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SOFTWARE REQUIRED FOR AUTOMATED GRADING AND FEEDBACK SYSTEM IN EDUCATIONAL SECTOR

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Abstract

The Study focuses on the software Required for Automated Grading and Feedback System in educational sector, with a goal to increase the effectiveness of software development and quality of student's feedback. Three purposes of study and three corresponding research question were raised for the study, three hypotheses also guided the study. The population for the study was 25 respondents comprised 15 computer lecturers and 10 software developers, drawn from technical college of education in south east Nigeria and registered software development companies. Intact sampling technique was used due to the manageable size. The study adopted descriptive survey research design, the instrument for data collection was structured questionnaire, consisting of 25 items in three clusters. The reliability of the instrument tested using Cronbach's Alpha yielded a reliability index of 0.73. The data collected for the study were analysed using mean and standard deviation, while the null hypothesis was tested using independent sample t-test at 0.05 level of significance. Finding from the study revealed that on average, the majority of the respondents agreed to the items in this required which are needed for automated grading and feedback system. The Recommendations noted that an automated grading and feedback system can significantly reduce the burden on educators, enabling them to focus more on instructional

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planning, student engagement, and individualized support. By automating the grading process, teachers can reclaim valuable time, allowing for a more efficient allocation of resources and a better work-life balance.

Keywords: Automated Grading, Feedback, System, Software**,**

Introduction

In this digital era, educational institutions across the globe have witnessed a significant shift from conventional system to online system. This is as a result of emerging technological trends, in order to meetup with the demand of educational sector in this digital era (Hedlund, et al., 2014). This rapid transition has brought forth numerous challenges, particularly in the area of grading and inability of the teachers to provide timely feedback to students, United Nations Refugee Agency (UNHCR) (2019).

Cloud computing is experiencing rapid growth and adoption because of its exceptional adaptability and wide range of applications. The simplicity, rapid data access, scalability, and cost-effectiveness of cloud computing have led to its widespread adoption across various industries, making it the preferred computing model for many organizations (Mell & Grance, 2011; Hashizume et al., 2013). However, this extensive utilization of cloud computing has introduced numerous security concerns, including privileged user access, data location, data segregation, privacy, and compliance risks (Hashizume et al., 2013; Aljawarneh et al., 2021). To safeguard organizational data from threats such as distributed denial-of-service (DDoS) attacks, malware, hackers, and unauthorized access, organizations implement robust cloud security mechanisms, including encryption, identity and access management, intrusion detection, and continuous monitoring (Aljawarneh et al., 2021; Kumar & Goyal, 2019).

In the realm of software analytics, Westerlund, Hedlund, Pulkkis, and Björk (2014) noted the need for a generalized and scalable software architecture capable of analyzing temporally structured big data in cloud environments. Software analytics involves the systematic analysis of software-related data to generate actionable insights that support decision-making, improve

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software quality, and enhance development processes (Menzies & Zimmermann, 2013; Hassan, 2020). Consequently, software analytics has attracted considerable research attention because of its potential to extract valuable knowledge from diverse software repositories for developers, managers, and other stakeholders.

In Software Engineering, effective collaboration and communication among software developers are fundamental to the successful development of software projects (Storey et al., 2017). Launchpad (2011) described Launchpad as a software collaboration platform that supports distributed software development. Collaboration tools comprise a suite of technologies that enable real-time messaging, group chat, file sharing, shared calendaring, project coordination, and voice and video communication for both individual and group interactions (Storey et al., 2017; Microsoft, 2023). These tools can also be centrally managed within enterprise environments, thereby simplifying administration and improving team productivity.

The concepts of collaboration and communication have been extensively discussed in the literature on Computer-Supported Cooperative Work (CSCW) and Software Engineering (SE). These concepts are frequently used to describe the distributed development of shared software artefacts through a division of labour (Grudin, 1994; Herbsleb & Mockus, 2003). Different levels of collaboration have been identified, including (a) informing, (b) coordinating, (c) collaborating, and (d) cooperating. In this taxonomy, cooperation differs from collaboration because it involves participants with equal rights pursuing individual goals that contribute to a shared collective objective. Like collaboration, cooperation requires continuous and intensive interaction among participants (Grudin, 1994; Ellis et al., 1991).

According to Chang, Hung, and Hsieh (2014), cultural adaptation, communication quality, and interpersonal trust are critical factors influencing the effectiveness of virtual software development teams. Effective communication technologies facilitate collaboration among team members, which is fundamental to the software development process (Chang et al., 2014; Storey et al., 2017). Successful software product development depends on software engineers working

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collaboratively, communicating clearly and effectively, and resolving emerging issues throughout the software development lifecycle (Pressman & Maxim, 2020).

Statement of the Problem

Previous studies have shown that students' performance in in most science courses has been poor and this poor performance has been a great concern to educators. This problem has been attributed to so many factors. However, one of the major factors responsible for the poor performance of students is overcrowded classroom. Consequently, researchers argues that overcrowded classrooms a challenges which disrupt objective of education as most teachers and students experience marking difficulties, problem of assessment, evaluation and feedback, which lead to frustration for both teachers and learners, as well as also lead to poor performance. Also, the existence of the insurgencies in the country and inter/intra state disputes, have necessitated that educational industries create an avenue for continued teaching, learning and assessment even in the face of these threats that could lead to national school closure. Therefore, a broad gap exists in the present situation of assessment and feedback. As a result of the present situation, needs A Software Requirements for Automated Grading and Feedback System (AGFS), so as to enable the students assessed their immediate feedback through automated means. These are the gaps that the study hopes to fill, to identified the software required in automated grading and feedback to improve the quality and speed of feedback

Purpose of the Study

The purpose of this research is to identify the software requirements for automated grading and feedback in educational sector. Specifically, the study is sought to:

1. determine the programming language, framework and database management system (DBMS) needed for automated grading and feedback system;
2. determine the web and Mobil development tools) in automated grading and feedback system;
3. determine the content management system (CMS) and version control system (VCS) in automated grading and feedback system.

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Research Questions

1. What are the Programming Language, Framework and Database Management System (DBMS) needed for automated grading and feedback system?
2. What are the Web and Mobile Development Tools Needed in Automated Grading and Feedback System?
3. What are the Content Management System (CMS) and Version Control System (VCS) needed in Automated Grading and Feedback System?

Hypotheses

HO_1: There is no significant difference in mean response of lecturers and software developers on the programming language, framework and database management system (DBMS) needed for automated grading and feedback system.

HO_2: There is no significant difference in mean response of lecturers and software developers on the web and mobile development tools needed in automated grading and feedback system

HO_3: There is no significant difference in mean response of lecturers and software developers on the Content Management System (CMS) and Version Control System (VCS) needed in automated grading and feedback system.

Methodology

The study adopted descriptive survey design. The study was carried out in Technical Colleges of Education in the Southeast Nigeria. The population for the study was 25, comprised of 15 lecturers from technical colleges of education in southeast and 10 software developers from registered software development companies in southeast Nigeria, intact sampling was used due to the manageable size, the instrument for data collection was structured questionnaire contained is 3 clusters with 25 items titled: software required for automated grading and feedback system in educational sector developed by the researcher. The questionnaire was subjected to validation by 3 experts. The data collected for the study were analysed using mean and standard deviation, while the null

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hypotheses were tested using an independent sample T-test at 0.05 level of significance using SPSS.

Results

Research question 1: What are the Programming Language, Framework and Database Management System (DBMS) needed for automated grading and feedback system

Table 1. Mean ($\overline{X}$) and Standard Deviation (SD) of Programming Language, Framework and Database Management System (DBMS) needed for Automated Grading and Feedback System

S/N	Items	N	$\overline{X}$	SD	Remark
1	HTML/CSS	25	3.52	0.872	Required
2	JAVA	25	2.64	0.860	Required
3	PhP or ,net	25	2.08	0.400	Not Required
4	Framework :Ruby on Rails, Laravel	25	3.00	0.913	Required
5	Django or Spring that expedite development	25	2.96	0.935	Required
6	An efficient DBMS for storing and managing user's data	25	2.72	0.980	Required
7	MYSQL, or PostgreSQL that manage course content	25	2.80	1.000	Required
8	Oracle Programming Language	25	2.72	1.208	Required
9	MongoDB	25	3.04	0.935	Required
10	Python	25	2.64	0.860	Required
Cluster 1 Average		**25**	**2.81**	**0.499**	Required

Key: *Required ≥ 2.50; Not Required < 2.5*

Result in Table 1 shows that the respondent considered nine out of the ten as required programming language, framework and database management system (DBMS) needed for

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automated grading and feedback system since they have mean ratings above the criterion mean of 2.5. Only item 3 (PhP or .net) has a mean rating below 2.5, hence was considered not required. A cluster average of 2.81±0.50 implies that on average, the majority of the respondents agreed to the items in this cluster as required programming language, framework and database management system (DBMS) needed for automated grading and feedback system.

Research question 2: What are the Web and Mobile Development Tools Needed in Automated Grading and Feedback System?

Table 2. Mean (X) and Standard Deviation (SD) of Web and Mobile Development Tools Needed in Automated Grading and Feedback System

S/N	Items	N	$\overline{X}$	SD	Remark
11	HTML	25	2.48	.872	Not Required
12	JavaScript	25	2.48	.872	Not Required
13	CSS	25	2.48	.872	Not Required
14	React frameworks	25	2.88	1.013	Required
15	Angular frameworks	25	2.92	1.152	Required
16	Vuejs to enhance web development	25	2.48	1.005	Not Required
17	Swift for native App development	25	2.80	.764	Required
18	Kotlin web development App	25	2.12	.726	Not Required
19	Flutter for cross platform App development	25	3.24	.779	Required
20	Front end components	25	3.04	.935	Required
Cluster 2 Average		**25**	**2.69**	**.630**	**Required**

Key: *Required ≥ 2.50; Not Required < 2.5*

Result in Table 2 shows that items 11, 12, 13, 16, and 18 which correspond to HTML, Java Script, CSS, Vuejs to enhance web development and Kotlin web development App were not required as web and mobile development tools needed in automated grading and feedback

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system since their mean ratings is below the 2.5 benchmark. The requires tools are items 14, 15, 17, 19, and 20 which have their mean ratings is above the criterion mean of 2.5. The cluster mean of 2.69±0.63 show that overall, the respondent agreed that these items are required as web and mobile development tools needed in automated grading and feedback system.

Research question 3: What are the Content Management System (CMS) and Version Control System (VCS) needed in Automated Grading and Feedback System

Table 3. Mean ($\overline{X}$) and Standard Deviation (SD)Content Management System (CMS) and Version Control System (VCS) needed in Automated Grading and Feedback System

S/N	Items	N	X	SD	Remark
21	Wordpress that can streamline content creation	25	2.48	0.872	Not Required
22	Drupal that organizes and delivers content	25	2.32	1.030	Not Required
23	Moodle	25	2.88	1.013	Required
24	Tracking code	25	2.08	0.400	Not Required
25	GIT that enables collaboration.	25	2.88	1.013	Required
Cluster 3 Average		**25**	**2.53**	**0.69**	**Required**

Key: *Required ≥ 2.50; Not Required < 2.5*

Table 3 showed that items 21, 22, and 24 have their mean ratings below the criterion mean of 2.5, hence they are considered as not required. However, items 23 (Moodle) and item 25 (GIT that enables collaboration) had their mean ratings above the 2.5 criterion mean, hence they are considered required. A cluster mean of 2.53 indicate that on average, they respondents agreed that they listed items were content management system (CMS) and version control system (VCS) needed in automated grading and feedback system

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Hypotheses

The following hypotheses were tested at 0.05 level of significance (95% confidence interval):

HO_1: There is no significant difference in mean response of lecturers and software developers on the programming language, framework and database management system (DBMS) needed for automated grading and feedback system.

Table 4. Summary of Independent t-test on Mean Response of Lecturers and Software Developers on the Programming Language, Framework and Database Management System (DBMS) Needed for Automated Grading and Feedback System

Experts Category	N	Mean	SD	T	Df	Sig. (2-tailed)	Remark
Lecturers	15	2.79	0.48	-0.228	23	.822	Not Significant
Software Developers	10	2.84	0.53				

Result in Table 4 shows that the lecturers had a mean rating of 2.79±0.48 while the software developers have a slightly higher mean rating of 2.84±0.53. The tested HO_1 show no significant difference between the responses of lecturers and that of the software developers $t(2, 23) = -0.228$, $p \geq 0.05$ (2-tailed). This mean that the lecturers and software developers do not differ in their opinion on programming language, framework and database management system (DBMS) needed for automated grading and feedback system.

HO_2: There is no significant difference in mean response of lecturers and software developers on the web and mobile development tools needed in automated grading and feedback system

Table 5. Summary of Independent t-test on Mean Response of Lecturers and Software Developers on the Web and Mobile Development Tools Needed in Automated Grading and Feedback System

Experts Category	N	Mean	SD	t	df	Sig. (2-tailed)	Remark
Lecturers	15	2.65	0.65	-0.433	23	0.669	Not Significant
Software Developers	10	2.76	0.62				

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Result in Table 5 shows no statistically significant difference in the mean response of lecturers and that of the software developers t(2, 23) = -0.433, p ≥ 0.05 (2-tailed). This mean that the lecturers and software developers do not differ in their opinion on the web and mobile development tools needed in automated grading and feedback system.

HO_3: There is no significant difference in mean response of lecturers and software developers on the Content Management System (CMS) and Version Control System (VCS) needed in automated grading and feedback system.

Table 6. Summary of Independent t-test on Mean Response of Lecturers and Software Developers on the Content Management System (CMS) and Version Control System (VCS) needed in Automated Grading and Feedback System

Experts Category	N	Mean	SD	t	df	Sig. (2-tailed)	Remark
Lecturers	15	2.49	0.74	-0.300	23	0.767	Not Significant
Software Developers	10	2.58	0.66				

Table 6 shows that there is no statistically significant difference in the mean response of lecturers and that of the software developers t(2, 23) = -0.300, p ≥ 0.05 (2-tailed). This mean that the lecturers and software developers do not differ in their opinion on the Content Management System (CMS) and Version Control System (VCS) needed in automated grading and feedback system.

Recommendations

Some recommendations are enclosed:

1. Embrace Efficiency and Time Savings: An automated grading and feedback system can significantly reduce the burden on educators, enabling them to focus more on instructional planning, student engagement, and individualized support. By automating the grading process, teachers can reclaim valuable time, allowing for a more efficient allocation of resources and a better work-life balance.

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2. Enhance Feedback Turnaround Time: The implementation of an automated system ensures prompt and timely feedback for students. Real-time evaluations empower learners to reflect on their performance, make timely corrections, and better understand the subject matter. This immediate feedback loop fosters a deeper understanding of concepts and enhances overall learning outcomes.
3. Foster Consistency and Objectivity: Automated grading and feedback systems adhere to predefined rubrics and criteria, ensuring consistency and objectivity in evaluations. By eliminating subjective biases, the system creates a level playing field for all students, promoting fairness and equity in the assessment process.

Conclusion

In conclusion, in this digital era demands innovative approaches to grading and feedback that align with the evolving educational landscape. Automated grading and feedback systems have emerged as a compelling solution, offering efficiency, objectivity, and timely evaluations. By embracing technology and leveraging artificial intelligence, educators can create a learning environment that empowers students, promotes continuous improvement, and ensures a fair and robust assessment process. As we navigate the new normal of education, the implementation of automated grading and feedback systems holds immense potential to revolutionize the educational experience and facilitate the holistic development of learners

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