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Article

Factors Influencing Employee's Productivity: A Case Study of UK-Based Construction Company

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Abstract: Given its substantial impact on project outcomes, increasing productivity in construction has been a major industry priority. Researchers studying construction have been focusing more on it and supporting various enhancement measures since determining the elements influencing labour productivity is a crucial step in this process. This research article uses questionnaires given to direct employees and midlevel employees to discover and comprehend the productivity elements influencing projects at a construction company located in the United Kingdom. After the questionnaire's answers were examined, it was simpler to pinpoint organisational and managerial flaws and to contrast the findings with those of previous productivity studies. The findings helped formulate suggestions for raising productivity. The primary conclusions show that truck availability, worker motivation dynamics, rework, tools, and machinery were the key factors influencing construction productivity. These findings are in line with earlier research conducted in the UK and the US. Salary expectations, the main reason for employee turnover in the organisation under investigation, was a component left out of previous studies. Finally, additional research seems to suggest that some productivity-affecting factors are common to international construction projects, supporting the gathering of data and the possibility of learning from experience in a variety of settings and even at different times of occurrence.

Keywords: work productivity; employee motivation; construction; craftsman questionnaire; case study

Introduction

The quantity of work produced by a worker in a given period is known as their productivity, and it is essential to the sustainability of any business. In simple terms, a business can only thrive if the total output of its workers surpasses the expenses of the business (Basahal et al., 2022). Every business aims to maximize staff productivity as a result. According to the research, a productive employee also tends to be satisfied and happy (GIKONYO, 2017). This in turn appears to be dependent on several variables, including financial incentives, chances for training and growth, and job involvement. However, there is not enough qualitative research data that looks to identify the variables influencing worker productivity (Mahamid et al., 2013).

Taking advantage of the new work settings that the development of digital technology has created, firms aim to raise employee engagement since engaged employees are more efficient at their jobs. Productivity can assist the company in maximizing the potential of its human resources (Almaamari, 2023). Because their motivation stems from sources other than themselves, engaged workers are more productive than those who are not. Prior research has also demonstrated the significance of perceived support from the organisation as a prerequisite element for the relationship between employee productivity at work and work output (Muda et al., 2014).

Additionally, prior research on this subject has tended to concentrate on one aspect of worker productivity, leaving a clear and comprehensive picture of the key variables that affect worker

productivity. It's also important to remember that the majority of research on this particular subject is quantitative, meaning it is predicated on preconceived notions (Noruzy et al., 2011). These studies fall short of giving a comprehensive overview of ways to raise worker productivity. As a result, crucial information and fresh perspectives that could only be discovered through qualitative research may be overlooked (Zongjun, 2019).

The goal of this study is to provide a detailed examination of the worker, supervisory, and organisational variables that influence worker efficiency. This is based on the idea that an in-depth analysis of the various factors that influence worker efficiency can yield a new and inclusive perspective on the topic.

Literature Review

One of the primary concerns from the project's inception has been productivity. A lot of construction managers thought that waste could have an impact on productivity. Researchers have been looking into the causes of declining productivity for the past 20 years. According to the Business Roundtable's efficiency analysis, inadequate management practices were the main factors that either directly or indirectly contributed to the fall in worker's productivity (Lelei, 2017, Prajapat et al., 2023).

To pinpoint the causes of lower productivity in building projects, Liou and Borcharding (1986) offer an intriguing qualitative model. The five main categories of unproductive time, waiting or idle, traveling, working slowly, performing ineffective labour, and performing rework, are used to explain the decrease in productivity on large, complicated construction projects (Liou and Borcharding, 1986).

One of the most common forms of waste in the construction business is unproductive time. The study established that internal delays, additional breaks, sitting and unwinding, incompetence, and delays in supervision account for the majority of the time lost by craftsmen. They lose eighteen percent of their working hours every week as a result of various production issues. The findings are in line with similar research carried out in the US. Only an average of 36% or 31.9% of work is thought to be unproductive (Naoum, 2016).

Additionally, Kaming et al. (1997) reported that the primary cause of craftsmen's productivity issues was a shortage of materials, which was followed by revisions, absences from work, interference, a shortage of tools, and equipment malfunctions. "On-site transport," "inadequate material storing," "excessive paperwork demands," and "inadequate planning" were the root reasons for the material availability issues. Rework was found to be mostly caused by changes in design and inadequate instructions (Kaming et al., 1997).

Case studies by Koskela demonstrated a connection between the prevalence of waste during construction and a decline in productivity. Koskela found that one of the main causes of low output was poor quality. Several investigators encountered a significant degree of substandard construction (Koskela et al., 2013). According to Cnudde, the cost of subpar work (non-conformance) as determined on-site has been found to account for 10–20% of the project's overall cost. Variation costs represented 12.4% of the overall installed project expenses in an American analysis of multiple industrial projects. 78% of the reasons for these quality issues are related to design, and 17% are related to construction. According to a construction industry survey, subpar labour skills accounted for 3.2% of project expenses overall (Cnudde et al., 1991).

Methodology

This manuscript presents the findings of a case study intended to investigate the primary determinants of labour productivity. In order to identify possible underlying causes for these issues, mining projects are examined. Additionally, the amount of time lost on the job in the British construction sector is measured. The mining industry in the UK is very competitive and contracts out a large portion of its profitable operations to building firms. Because the workforce has a thorough awareness of the elements influencing productivity, questionnaires given to craftsmen were utilized to gather opinions from project people regarding productivity difficulties. This strategy may result in better resource management, including the distribution of labour and materials.

This study's primary goal was to investigate the elements of UK construction projects that either impede or reduce labour productivity. The case study approach and information from 3 mining operations that highlight specific aspects of the variables influencing worker productivity were used in this paper. A secondary goal was to assess potential variations and patterns among projects and nations, as well as gain a deeper comprehension of the elements influencing productivity in the construction industry, by comparing these productivity aspects with earlier research.

One technique that's frequently utilized in managing projects is case study research. When addressing "how" and "why" issues, when the researcher has limited control over the course of events, or if the primary emphasis is on current phenomena inside a real-world environment, case studies are typically the best approach (Yin, 1994). Craftsmen questionnaires were chosen as the data collection tools due to their ease of use and the assurance, they provided from validation in earlier studies conducted under the United States Department of Energy initiatives. Those directly involved in on-site production in building projects can provide valuable insights on the factors influencing worker productivity. Additionally, this can help site managers make better decisions to increase worker productivity.

To accomplish the objectives of this article, the following investigative stages were identified: (1) a review of literature on factors influencing efficiency, survey studies, and case report research; (2) several mining projects of a UK general contractors were chosen and formed the case study; (3) a questionnaire based on the Department of Energy survey was created, with some questions modified to fit the study's context; (4) specific project personnel were chosen, comprising midlevel managers and craftsmen-level employees directly involved in on-site operations; (5) collected data from surveys were examined to identify the primary factors affecting worker productivity, the opinion of lost time in the construction industry, potential causes of problems in projects.

While there is little evidence to support the difficulties examined in the local construction sector, the study was exploratory rather than descriptive in character, but it is important to suggest future measures for improvement.

Results

Survey Questionnaires

The outcomes of 28 questionnaires given to the nine midlevel workers and the 19 direct employees who were working on the projects provided the data for this study. The work type and specialty of each person surveyed are detailed in Tables 1 and 2.

Table 1. Workers Surveyed Based on Work Type.

Type of work	Activity	Number	Total number
Direct	Foreman	2	19
	Helper	5	
	Craftsman	12	
Indirect medium	Administrative	2	9
level	Warehouse	2	
	Supervisor	3	
	Quality	3	

Total			28
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Table 2. Workers Surveyed Based on Work Specialty.

Specialty	Type of work	Number	Total number
Warehouse	Indirect medium level	3	3
Quality control	Indirect medium level	3	3
Earth movement	Direct	1	1
Civil works	Direct	12	17
	Indirect medium level	5	
Piping	Direct	4	4
Total			28

Table 3 lists the features of the questionnaire, which focus on project-specific data and data on issues and motivation.

Table 3. Questionnaire Characteristics based on the number of questions for each category.

Topics	Number of questions	People interviewed
General	8	Top project management
Contract	7	
Personnel	6	
Resources	7	
Safety	2	
Total	31	

The data provides crucial details on the state of the projects the organisation is working on, as well as insight into identifying the main variables influencing productivity and suggesting ways to make improvements. Because the participants in this research are directly involved in on-site work, their opinions are reflected in the findings. As such, this information is crucial for determining labour productivity variables at the project management level.

Results from Questionnaire Analysis

Following the analysis of the survey data, certain identifiable trends regarding the primary determinants of worker productivity emerged, as enumerated in Tables 4 and 5. Table 5 defines a relative index (RI) to declare the order of the most important impact items (estimation details contained in Table 5). Table 4 finds the important factors by just comparing the total positive replies

in every influence item. As a result, the primary factors that were found were rework, substances, trucks, tools, and equipment.

Table 4. Main Factors Influencing Craft Productivity.

Total sample size: 28; midlevel: 9direct: 19	Total affirmative responses			Percentage (affirmative responses/sample size) × 100		
Influence	Midlevel	Direct	Total	Direct	Midlevel	Total
Materials	8	13	21	68%	89%	75%
Rework	6	10	16	53%	67%	57%
Equipment and trucks	6	9	15	47%	67%	54%
Tools	5	10	15	53%	56%	54%
Interference	4	5	9	26%	44%	36%
Instructions	4	5	9	26%	44%	36%
Design interpretation	5	2	7	11%	56%	29%
Inspections	3	3	6	16%	33%	25%
Absenteeism	2	3	5	16%	22%	18%
Overcrowded work areas	2	2	4	11%	22%	18%
Turnover	2	2	4	11%	22%	18%

Table 6 shows each person's perceived number of hours lost per week. Without accounting for rework, each worker's weekly total hours lost comes to a very high 32.44 hours. According to Table 6, 59% of the overall waiting time is made up of the time that was wasted for the first four variables: materials, equipment, tools, and design comprehension, and vehicles.

Given that workers work 45–50 hours a week (including overtime), 32.44 hours lost throughout the workweek constitute 65–72 percent of the whole workweek, which is a very significant amount of lost time. This does not, however, imply that the employees work only 28% to 35% of the time; rather, it highlights the possible impact the leadership and the client may have on the total amount of work time. Analyzing direct personnel perspectives reveals that there were 26.35 wasted hours, or 53–58% of the weekly.

Table 5. Ordering of the Elements Affecting Craft Production.

Total sample size: 28; midlevel: 9 direct: 19	Points (p.) total rank order 1st: 3 p./2nd: 2 p./3rd: 1 p.			Relative index (RI) number of points		
Problem area	Direct points rank	Midlevel points rank	Total points rank	Direct RI	Midlevel RI	Total RI
Rework	13	8	21	0.23	0.3	0.25

Materials	29	10	39	0.51	0.37	0.46
Tools	16	8	24	0.28	0.3	0.29
Equipment and trucks	13	6	19	0.23	0.22	0.23
Other crews not finished	5		5	0.09	0	0.06
Waiting for instructions		2	2		0.07	0.02
Waiting for quality control	2		2	0.04	0	0.02
Waiting for design interpretation/ engineering information	3	5	8	0.05	0.19	0.10
Turnover	4	2	6	0.07	0.07	0.07
Absenteeism	8	1	9	0.14	0.04	0.11
Parking and access roads	1		1	0.02	0	0.01
Quality of work	1	3	5	0.02	0.11	0.06
Quality of supervisors		1	1	0	0.04	0.01
Safety	2	2	4	0.04	0.07	0.05

By assessing the outcomes for each project, it is possible to determine the minimum number of hours abandoned that all of the direct and midlevel employees believe to be the result of decisions made by management (such as the manager of the project of the subcontractor or the field the superintendent) and the client (such as the project supervisor or owner), as well as the influence of supporting organisations. According to Table 6, support from management of employees accounted for a minimum 40% (19 h of every 45 to 52 h) of week time spent at work. Table 6 displays the direct personnel's opinions on lost work hours. It is evident that roughly 15% (7 hours out of every 45 to 50 hours) of week work hours are lost, which the direct workers attribute to management and clients.

Supplies, tools, and directions are major challenge areas that are similar to all projects; other issues are specific to the project. These calculations, which contrast the outcomes of each of the three initiatives (see comparison columns), depend on the lowest and highest possible values for the total average hours wasted per employee per person. They are displayed in Table 6.

Employees identified four main reasons for material-related issues: not enough materials arriving on time at the central storage facility not having enough materials available before work begins, materials being too far away from the work regions, and too much paperwork. Employees also mentioned that there was not enough machinery to carry materials, maybe from the field where there was no support for logistics or reviews.

Table 6. Perception of the Weekly Average Hours Lost for Each Project by Worker and Person.

Total sample size: 28 Midlevel: 9 direct: 19	Weekly average of hours missed by each employee			Comparison					
Problem area	Total average delay by			overall comparison of every project			A straight-up comparison of every project		
	Midlevel	Direct	Total	Differ	Min	Max	Differ	Min	Max
Materials	7.41	4.25	5.30	2.6	4.30	6.90	3.4	3.30	6.70
Tools	6.25	4.90	5.29	2.7	4.00	6.70	4.3	2.70	7.00
Design	4.4	4.00	4.40	1.8	3.70	5.50	4	0.00	4.00
interpretation									
Equipment	4.2	4.20	4.20	1.3	3.00	4.30	4.6	0.00	4.60
and trucks									
Interference	3.33	4.50	4.00	4.7	1.00	5.70	6	0.00	6.00
Overcrowd	6	1.00	3.50	6	0.00	6.00	1	0.00	1.00
work areas									
Inspections	4	2.00	3.00	4.5	1.50	6.00	3	0.00	3.00
Instructions	4	1.50	2.75	2.8	1.50	4.30	1	1.00	2.00
Others									
Total	39.59	26.35	32.44	26.4	19.00	45.40	27.3	7.00	34.30
Rework	2.75	4.11	3.69	0.37	3.63	4.00	0.3	4.00	4.30

An inadequate supply of tools for those working in the field was cited as the primary cause of tool issues. Second, tools were damaged when they were needed, weren't replaced when they broke and were unavailable when needed. The tool room's inefficiency or excessive distance from the working area were other complaints made by the participants. The claim that individuals did not take good care of the instruments was made by just one person. Electric cutting instruments, generators powered by electricity, grinders, drills, shovels, picks, pike poles, gasoline (oxyacetylene), the radio, electrical expansions, and electric hammers were a few of the instruments that caused issues. Solder, lumber, metal tape, concrete supplies, fuel, safety adhesive, tape measurements, saw

blades, drilling instruments, safety shoes, helmets, and safety indicators were a few of the troublesome consumables.

This kind of issue was primarily caused by a lack of trucks in the fields, particularly when it came to carrying tools or commodities. The employees believe that it takes too long and requires insufficient coordination to obtain trucks or tools when needed.

Employees stated that customer modification requests were the main reason for rework, with design flaws or a vague project specification coming in second. Merely 20% of the reasons for rework were associated with mistakes or misinterpretations in the field.

The reasons stated were small work areas, too many individuals assigned to one area, and poor crew coordination, even though it was not regarded as a big issue.

The reasons stated were crews' lack of precise preparation and supervisors' lack of cooperation, even though it wasn't thought to be a serious issue.

Employees attributed equal blame for instructions being delayed to clients, central office, managers, and engineering, even though this element was not very significant.

Employees stated that incompetent inspectors, a lack of quality control preplanning, failing to alert quality control ahead of time, and trouble understanding specifications and drawings were the main causes of inspection delay.

Poor specifications and drawings, engineers not experienced with field circumstances, and hesitation were cited by the workforce as the causes.

The primary reason given by employees for the high employee turnover rate at the company was salary (better offered salaries or salary standards); other factors included personal issues, a desire to work near home, a lack of promotions, temporary employment, an improved work structure, and manager treatment.

There were many different explanations given for missing the shift. These include illness, exhaustion, alcoholism, issues with oneself, and free time for hobbies. This final justification is pertinent under a Monday through Friday (M–F) workweek arrangement since a sizable percentage of the workforce required personal time and did not reside in the work region.

The worker-to-supervisor ratio was another significant factor. In other places, there isn't a set guideline like the American union laws on the supervisory ratio. It is contingent upon the area of expertise and the high-level supervisor's judgment. It is anticipated that there will be 10 to 12 employees per foreman and between twenty and thirty employees (2 or 3 teams) for each manager. The survey revealed that the foreman oversaw a workforce consisting of five to sixteen members, with a mean of nine. The range for managers is Thirteen to thirty-six, with a typical crew size of twenty-three. Supervisors are field-trained individuals with an array of expertise who have not completed any formal education.

The study identified the factors that motivate and demotivate employees, although it was mostly focused on the business rather than the project, which is divided into direct and midlevel workers.

Discussion

The outcomes of the case study in the current study have been compared with the outcomes of earlier studies conducted in the US to obtain an understanding and better comprehension of factors impacting worker productivity. While it might not be accurate from a statistical standpoint, the authors admit that evaluating studies from different nations with different survey methodologies and sizes of samples in various time frames is a difficult and perhaps pointless endeavor. Furthermore, these disparities prevent the drawing of statistical conclusions. To acquire a summary of the productivity aspects found in the case study, it may be possible to outline potential trends and patterns by comparing the primary concerns and findings across several studies.

Two US construction research are contrasted with this case report from the UK. First, a famous DOE study approximately productivity issues and their root causes in nuclear energy projects was conducted in the 1970s (Garner et al., 1979). It used an approach similar to this one, gathering roughly 1,200 surveys regarding the opinions of craft workers. The second study involved around 2,000 craft workers countrywide and measured the relative importance of several productivity indicators based

on the workers' perspectives. In contrast to the previously stated polls, Dai et al. (2009) provide a more thorough explanation of respondents' perspectives by stating rankings of productivity indicators based on Likert scales (Dai et al., 2009). However, the latter makes it possible to state a classification of productivity factors that is similar to that of the other studies (Selkämaa, 2018).

Although Dai et al. (2009) exclusively uses the opinions of craft workers, the Department of Energy's study, this case research, and midlevel employees all used these perspectives (Dai et al., 2009). The RI is used in the UK-based case study and the Department of Energy's survey to evaluate the productivity determinants, with the effect degree of each item determined by the opinions of the craftsmen (Table 5). Craft workers' opinions are recorded using a Likert scale, and Dai et al. (2009) use a severity index (SI) to quantify the influence of factors impacting worker productivity (Dai et al., 2009).

These studies are clearly comparable to one another: (1) Tools and materials are the first two factors related to productivity where all three studies show similarities; (2) studies collected by this UK-based case study and Garner et al. (1979) has more closely parallels in these efficiency variables, being in a comparable priority stability; (3) the manager's issue is one of the most essential productivity factors shared by examines by Dai et al. (2009) and Garner et al. (1979); and (4) this UK-based case study shares three of the five most significant variables with each of the studies conducted in the US (Garner et al., 1979, Dai et al., 2009). These include machinery, instruments, and rework with the Department of Energy investigation as well as equipment, devices, and material with the Dai et al. (2009) investigation (Dai et al., 2009).

It is noteworthy that comparable trends in productivity parameters are seen in two US studies conducted over 30 years apart (Arleroth and Kristensson, 2011). This explanation could partially account for the construction industry's declining productivity over the past few decades, even with industry and academic attempts to enhance project performance. Furthermore, the authors contend that inadequate crew-level planning is the reason behind the lack of productivity gains on numerous projects in the UK and the United States. Consequently, there hasn't been much dedication to this degree of preparation in projects thus far (Görsch et al., 2024).

Conclusion

The key productivity elements that were found to be associated with work-time losses were revisions, trucks, supplies, instruments, and equipment. Put otherwise, these represent the variables that are associated with a greater likelihood of wasting time on unproductive pursuits. Each element influencing labour productivity as reported by project staff was examined, along with the primary potential causes for each.

The most important productivity components, such as materials, tools, and equipment, appear to follow a pattern when compared to earlier American research and the UK-based case study. These determinants are still present in emerging nations like the one in our case study and have been for the past thirty years in the US construction industry. Due to analytical constraints, this data cannot be deemed definitive; rather, it serves as a call to action for scholars and practitioners to create more sensible management strategies in order to address prevalent productivity issues that persist in various contexts and eras.

The projects that were studied showed a great potential for efficiency improvement when they concentrated on meticulous crew-level planning. The writers were able to determine important regions where improvement activities might be put into practice by using the first improvement stage, which involved recognising and categorizing elements impacting labour productivity. Furthermore, the project staff members who were interviewed identified both the employees' motivators and demotivators in addition to the elements that negatively affect productivity.

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