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Integrating Software Development Courses in the Construction Curriculum

Afolabi, ADEDEJI
Covenant University, Ota, Ogun State, NIGERIA
adedeji.afolabi@covenantuniversity.edu.ng

Ojelabi, RAPHEAL
Covenant University, Ota, Ogun State, NIGERIA

Oyeyipo, OPEYEMI
Bells University of Technology, Ota, Ogun State, NIGERIA

Tunji-OLAYENI, PATIENCE
Covenant University, Ota, Ogun State, NIGERIA

Omuh, IGNATIUS
Covenant University, Ota, Ogun State, NIGERIA

Amusan, LEKAN
Covenant University, Ota, Ogun State, NIGERIA

ABSTRACT

Researchers have largely revealed the importance of ICT/Software in changing the economy of a nation and achieving sustainable goals. The present youth population are a result of the computer/internet age and these characteristics should be harnessed. The study examined the integration of software development courses in the construction curriculum, specifically in the business of resource management. The study employed the use of a cross-sectional survey design using the instrument of questionnaire to obtain data. A total of thirty (30) educationist in the built environment participated in the study and were selected randomly through a convenient sampling method. The data obtained were analyzed using SPSS v21.0. Descriptive and Inferential statistics test of Factor Analysis, One-way ANOVA and Kruskal wallis were conducted. Results revealed that the factors that engender learning of software development courses in the construction curriculum are grouped into three (3) namely teaching support factors, learning Support factors and the regulatory support factors. The study revealed that poor delivering method, poor internet connectivity and low patronage of indigenous software are significant barriers to the integration of software development courses in the construction curriculum. In conclusion, there was no significant difference among construction professionals on the benefits of integrating software development courses in the construction curriculum. The study recommended the speedy integration of software development courses in the construction curriculum, carefully aided with adequate teaching and learning facilities. In addition, government should support and patronize locally developed software in order to aid the growth of the industry in the sub Saharan Africa.

Keywords: Construction Education, Teaching support, Resource Management, Software development, Learning methods.

INTRODUCTION

A surgical look at the revolutionary impact of the internet and the advent of online applications in social media and e-commerce or e-business makes it important to consider what it could do to the business of construction and other professions. The construction sector has been seen as the provision of shelter and infrastructure rather than been seen as this and much more. The business side of the construction sector must be critically examined. Not seeing the construction sector as a business would largely affect time, cost and the quality requirements of a building. Yagmuroglu, Gunaydin and Arditi (2009) asserted that contractors fail because they lack business knowledge of construction projects. Every contractor’s aim is to make profit, by this he/she employs the construction professionals to achieve this purpose. But, sadly to infer, construction professionals have not judiciously helped contractors and investor to achieve this sole purpose.

In recent years, the construction industry has been using many softwares on construction project in preparing construction time and cost needs. But, this has not led to project success on many construction projects in Nigeria. The high incidences of cost overrun, time overrun, abandonment of projects, large piles of construction waste, delay, non-payment of workers etc. have marred the image of the Nigerian construction industry. This has led to adversarial relationship between many investors, clients and contractor/construction professionals. This can be largely attributed to contractor/construction professionals' neglect of controls and quality (Bamisile, 2004). The argument may be that most of the construction softwares are not developed by construction professionals and therefore makes it hard to incorporate certain controls.

But how can construction softwares measure quality? It is opined that when construction softwares are used to prepare construction documents, it is for the plan that is set in the future. Nevertheless, there is need for controls to be set in place. Yagmuroglu *et al.* (2009) argued that construction managers are meant to make plans and assess the status of the plans thereafter. Plans are activities set for the future, while controls are set to cope with the changes that will invariably occur in the actualization of these plans. Bamisile (2004) referred to this as having a progressing system for the resource conversion process. Jimoh (2012) explained that this is the act of checking, measuring and recording of progress in comparison with planned requirements. Construction softwares can help to ensure quality of attaining cost and time requirements which are of enormous benefits to all stakeholders in the construction industry. This can be achieved by measuring plans, controls and the changes that occur eventually. Construction softwares that helps to put controls and ensure quality are either scarce, not user friendly or not available in the Nigerian context.

Lately, the Nigerian curriculum has receive some bashing from different quarters for its rigidity and not been able to measure with the needs of the times (Asaolu, 2012). There is need for the Nigerian curriculum to adapt to the new trends and sustainable goals of modern society. Studies of curriculum development such as introduction of sustainability in construction education, entrepreneurship, video learning, occupational health and safety, OSHA etc. shows that if well implemented, can lead to a better performing construction industry. Therefore, the study aims to examine the integration of software development courses in the area of resource management in the construction curriculum. The following research questions would form a guide for this study;

- What factors engender learning of software development courses in the construction curriculum?
- How significant are the barriers to the integration of software development courses in the construction curriculum?
- Of what benefit is the integration of software development courses in the area of resource management in the construction curriculum?

RESOURCE MANAGEMENT

Resource management is the soul and heart of any construction project. According to Ziaidoostan, Ghaneh, Amanin and Gholipor (2013), no task or activity in the construction industry can be performed without various construction resources. Nagaraju, Reddy and Chaudhuri (2012) defined resources as an entity that contributes to the fulfillment of project assigned tasks such as manpower, material, money, equipment, time or space. While management involves planning, organizing, commanding, coordinating and controlling. Simply put, resource management is the process of using management skills and techniques in planning, organizing, commanding, coordinating and controlling of resources.

The construction industry is known to consume large amount of resources and energy (Ekanayake and Ofori, 2000; Nagaraju *et al.*, 2012). These resources makes the major cost of construction projects. It is worthy to note that these resources have their own inherent high risk and uncertainties, which makes it necessary to manage them well. According to Mendoza (1995), manpower, equipment and materials are important project resources which requires close management attention in order to ensure a satisfactory conclusion to a construction project.

The Nigerian construction industry has exhibited attributes of large amounts of waste (Enshassi 1996; Garas, Anis, and Gammal, 2001), delays (Odeh and Battaineh, 2002), cost overrun, time overrun, poor productivity (Hai, Yusof, Ismail and Wei, 2012), conflicts and dispute (Okoye, Ngwu and Ugochukwu, 2015) etc. which are major characteristics of mismanagement of resources and adds no significant value to the client or investor. Apart from mismanagement, other negative aspects which affects construction projects in terms of its resources are unavailability of resources, theft and vandalism, use of sub-standard resources, delivery of wrong quantities. These undesirable qualities can invariably cripple contractors and construction firms. In Nigeria, there are two main categories of construction firms; the few multinationals and the indigenous firms (National Bureau of Statistics, 2013). These multinationals which controls large chunk of the mega projects engage the use of some prime foreign or in house developed ICT tools in carrying out its business of resource management and as thus realized great gain from it (Jimoh, 2012).

According to Jimoh (2012) executing construction projects are becoming more complex and challenging by the day. Effective resource management is the key to construction project success which can largely be achieved through the integration of information and communication technology in its diverse phases (Haddad, 2015). In spite of the growing problem and the implications of poor construction resource management, most indigenous construction businesses still manage these critical resources—and all of the data surrounding them—with nothing more than spreadsheets, paper forms and human memory. As a result, these organizations are incurring unnecessary costs and taking on risks that are impeding their ability to grow and compete in an industry where there is very little room for error. The areas in resource management are wide, ranging from material management, money management, human (manpower) and non-human (equipment) management, time management and space management. Material management alone, can be broken further into Material estimation, budgeting, planning & programming, Scheduling, purchasing & procurement, Receiving & inspection, Inventory control, storage & warehousing, Material handling & transport and Waste management (Thomas, Riley and Messner, 2005; Stukhart, 2007). These are areas burgeoning the need for further ICT and software development.

SOFTWARE DEVELOPMENT IN DEVELOPING ECONOMIES

Information is an asset. Information and Communication technology has been identified as a key driver for the socio-economic development of developing economies like Nigeria (Soriyan, Mursu, Akinde and Korpela, 2001; Misra, 2015). Olaore (2014) stated that it can engender global competitiveness and national development. According to Okonta (2006) investment in ICT is able to create wealth to an ailing economy. Countries such as Japan, India and Israel are major exporters of software technology as a primary product in its economy (Momodu *et al.*, 2007). Therefore, ICT should be high priority sector to aid any economy's plan of diversification (Soriyan *et al.*, 2001).

Presently, some Nigerian institutions have incorporated the use of ICT into their curriculum. The aim was that when students grow up in an ICT environment, they may gain many hours of experience using ICT facilities (Olaore, 2014). Even though the institutional framework for the adoption of ICT has been there since 1989 by the Nation University Commission, Idowu and Esere (2013) noted that the adoption has been slow due to resistance to change, inadequate ICT infrastructure and lack of qualified personnel.

ICT is taking over the construction process, right from the inception to the completion (Onyegiri, Nwachukwu and Onyegiri, 2011). This arose from the need to be more client oriented, large data being transferred and the competitive nature of the industry (Weippert, Kajewski and Tilley, 2003; Peansupap and Walker, 2005). Apart from the hardwares, internet and the World Wide Web (WWW) been used by the Nigerian construction industry, some commonly used softwares include Autocad, Archicad, Studiomax 3D, Revit, BIM, Primevera and Microsoft Office programs (Onyegiri *et al.*, 2011). Other innovative tools have been developed but are not frequently in use in the industry. For example, Menzel *et al.* (2006) developed an innovative tool of e-resource sharing tool for sharing idle resources among construction companies. Appropriate software packages and organizational information systems for African settings must thus be developed locally, even if a foreign package can be used as a starting point for adaptation (Heeks, 1999). The huge nature of the industry calls for more indigenous software applications and web based technologies to tackle the challenges facing the Nigerian construction industry from design to the construction phase.

According to the United Nations Educational, Scientific and Cultural Organization, UNESCO (2003) education helps in developing the knowledge and skills needed for a sustainable future. Therefore, the built environment education required for the management and administration of the Nigerian construction industry in the twenty-first century calls for diverse skills required in achieving optimum goals (Ameh *et al.*, 2010; Afolabi et al., 2016). Skills emphasizing entrepreneurship, workplace skills, competency skill, softs skills (Chapman, 2004), craftsmanship, occupational health and safety administration, OSHA (Afolabi *et al.*, 2016) and ICT skills can help satisfy the needs of the industry. The effective management of construction projects calls for continuous improvements of skills required such as software development. Construction students can be armed with programming skills with the knowledge of the construction process to produce cost effective, user friendly construction softwares.

Momodu *et al.* (2007) defined the software industry as a relatively low-investment, environmentally friendly, high-growth global industry. Osofisan and Osunade (2005) noted that the Nigerian software development sector of the ICT sector is on the rise. But, a huge gap still exist due to the dependence on foreign softwares used in different Nigerian industries (Asaolu, 2012). According to Misra (2015) apart from the local consumption that can be provided for by indigenous software development, Nigeria can become a Global Software Development (GSD) location due to its language, high youth population trained in IT disciplines and the reduced cost of producing software products. Momodu *et al.* (2007) opined that if the industry is properly managed it can result in economic boom and engender sustainability for the nation. It is hoped that in the years to come, Nigeria will become an offshore software outsourcing destination (Osofisan and Osunade, 2005; Momodu *et al.*, 2007; Misra, 2015). This can be achieved through proper funding/management, staff training, curriculum review, student involvement and academia-industry cooperation (Asaolu, 2012).

METHODLOGY

The empirical nature of the study employed the use of a cross-sectional survey design using the instrument of questionnaire to obtain data. The study location was carried out in Lagos state, which is one of the most technologically advanced cities in Nigeria. Lagos State also has the largest ICT (hardware and software) market domiciled in Ikeja referred to as Nigeria's Silicon Valley. Through a convenient sampling method, a sample size of sixty (60) educationists comprising of architects, builders, quantity surveyors and civil engineers in the built environment were contacted for the study. However, a total of thirty (30) questionnaires were returned and carefully scrutinized that they did not have any form of error. Non probability convenience sampling method was adopted; this is a sampling method according to Teddlie and Yu (2007) and Collins *et al.*, (2007) that involves choosing from a sample that is not only accessible but the respondents are willing to take part in the study. The data obtained were analyzed using SPSS v21.0. Descriptive and Inferential statistics test of Mean, Factor Analysis, One-way ANOVA and Intra-Class Correlation coefficient were used for the study.

FINDINGS AND DISCUSSION

In this section, the study examined the factors that engender learning of software development courses in the construction curriculum, examined the significant barriers to the integration of software development courses in the construction curriculum and identified the benefits of integrating software development courses in the area of resource management in the construction curriculum.

Factors that engender learning of software development courses in the construction curriculum

Literature identified nineteen (19) factors affecting the learning of indigenous software development in construction education and thus assessed by the use of Component principal analysis (CPA) also called factor analysis. From the analysis as shown in Table 1, the KMO and Bartlett's test of sphericity show good factorability features.

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.217
Bartlett's Test of Sphericity:	
Approx. Chi-square	517.282
Degree of freedom	190
Significant level	0.000

The Bartlett's test of sphericity gave a chi-square value 517.282 at 190 degree of freedom, significant at 5%. This shows correlation among the identified factors, hence a supportive criterion for factorability. CPA indicates 6 components (out of the 19 possible components) with Eigen value of at least 1. The first component has an Eigen value of 7.827 while the sixth has 1.073. These are the variation each of the linear components can explain. The percentage of variance explained by each of these components is given in the third column while their cumulative is in the fourth column. The first component explained the highest variation of 41.197% while the last explained 5.646%. Altogether, the sixth explain 86.774% variation by their linear components.

Table 2. Total Variance Explained before and after rotation

nt	Initial Eigenvalues	Extraction Sums of Squared Loadings	Rotation Sums of

							Squared Loadings(a)
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	7.827	41.197	41.197	7.827	41.197	41.197	6.503
2	2.661	14.003	55.200	2.661	14.003	55.200	5.215
3	2.160	11.368	66.568				
4	1.483	7.804	74.372				
5	1.284	6.755	81.127				
6	1.073	5.646	86.774				

Extraction Method: Principal Component Analysis.
a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.
Kaiser's criterion suggests the extraction of 6 factors, but 6 factors are too many given the communality of the components. However, scree plot was resorted to and rotated 3 factors with point of inflection showing Eigen values of above 2.

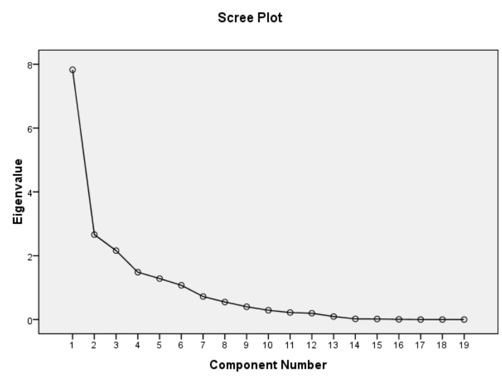

Figure 1. Scree plot

The items are loaded at different degree on each of the variables, but item(s) with high loading is/are considered (item with highest coefficient and those close to that with same theme).

On the first component, academic management support, software development trained personnel and training software packages were highly loaded while on the second component, availability of internet connection, availability of personal computers and teaching methods were highly loaded. On the other hand, funding, government support and curriculum review responsibilities were the highest loading co-efficient on the third component. The highest loading items on the same components therefore suggests factor's name to be given to such component, and in line with this, the three components obtained in this analysis are named thus; 1) Teaching support factors, 2) Learning support factors, 3) Regulatory support factors.

Table 3. Rotated Component Matrix

	Component		
	1	2	3
Academic management support	.904		
Software Development trained personnel	.892		
Training software packages	.850		.329
Student involvement	.818		
Knowledge of the construction process	.745	-.390	
Interest of Construction Students	.733	.302	
Academic-Industry cooperation	.727		
Programming language to be used	.692	-.360	

Needs of the construction industry	.681	-.437	.330
Funding	.575		.533
Construction curriculum review	.572	-.365	.496
Curriculum Regulators	.520	-.504	
Availability of Internet connection	.666	.675	
Availability of Personal Computers	.319	.638	
Teaching methods	.499	.544	
Increased patronage of few local software	.323	-.418	
Foreign software	.475		-.655
Previous ICT skills of students	.441		-.635
Government Support		.386	.486

Extraction Method: Principal Component Analysis.
a. 3 components extracted.

The three (3) main factors derived for Table 3 are discussed;

Factor 1: Teaching Support factors – The teaching support factors are defined has those factors necessary to aid the teaching delivery methods to the students either via the lecture environment or lecture instruments to be used. Factors such as academic management support, software development trained personnel and training software packages are considered under this category. The academic management support could come in form of well-equipped computer laboratories, provision of up-to-date training software packages and trained personnel. The trained personnel must be up-to-date in the knowledge of recent software packages. Idowu and Esere (2013) stated that most institutions lack computer literate teachers and ICT experts that would support and manage the internet connectivity and/or application of computing in the teaching-learning process. Having a suitable teaching support system would help ensure that the students adequately grasps the concept of software development in the higher institution environment. In addition, the limited training software suitable for this clime is a factor that should be considered. Aduwa-Ogiegbaen and Iyamu (2005) noted that due to the differences in education standards and requirements, the foreign softwares do not integrate into curriculum across countries. Software that is appropriate and culturally suitable to the Nigerian education system is in short supply. There is a great discrepancy between relevant software supply and demand in developing countries like Nigeria (Aduwa-Ogiegbaen and Iyamu, 2005).

Factor 2: Learning Support factors – The second category of supporting factors engendering learning of software development courses in the construction curriculum are based on the variables such as availability of internet connection, availability of personal computers and teaching methods. These are facilities that aid the student in learning of software development. According to Oyovwe-Tinuoye and Adogbeji (2013), in Nigeria, most ICT facilities are not sufficient to enhance quality education to learners and teachers, even where it exist there are not sophisticated enough to stand the test of time like the ones acquired in developed countries. Nwosu and Ugbomo (2012) stated that problems of quality and lack of resources are compounded by the new realities faced by higher education institutions battle to cope with every increasing student's numbers.

Factor 3: Regulatory Support factors – This category comes about from the variables of funding, government support and curriculum review. Essentially, it requires the collaboration of the academic institution and the government through the national commission to ensure the take-off and the continuity of the programme. Software development is heavily capital intensive in the short term and therefore the issues of funding needs to be adequately catered for. According to Uzodinma (2015) experts have argued that emerging indigenous software companies are not effectively being encouraged. They believe that the government must guarantee their survival by charging them with the responsibility of either coming up with their own solutions or demonstrating that they can develop or implement software solutions proposed by the government. The overall educational system is under-funded (Taiwo, 2004) therefore available funds are used to solve more urgent and important survival needs by the institutions. Oyovwe-Tinuoye and Adogbeji (2013) suggested that funding and maintenance of the ICT tools should not be neglected or politicized. The institutions management must be interested and fully involved in implementation and maintenance of ICT equipment and the Internet connectivity. Idowu and Esere (2013) opined that adequate funding is necessary for tertiary education in general and development of ICT in particular. To this end, government should increase funding for the entire educational sector. Government can play several roles in support of the development of software exports and in the application and diffusion of software or ICT in private sectors of the economy. For example, Momodu et al. (2007) suggested that government can create of a supportive regulatory environment for telecommunication and internet; protection of intellectual property rights; targeted investments in software education and research; and broad promotion of ICT literacy programmes and action that would promote long-term progress in both domestic and export activities.

Barriers to the integration of software development courses in the construction curriculum

A one-way between-groups analysis of variance was conducted to compare the means between the four (4) groups used in the study on barriers to the integration of software development in construction education. The test was to examine the effect of each group on the listed barriers. The decision rules that when p value < 0.05, the listed variable(s) is termed significant and vice versa. Table 4 revealed the ANOVA results on barrier to the integration of software development in construction education. This is inferred from their p-value which is less than 0.05 (5% level of significance), signifying they are significant. From the twenty-three (23) variables identified in literature, the variables of poor delivering method, poor internet connectivity and low patronage of indigenous software are significant. In Nigeria, there are few Internet providers that provide internet gateway services to Nigerians. According to Aduwa-Ogiegbaen and Iyamu (2005), many of these companies provide poor services to customers who are often exploited and defrauded with the few reputable companies, which render reliable services charging high fees thus limiting access to the use of the Internet. Uzodinma (2015) argued that a serious problem affecting the Nigerian software industry is the lack of believe in locally made software in that government and IT companies have not done much to show they believe in the ability of their citizens. For instance the Chinese government hires local citizens to build alternative to expensive unaffordable software systems, aiming to produce a cheaper one for its citizens. This raises the morale of the youths who are in the industry or aspiring to join the industry as they are certain there is an available job and market for them. Kwacha (2007) noted that, the most common problems associated with the effective implementation of ICT are lack of qualified ICT personnel, cost of equipment, management attitudes, inconsistent electric power supply, inadequate telephone lines, particularly in rural areas and non-inclusion of ICT programmes in teacher's training curricula and at the basic levels of education**.** Pelgrum (2001) stated that the obstacles for ICT implementation include the following: Insufficient number of computers, teachers' lack of ICT knowledge/skills, difficult to integrate ICT to instruction, scheduling computer time, insufficient peripherals, not enough copies of software, insufficient teacher time, not enough simultaneous access, not enough supervision staff and lack of technical assistance. In addition, Lewis and Smith (2002) summarized these barriers as limited equipment, inadequate skills, minimal support, time constraints and the teacher's own lack of interest or knowledge about computer. Majorly, it is evident that the tools and the encouragement is lacking in the system which are major barriers to the integration of software development in the construction eduction.

Table 4. ANOVA results on barrier to the integration of software development in construction education

		Sum of Squares	df	Mean Square	F	Sig.
Low interest from students	Between Groups	.833	3	.278	.609	.615
	Within Groups	11.867	26	.456		
	Total	12.700	29			
Inadequate curriculum to cover the area	Between Groups	.933	3	.311	.436	.729
	Within Groups	18.533	26	.713		
	Total	19.467	29			
Lack of software development trained staff	Between Groups	.183	3	.061	.171	.915
	Within Groups	9.283	26	.357		
	Total	9.467	29			
Lack of tools and practical facilities	Between Groups	.983	3	.328	.711	.554
	Within Groups	11.983	26	.461		
	Total	12.967	29			
Low commitment from stakeholders	Between Groups	2.633	3	.878	1.324	.288
	Within Groups	17.233	26	.663		
	Total	19.867	29			

Insufficient time to acquire knowledge	Between Groups	1.683	3	.561	.366	.778
	Within Groups	39.817	26	1.531		
	Total	41.500	29			
Poor funding	Between Groups	1.933	3	.644	1.855	.162
	Within Groups	9.033	26	.347		
	Total	10.967	29			
Emphasis on Theory	Between Groups	3.000	3	1.000	1.408	.263
	Within Groups	18.467	26	.710		
	Total	21.467	29			
Inability to communicate skills to the students	Between Groups	2.583	3	.861	1.557	.224
	Within Groups	14.383	26	.553		
	Total	16.967	29			
Inability to quickly grasp the knowledge	Between Groups	3.833	3	1.278	1.255	.310
	Within Groups	26.467	26	1.018		
	Total	30.300	29			
Tedious nature of programming	Between Groups	3.533	3	1.178	1.204	.328
	Within Groups	25.433	26	.978		
	Total	28.967	29			
Inability to understand its importance	Between Groups	2.200	3	.733	1.771	.177
	Within Groups	10.767	26	.414		
	Total	12.967	29			
Epileptic power supply	Between Groups	3.250	3	1.083	2.757	.063
	Within Groups	10.217	26	.393		
	Total	13.467	29			
Low patronage of Indigenous softwares	Between Groups	3.567	3	1.189	5.330	.005
	Within Groups	5.800	26	.223		
	Total	9.367	29			
Insufficient book materials on programming	Between Groups	.933	3	.311	.488	.693
	Within Groups	16.567	26	.637		
	Total	17.500	29			
Poor internet connectivity	Between Groups	9.733	3	3.244	4.190	.015
	Within Groups	20.133	26	.774		
	Total	29.867	29			
Dominance of foreign softwares	Between Groups	7.333	3	2.444	1.890	.156
	Within Groups	33.633	26	1.294		
	Total	40.967	29			
Low government support	Between Groups	.633	3	.211	.236	.870
	Within Groups	23.233	26	.894		
	Total	23.867	29			
Poor ICT skills of students	Between Groups	.283	3	.094	.106	.956
	Within Groups	23.183	26	.892		
	Total	23.467	29			
Lack of personal computers	Between Groups	6.983	3	2.328	1.755	.180
	Within Groups	34.483	26	1.326		
	Total	41.467	29			
Rigidity of the Construction curriculum	Between Groups	4.983	3	1.661	1.281	.302

	Within Groups	33.717	26	1.297		
	Total	38.700	29			
Insufficient knowledge of the construction process	Between Groups	4.533	3	1.511	.930	.440
	Within Groups	42.267	26	1.626		
	Total	46.800	29			
Poor teaching delivering methods	Between Groups	8.733	3	2.911	3.772	.023
	Within Groups	20.067	26	.772		
	Total	28.800	29			

Benefits of integrating software development courses in the area of resource management

This section identified benefits of integrating software development courses in the area of resource management. The variables identified includes increase self-employment of students, boost self-sufficiency and self-reliance of students, increase the knowledge of construction process to the students, improve process of resource management, improve employability of students, higher productivity of the construction industry, diversification of the nation's economy, enrich the construction curriculum, reduce reliance on foreign softwares, increase entrepreneurship instincts, sustainability of the construction industry, improve supervision on construction sites, increase business opportunities, technological Improvement, increase Innovation and creativity, increase accountability and transparency in resource management and reduce waste generated during resource management. The study tested the hypothesis;

H_o: there is no significant difference about the benefits of integrating software development in the construction education.

H_1: there is no significant difference about the benefits of integrating software development in the construction education.

Kruskal wallis was used to test the significance difference of professional background on benefits of software development in construction education as presented in Table 5.

Table 5. Kruskal Wallis test for difference about the benefits of integrating software development

	Benefits of integrating software development
Chi-square	3.589
Df	3
Asymp.Sig	0.309

The table shows that there is no significant difference among construction professionals on the benefits of integrating software development measures at 95% confidence level. This implies that educationists in the fields of civil engineering, building technology, architecture and quantity surveying have the same perception about the benefits integrating software development in the construction education. Where p value > 0.05. Thus, the null hypothesis which states that there is no significant difference about the benefits of integrating software development in the construction education is accepted and the alternative hypothesis is rejected. According to Uzodinma (2015), in every nation, the importance of computer software industry in the development of the nation cannot be overemphasized. The fact that 70% of world's programmers are below 35 years shows that the youth are very important in this industry. Improving the quality of education and training is a critical issue, particularly at a time of educational expansion. ICTs can enhance the quality of education in several ways; by increasing learner motivation and engagement, by facilitating the acquisition of basic skills, and by enhancing teacher training (Haddad & Jurich, 2002).

CONCLUSION AND RECOMMENDATION

The aim of the study was to examine the integration of software development courses in the construction curriculum. The study revealed that the factors that engender learning of software development courses in the construction curriculum can be categorized into three (3) main factors namely teaching support factors, learning Support factors and the regulatory support factors. The teaching support factors are factors such as academic management support, software development trained personnel and training software packages while the learning support factors are availability of internet connection, availability of personal computers and teaching methods. The regulatory support factors were from the variables of funding, government support and curriculum review. The study revealed that poor delivering method, poor internet connectivity and low patronage of indigenous software are significant barriers to the integration of software development courses in the construction curriculum. The study revealed that there was no significant difference among construction professionals on the benefits of integrating software development courses in the construction curriculum. All professions require one software or the other to function. The level of ICT development has found its way to all spheres of life. Therefore, the dire need to tap into the unlimited resources of software development especially the indigenous one. The study recommended the speedy integration of software development courses in the construction curriculum, carefully aided with adequate teaching and learning facilities. The study posits that with the internet age students it may be easier to grasp the knowledge of coding, programming and software development in that may be applicable to the area of study or profession. In addition, government should support and patronize locally developed software in order to aid the growth of the industry in the sub Saharan Africa.

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