

Academic training evaluation of building technology programme

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Abstract:

Training evaluation is one method through which tertiary institutions examine the effectiveness of the training they deliver in order to establish their students' readiness for the workplace. However, several higher institutions' evaluation methods have been confined to assessment in tests and exams without considering the knowledge and competencies acquired by students via training in fulfilling workplace expectations. Hence, the study assessed the training received by Building technology graduates in construction management and construction technology courses. The study adopted the Kirkpatrick model's first two stages of training evaluation (Reaction and Learning levels) with a questionnaire distributed to purposively selected Building technology graduates from two polytechnics in Southwestern Nigeria using a snowball sampling technique. Data obtained were analysed using descriptive statistical tools. The study's findings show that respondents were satisfied with the training acquired and possess the basic competency from the training. However, the graduates lack sufficient knowledge of laws and regulations governing construction work, the use of computer programme for planning and scheduling projects and the ability to use tools and equipment for construction work. The study findings imply that building graduates would be unable to work adequately in the construction industry without additional training, putting enormous strain on construction firms to re-training them to meet their expectations. Tertiary institutions need to revamp their training strategies and methods for students to improve their competency to thrive in the construction industry.

Keywords:

Building technology, competencies, construction management, construction technology, construction industry, training evaluation.

1 Introduction

Tertiary education plays a vital part in any society's development. Its products form the core of nation-building in terms of contributing to capacity and human resources development in every area of the economy (Nyerere et al., 2016). Ekene and Oluoch-Suleh (2016) suggested that tertiary education transforms individuals and promotes greater work efficiency and productivity. Römgens, Scoupe and Beausaert (2020) opined that the primary focus of tertiary education should be to prepare students for an uncertain and unpredictable future in their chosen careers. According to the National Policy of Education in Nigeria (Federal Republic of Nigeria [FRN], 2014), one of the goals of tertiary education is to contribute to the national development through high-level human resources training. However, many employers in Nigeria have expressed dissatisfaction with the quality of graduates produced by tertiary institutions. Oviawe, Uwameiye and Uddin (2017) revealed that although graduates are academically qualified, they are unemployable because they lack the required competencies to get and succeed in the job. Graduate underperformance in the workplace has been a source of worry for several employers, governments, and tertiary institutions. As a result, most higher institutions have made employability a priority, with the quality of their training now being measured by the employability of their graduates (Römgens Scoupe & Beausaert, 2020). Tertiary institutions are now adjusting their training approaches and methods to meet the current realities of the economy and the world of work (Clarke, 2018).

One of the tools for determining the effectiveness of the training acquired by students is training evaluation. According to Igwenagu (2014), training evaluation is a vital component of the teaching and learning process. It is an important instrument for assessing the quality of teaching and learning. Dotong *et al.* (2017) also argued that evaluating the training acquired by graduates will help determine the quality of training they received and gauge the programme's relevance and responsiveness to industry demands. Although training assessment is the last phase in the training cycle, it is critical in measuring the efficacy of the training provided to students (Al-Mughairi, 2018). Al-Mughairi (2018) further revealed that many institutions overlook this final phase or that the techniques utilised to perform the evaluation are ineffective. Igwenagu (2014) also acknowledged that the evaluation procedure of Nigerian higher institutions had become a major source of worry. The assessment procedure is only dependent on the student's learning outcomes as determined by tests and examinations, with no consideration given to the knowledge, qualities, or skills acquired by students during training. The evaluation of the student's training is intended to enhance the training delivery or the student's competence.

Furthermore, the assessment input would aid in establishing if the course met its objectives and deciding on future training. Therefore, this study assessed the training received by Building technology graduates in some construction management and construction-related courses in some selected polytechnics in Nigeria to determine their satisfaction with the training and the competencies attained from the training. Although several studies have been carried out to evaluate the training received by students; however, these studies are unrelated to the built environment programmes.

2 Literature Review

2.1 Training evaluation

The evaluation of training programmes assesses the various approaches and strategies used in training delivery (Tripathi & Bansal, 2017). It is used to identify the weakness of the training programme, thus helping to create a secure connection between training and performance in the job place. Noe (2016) describes training evaluation as a systematic method of gathering and analysing information about a training programme used for decision-making and assessing various training components' importance, efficacy, and impact. Bhasin (2020) argued that training evaluation defines the relevance of the training programme and to what degree the training meets the needs of individuals and organisations. According to Prachi (2015), training evaluation guarantees that the required skills are acquired and the learning outcomes are not compromised, it serves as input to the trainers during the training process and enhances the quality of employee and creates new skills within the employee.

Tertiary institutions must thus review their programmes to see whether specific training objectives are met. The evaluation will assist in identifying performance standards for students as well as areas of weakness and strength. Furthermore, the assessment process will enable tertiary institutions to discover gaps in their training, adjust their teaching technique or strategy, and enhance and reorganise the curriculum to fulfil the programme's intended goals.

2.2 Models for training evaluation

Training evaluation models are a systematic framework to evaluate and examine the effectiveness and success of the training. Training evaluation models are targeted at determining whether the training objectives are achieved, the trainees learnt something, the training impact the performance of the trainees, achieve value for money and determines ways of improving the training (Prachi, 2015). Although several models have been developed to evaluate training, such as the Return of Investment model, Context Input Reaction Outcomes (CIRO) model, Context Input Process Product Evaluation model and Kaufman's five levels evaluation model. However, Kirkpatrick's training evaluation model is widely used to measure training effectiveness due to its simplicity and ease of use. The model was developed by Donald Kirkpatrick in 1959. The model became popular because of its ability to divide a complex topic into manageable stages. It considers both formal as well as informal styles of training.

Kirkpatrick (1998) divided the evaluation model into four parts: Reaction, Behaviour, Learning and Result. Reaction level measures the level of satisfaction with the training programme by the participant. The reaction stage measures the students' satisfaction with the training acquired. Student satisfaction is a subjective assessment of the multiple outcomes and experiences associated with the education received (Elliott & Shin, 2002). The reaction evaluation usually occurs after the individual has finished the programme. It also requires evaluating participants' feelings or attitudes regarding different programme components such as content, subjects, teachers, and approaches. The learning level, on the other hand, defines how learners master the knowledge and skills.

It assesses the level of knowledge obtained by participants before and after the training programme (Srivastava & Walia, 2018). In other words, learning evaluation seeks to quantify the gap between what they knew before training and what they learned throughout the training programme. Kirkpatrick argues that if learning is not transferred to the workplace, it cannot influence the job or the company. The behavioural level determines if the acquired knowledge, abilities, and behaviours are transferred to the workplace to exhibit positive behaviour and job performance gains. The behaviour assesses how much the trainee's work behaviour has improved at the end of the training. The testing will reveal how much the training regimen affects the results. This model's main strength is that it focuses on the behavioural outcomes of the learners who participate in the training. Finally, the result level influences the participants' better performance in the business or environment. It also examines the organisation's reaction to the training intervention. The complete success of the training programme is identified through the results. Nonetheless, Kirkpatrick (1998) stated that for this model to be efficient, the evaluation should begin with the level of reaction and proceed to the other levels one by one since each level affects the following level.

2.3 Building technology programme in Nigeria

Building technology is taught at Nigerian polytechnics and universities. Building technology is taught in Polytechnics over two academic years at the National Diploma and Higher National Diploma levels and a five-year university degree. The courses offered in Building technology programmes are designed to produce qualified graduates with a solid understanding of the science and management of construction processes, as well as specialists in any of the following areas of construction technology, construction management and economics, building materials and structure, and building maintenance. According to the Nigeria Institute of Building (NIOB), tertiary education training in Building technology is intended to produce academically qualified and licensed students as professionals to be in charge of building production management, construction administration, and building maintenance for human use and safety. According to National Board for Technical Education [NBTE] (2001), the Building Technology curriculum in Polytechnics is aimed to increase students' ability to take an active position in the construction sector, notably in the management of building production processes. Students in building technology will also learn how to manage human, material, and financial resources in construction projects in order to develop a structurally sound and appealing structure. The Builder's job in the Nigerian construction industry is enshrined in the National Building Code (NBC), which gives them sole authority over the execution of building projects and the supervision of craftsmen and artisans on construction sites. According to NBC (2006), the Builder is also responsible for preparing the following pre-construction documents: project quality management plan, construction programme, and project health and safety plan. Given the critical responsibilities that builders play in the construction sector, their performance is critical to ensuring the long-term viability of the construction industry in Nigeria.

3 Research Methodology

This study adopted a quantitative research approach to evaluate the training acquired by Building graduates in courses relating to construction management and construction technology in the study of Building technology. The quantitative approach entails collecting numerical data and analysing them (Ghani et al., 2020). The evaluation was carried out using the first two levels of the Kirkpatrick model of training evaluation (reaction and the learning levels) to measure the level of satisfaction in the training Building graduates had received in the 12 identified courses relating to construction management and construction technology and the competencies attained from the training. These two levels were chosen because it focuses on the feedback from the trainee on their learning experiences and what they had learnt. The study population consists of Building graduates in 5 academic sessions (2015 to 2020) from two purposively selected polytechnics (Yaba College of Technology [Yabatech] Lagos and The Polytechnic Ibadan) in the Southwestern zone of Nigeria with a sample frame of 590. A questionnaire survey was used as the data collection instrument to get feedback from Building technology graduates on their training experience and competencies attained from the training. The questionnaire was designed with Google form and administered to 234 calculated sample size (Krejcie & Morgan, 1970) to Building graduates through the social media platforms of the institution's Alumna associations. A Google form is a template or worksheet-based application that may be used individually or in tandem to collect user information (Nurmahmudah & Nuryuniarti, 2020). The questionnaire comprised twelve courses relating to construction management and construction technology in the first section and sixteen expected learning outcomes from the courses in the second section. In the first section, the respondents were asked to rank these courses in order of their level of satisfaction in the training they had received using a 5-point Likert scale (1 = dissatisfied, 2 = not satisfied, 3 = moderately satisfied, 4 = satisfied and 5 = very satisfied. The respondents were also required to rank the competencies they had acquired from the training received from the sixteen (16) expected learning outcomes drawn from the course's curricula in the second section of the questionnaire using a 5 point Likert scale of 1 (not Competent) to 5 (very competent). Frequency distribution, percentage and mean score were used for data analysis.

4 Findings and Discussion

4.1 Respondents' details

The frequency distributions of the participants' data were employed in this study to create a comprehensive picture of the respondents' profiles. Out of the 234 questionnaires administered, 231 were received from the two institutions.

Background data were acquired from respondents' institutions, educational degrees if they worked for a construction firm and post-graduate years of experience. These statistics were required to identify the respondents' academic training experience and knowledgeability to improve the presented data's trustworthiness. According to Table 1, 51.9% (N-120) of the entire population attends Yaba College of Technology Lagos, whereas 48.1% (N-111) attend The Polytechnic Ibadan. As shown in Table 1, 71.9%

(N-166) of the population possess a Higher National Diploma degree, while 22.1% (N-51) of the population are with a Post Graduate Diploma degree. The large proportion of respondents holding a Higher National Diploma degree reflects the high quality of responses gathered throughout the field survey. The bulk of the respondents work in a construction-related organisation, representing 74.5% (N-172). A closer look at Table 1 shows that 96.9% of the respondents had more than three years of post-graduation working experience, implying that the respondents have enough experience to relate their academic learning experience with knowledge of what is available in the construction industry.

Table 1: Background data of respondents

	Frequency	%
Respondent's Institution		
Yaba College of Technology Lagos	120	51.9
The Polytechnic Ibadan	111	48.1
Total	231	
Respondents' Educational qualification		
Post Graduate Diploma	8	3.5
Master's Degree	51	22.1
Bachelor's Degree	6	2.9
Higher National Diploma	166	71.9
Total	231	
Working in a construction-related organisation		
Yes	172	74.5
No	59	25.5
Total	231	
Post-Graduation working Experience		
1-2	7	3.0
3-4	184	79.7
5 and above	40	17.3
Total	231	

4.2 Students' satisfaction with the training in construction management and technology courses

Table 2 shows the different categories of students rated their satisfaction with construction management and technology-related courses. The results in Table 3 revealed that construction technology, construction management, project management, and tendering and estimating were the highest-ranked courses with mean values of 4.26, 4.21, 4.11 and 4.11, respectively, across the respondents' institutions. These most ranked courses are vital to building students' competence in the construction industry because they provide theoretical and practical knowledge of the construction processes. Studies by Alakavuk (2016) and Babalola and Oladipo (2018) agree that construction technology is one of the most relevant courses for the construction industry. The finding indicates that students are satisfied with the training in construction technology. It exposed them to construction activities, processes, and various techniques and technologies to construct structurally stable components and structures. Students' satisfaction in construction management and project management courses implies that they will be able to perform the core function of managing the activities of skilled and unskilled workers on construction sites using appropriate management techniques and

tools, owing to the fact that these courses emphasise the importance of human relations management skills that are essential for the construction industry's success. As a result, Building students must be thoroughly taught about contract administration, allocation and management of various resources available for construction using various management and information communication tools. This knowledge is needed in the construction industry to succeed as a construction manager (Adinyira & Abankwa, 2015). In addition, students' satisfaction in tendering and estimating course will enable them to be competent in preliminary cost estimating of materials, labour, and machines in construction work. It will also expose them to contract administration and the understanding of the rights and responsibilities of parties to the construction contract. Sitanggang *et al.* (2019) attest to the need for effective estimating training, stating that faulty estimating in construction works might result in an under or over-allocation of resources, both for commercial. Because of the difficulty in developing an accurate estimate in the execution of construction projects, Regmi and Willis (2018) proposed a well-thought-out curriculum of cost estimating for efficient teaching of the course. Overall, Building students' satisfaction with the teaching and learning in Building technology courses is important to their competency and success in the construction industry. Students' satisfaction in training is a key sign of their success. The conduct of students' satisfaction surveys often highlights areas for improvement and offers the best possible learning environment for their students (Waller, Foust & Panthi, 2021).

Table 2: Students' satisfaction with the training in construction management and construction technology courses

Construction Management and Construction Technology related courses	Yabatech		PolyIbadan			
	Mean	Rank	Mean	Rank	Mean	Rank
Construction technology	4.27	2	4.25	1	4.26	1
Construction management	4.28	1	4.14	2	4.21	2
Project Management	4.27	2	3.94	7	4.11	3
Tendering & Estimating	4.22	4	3.99	4	4.11	3
Contract laws & Arbitration	4.18	5	4.01	3	4.10	4
Entrepreneurship development	4.15	6	3.98	5	4.07	5
Estimating & Price Analysis	4.23	3	3.89	8	4.06	6
Budgeting & financial control	4.14	7	3.97	6	4.06	6
Technical report writing	4.15	6	3.86	10	4.01	7
Architectural drawing & Design	4.18	5	3.81	12	4.00	8
Measurement of Building & Civil works	4.10	9	3.88	9	4.00	8
Engineering Surveying	4.12	8	3.82	11	3.98	9

4.3 Competencies attained from the training in construction management and technology courses

Table 3 presents the competencies attained from the training in construction management and technology courses ranked by the respondents according to their degree of competency. The highest-ranked knowledge gained by the respondents were the capability to carry out construction layouts for various types of buildings, knowledge of the construction of various components of buildings, knowledge of construction standards and practices, and the ability to decipher building plans and specifications. The finding aligns with Gimba (2011) study, which identified the

capacity to carry out building layout as one of the employability skills that Building students must acquire to be employable in the construction industry. This skill is necessary for the construction sector to convert the building plan from paper to land before the actual construction process begins. It also aids in precisely positioning the building in its form and design. Husain *et al.* (2017) study also agreed with the findings in that students' understanding of the construction of various building components is essential to properly execute construction jobs. Another highly ranked competency gained by graduates is in construction standards and practises. This competency is essential for graduates' success in the construction industry since it will aid in assuring quality and safe building operations, as well as lowering costs, eliminating waste, and enhancing efficiency (Mbereyaho et al., 2019). It is also a necessary skill for building professionals to create the project quality management plan document for the construction project (Ogunbiyi, 2015).

In line with the studies of Gimba (2011) and Obaju, Fagbenle and Amusan (2022), the ability to understand building plans and specifications is a critical competency needed in the construction industry for Building students. It is a necessary skill for a job in the construction industry and is critical in finishing the project within the specified quality, budget, and time. This ability is crucial for building graduates in drafting construction documents such as project quality management plans, construction programs, and project health and safety plans as recommended by the National Building Code (NBC, 2006). A contract is an essential aspect of the construction process because it guides the conduct of each party in the project, prevents unanticipated risk, and outlines the methods and rules for guaranteeing the project's successful completion. Du Plessis and Oosthuizen (2018) argue that construction contracts have evolved into a management tool for effectively executing construction projects. As a result, knowing contract processes is critical for building students entering the construction industry. Findings from the study on the competency in health and safety practices by students align with the study of Farooqui and Ahmed (2009), which rated the knowledge of health and safety as one of the essential skills for construction undergraduates and graduates. This competency requires Building students to create a health and safety plan in order to identify potential health and safety issues in the building process and adopt policies and methods to address them.

Table 3: Competencies attained from the training in construction management and technology courses

Areas of Competencies	Yabatech		PolyIbadan		Overall	
	Mean	Rank	Mean	Rank	Mean	Rank
Carrying out construction layout for various types of buildings	4.27	4	4.17	1	4.22	1
Construction of various components of buildings	4.24	5	4.17	1	4.21	2
Construction standards and practices	4.28	3	4.13	3	4.21	2
Decipher building plans and specifications	4.31	1	4.05	9	4.19	3
Procurement and contracting procedures	4.19	8	4.17	1	4.18	4
Health and safety practises	4.30	2	4.05	6	4.18	4
Construction professionalism and practices	4.24	5	4.09	4	4.17	5
Supervision and Coordination of skilled and unskilled individuals on construction sites	4.23	6	4.05	6	4.14	6

Prediction and estimation of building materials, labour, and plant resources.	4.14	11	4.14	2	4.14	6
Effective communicate on the construction site	4.18	9	4.06	5	4.12	7
Construction site dispute management and resolution ability	4.16	10	4.06	5	4.11	8
Reading, understanding, and interpreting contract documents	4.22	7	3.99	8	4.11	8
Preparation of construction status reports.	4.18	9	3.99	8	4.09	9
Use of variety of construction tools and equipment	4.11	12	3.99	8	4.05	10
Knowledge of various tools for project planning and scheduling	4.04	13	4.02	7	4.03	11
Construction regulations and laws	4.04	13	3.99	8	4.02	12

Nevertheless, the results of the study revealed knowledge of construction regulations and laws and knowledge of various tools for project planning and scheduling as the least ranked competencies attained by the respondents. The lack of competency of graduates in construction rules and legislation would add to the already existent average level of building regulation practice in the Nigerian construction industry, as reported by Osuizugbo (2019). Building graduates will need this skill to contribute to the formulation of standards and regulatory requirements for designing and erecting buildings that will safeguard the safety and health of building users. The lack of knowledge in project planning and scheduling tools is not limited to graduates alone. AlNasseri and Radhlinah (2015) studies also found a lack of sufficient knowledge of project planning and scheduling tools and their application among construction stakeholders. Project planning and scheduling have become two of the most significant elements for project success because it helps establish procedures and define project activities and durations to determine the goals, scope, and quality of the project.

5 Conclusion and Further Research

One of the most important aspects of training evaluation is identifying areas of strength and weakness in the training. This study was able to identify training and competency gaps in building technology training, as well as provide a basis for future research in training evaluation in the built environment courses. According to the findings, Building technology graduates are satisfied with the training acquired and possess the essential competencies from the expected learning outcomes of the courses. However, there is a need for improvement in the training in engineering surveying in order to improve the competency of the graduates in the use of tools and equipment to carry out construction work accurately. The study also observed that the graduates lack sufficient knowledge of laws and regulations guiding construction work and various construction project planning and scheduling tools. These findings imply that building graduates would be unable to work adequately in the construction industry without additional training, putting enormous strain on construction firms in re-training them to meet their expectations while also calling into question the quality of their training. This study recommends revamping the training method and strategies in the less competent areas identified in the study and the involving of construction professionals in the training of students for the construction industry. Because of the study's population size limitation, other tertiary institutions can be studied to generalise the findings. Furthermore, investigations in other specialised areas of building and other fields in the built environment can be conducted.

6 References

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