank**	**Mean**	**Std. Dev.**
Work Environment	1	0.7360	0.1123	Work Environment	1	0.7186	0.1358
Work Content	2	0.7140	0.0882	Regulations	2	0.7150	0.1956
Workforce	3	0.6824	0.0881	Work Content	3	0.6684	0.1403
Regulations	4	0.5283	0.1413	Workforce	4	0.6627	0.1339

Table IV: Comparison of ranking of the four broad level classifications of factors between the two samples

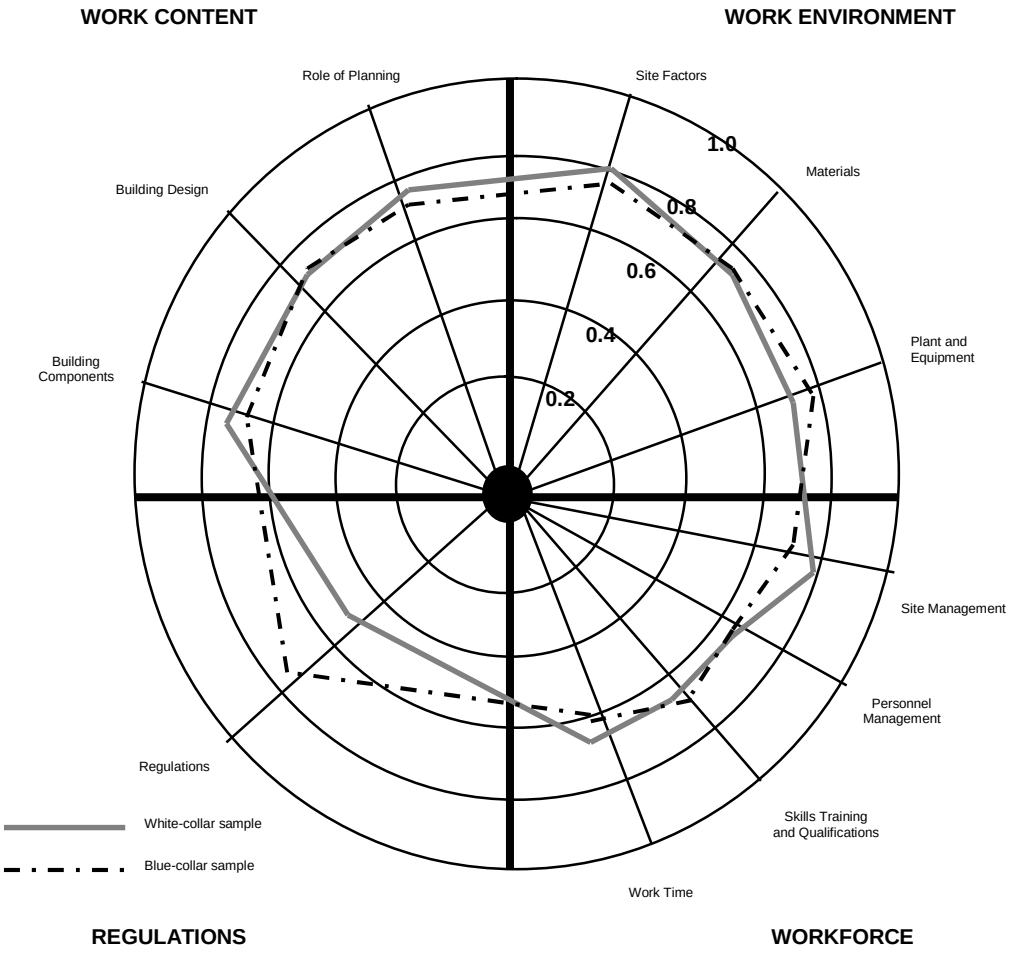

Figure I: Overall mean scores for the eleven sub-groups covering the work content, work environment, workforce and regulations

Component	Sample	Mean	Std. Dev.	*t*-test statistic		
				***t* (203)**	**ρ**	**η^2**
Building components	White-Collar	0.71	0.12			
	Blue-Collar	0.65	0.16	2.74	0.01	0.04
Building design	White-Collar	0.72	0.12			
	Blue-Collar	0.70	0.16	0.86	0.39	N/A
Role of planning	White-Collar	0.71	0.14			
	Blue-Collar	0.65	0.19	2.83	0.01	0.04
Site factors	White-Collar	0.79	0.16			
	Blue-Collar	0.70	0.16	4.25	0.00	0.08
Materials	White-Collar	0.73	0.14			
	Blue-Collar	0.73	0.18	0.34	0.73	N/A
Plant and Equipment	White-Collar	0.68	0.16			
	Blue-Collar	0.73	0.18	-2.05	0.04	0.02
Site management	White-Collar	0.78	0.14			
	Blue-Collar	0.73	0.16	-2.49	0.01	0.03
Personnel management	White-Collar	0.68	0.11			
	Blue-Collar	0.66	0.17	1.07	0.29	N/A
Skills training and qualifications	White-Collar	0.62	0.11			
	Blue-Collar	0.66	0.16	-1.95	0.05	N/A
Work time	White-Collar	0.65	0.13			
	Blue-Collar	0.61	0.18	1.81	0.07	N/A
Regulations	White-Collar	0.53	0.14			
	Blue-Collar	0.72	0.20	-7.89	0.00	0.23

Table V: *t*-test statistics of the eleven sub-groups of factors

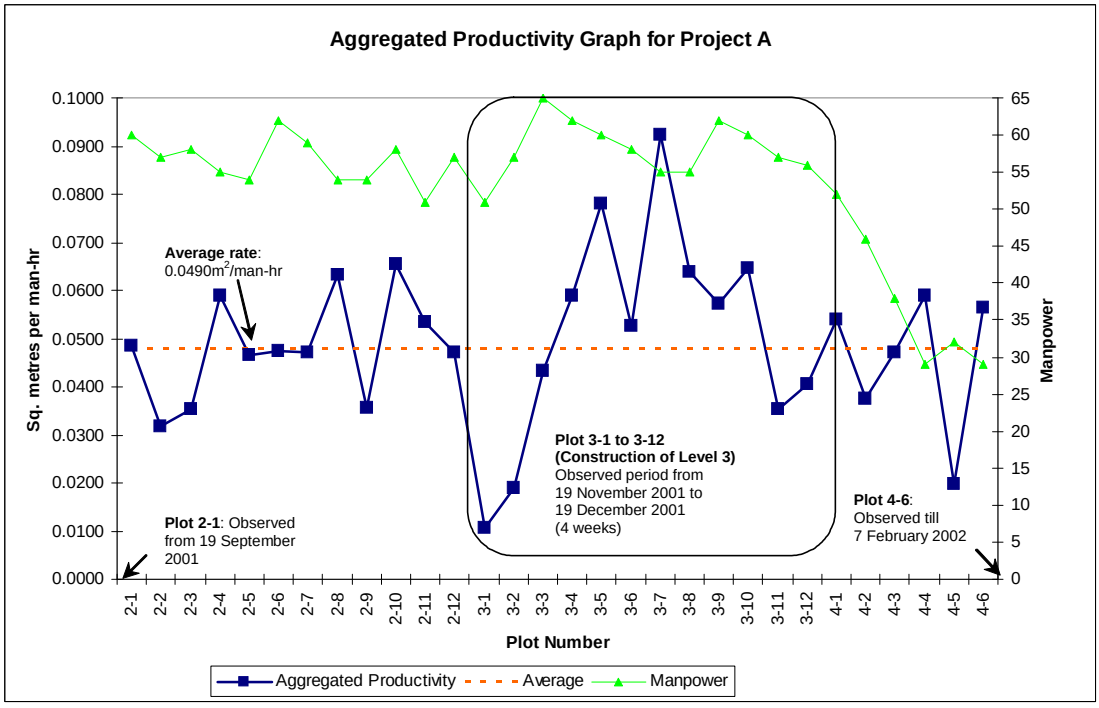

Figure II: Aggregated productivity graph for project A collected during the time of observation

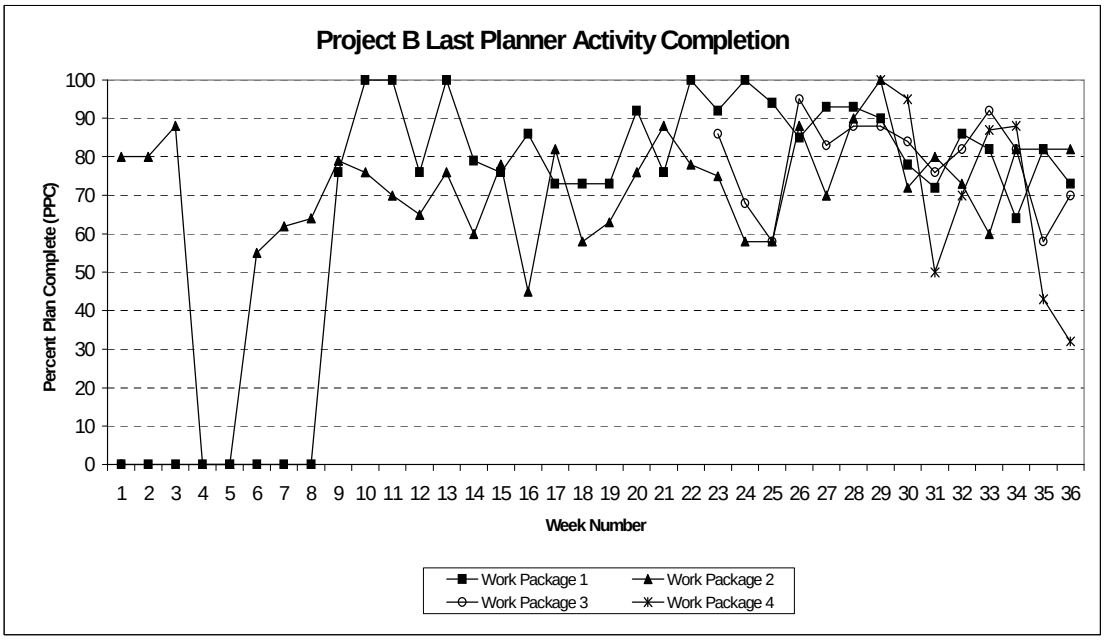

Figure III: Project B progress for all four work packages for the first 36 weeks collected during the time of observation