



## **Design and Implementation of CERPS for Examination Officers in Universities in Enugu State**

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### **Abstract**

The study focused on the development of computerized examination result processing system for universities in Enugu State. Four research questions were formulated to guide the study. Research and Development (R&D) design was adopted for the study. The population for the study was 181 respondents. This consists of 97 exam officers and 60 personnel from exams and records; 9 computer education lecturers; 15 exam officers from the selected five faculties. The entire population was studied because it is manageable. A structured questionnaire of 48 items was used to collect data and was face-validated by five experts; two lecturers from the Department of Computer and Robotics Education, two lecturers from the Department of Computer Science, and one ICT expert from the ICT Unit, all from the University of Nigeria, Nsukka. Data collected were analyzed using mean scores. The findings of the study revealed that Computerized Examination Result Processing System (CERPS) could be better used to manage students' examination results processing issues than the existing conventional methods currently used in most Nigerian tertiary institutions. Findings of the study also revealed high-level of satisfaction among respondents on the functionalities of CERPS in handling result processing of the universities sampled. It was therefore recommended that Staff at examination and records units as well as examination officers should be motivated and encouraged to make use of CERPS for accurate processing of students' results in Nigerian higher institutions especially the universities in Enugu State.

**Keywords:** Computerized Examination, Result Processing, Examination Officers, Universities, Electronic Management.

### **Introduction**

The education sector has experienced tremendous growth as a result of the introduction, adoption and implementation of Information and Communication Technology (ICT) into its day-to-day academic and non-academic activities. According to Bala (2018) and Alkamel and Chouthaiwale (2018), ICT has immensely contributed to the quality and quantity of teaching and learning and research in traditional and distance education institutions. ICT enhances teaching and learning through its dynamic interactive and engaging content and provides real opportunities for individualization of instruction (Brewer & Movahedazarhouligh, 2018). Integrating ICT in higher education has led to the computerization of various aspects of teaching and learning (Tokareva, Smirnova & Orchakova, 2019) like real-time teaching and learning using Zoom, Facebook, YouTube; collaborative learning using social media tools and interactive learning tools like simulations, animations; the use of computerized learning assessment tools like iSpring Quizmaker, Examus, PESofts, R-Exams, etc. for assessing students' academic achievement in a course; as well as the use

of Learning Management Platforms like Moodle, Blackboard, WebCT, etc. for online teaching and learning.

Virtually all higher institutions in Nigeria have moved from the traditional way of teaching and learning to electronic methods of teaching and learning (Crawford, Butler-Henderson, Rudolph, Malkawi, Glowatz, Burton & Lam, 2020; Eze, Chinedu-Eze & Bello, 2018; Obi, Charles-Okoli, Agunwa, Omotowo, Ndu & Agwu-Umahi, 2018). Most universities now have functional websites and eLearning platforms that include the Computer-Based Testing (CBT) services among others. The test administered by these institutions are graded automatically online and the results are downloaded in pdf, xls or csv file format. The results are then forwarded to Examination Officers for appropriate documentation, computation of the CGPA and liaising with the Examination and Records Unit for final completion of students' results and the award of degree. This process is tedious and time-consuming due to the manual approach adopted by examination officers in accessing, verifying, authenticating, documenting and computing students' results.

In order to achieve maximum efficiency in this regard, reliable and secure information system is required especially as it concerns the processing and management of students' results (Hina & Dominic, 2018). This has become a vital issue on the part of the students as they spend so much time trying to compute their Grade Point Average (GPA) through the appropriate authority in the university (Exams and Records Unit) (Genesis & Oluwole, 2018). Ukem and Ofoegbu (2012) reported that the existing system of processing undergraduate students' results is inefficient and has led to time-wasting and inaccuracy of results, and poor handling of students' results. Also, cases of missing results have been reported thereby making examination results' processing more difficult and time-consuming (Emaikwu, 2012; Nwosu, 2017; Huda, Kabir & Siddiq, 2020). The existing result computing system, which is manual-based, also leads to errors during the processing of results. Students spend days or even months to have their results retrieved and computed, especially for students seeking a scholarship, transfer to other institutions or admission into other degree-awarding institutions. Furthermore, students contesting for Student Union Government (SUG) positions are to submit their GPA to the appropriate authority for screening before allowing them to contest. Oftentimes, it takes many days for examination officers to trace, collect, compile and compute the GPAs of these students thereby disqualifying some of them from contesting such posts. Based on this, the present study developed a Computerized Examination Result Processing System (CERPS) for efficient management of students' results in this digital age. The new system, CERPS, was developed based on accessibility, ease of use, user-friendliness, simplicity, cost-effectiveness, security and as an alternative effective solution to the conventional paper-based exam results' computation, reporting and distribution. According to Eludire (2011), electronic management systems have proven to be an efficient and effective means of handling manual jobs for accuracy, reliability, efficiency, and security.

The findings of this study will be of immense benefit to students in that their results will always be available to access without stress and delay. Especially, the final year students will graduate on time since their entire results have been computerized. Examination officers and the Exams and Records Unit of the institutions will be more productive with the use of CERPS for results' processing, which will relieve them of too many paper work and manual computation of results that could lead to errors. The university will appreciate the new system because it will facilitate the effectiveness and quality of service delivery by the university.



### **Statement of the Problem**

The manual system of processing students' results has been flawed with so many shortcomings which include delay in processing of students' results, errors in results' computations, missing results, inefficiency in the management of students' bio-data, among others. It is obvious that the institutions surveyed in this study have functional websites and had at some point introduced a kind of innovation by subscribing to online commercial results' processing platforms that manage students' records including results' computation and grading. It was observed that this kind of innovation has not been sustained either as a result of expired subscriptions or poor management of the system coupled with problems such as the complexity of such a system and lack of adequate skills to operate it. In these institutions, preliminary findings revealed that the manual method is still being used for results' processing due to the fact that it has been the acceptable normal practice in these institutions for decades. Therefore, the present study designed and developed a Computerized Examination Results Processing System (CERPS) that will enhance the overall management and processing of students' bio-data and results as well as increase productivity on the part of the exam officers and personnel at the Exams and Records Unit. The new system was developed to align with the results' computation process and grading system in Nigerian higher education according to the National Universities Commission (NUC) guidelines and procedures. Secondly, the new system, CERPS, does not require any subscription or extensive training for its use since it has an interface and structure that is user-friendly.

### **Purpose of the study**

The main purpose of this study is to develop Computerized Examination Result Processing System (CERPS) for universities in Enugu State. Specifically, this study sought to:

1. Determine the objective of CERPS.
2. Determine the requirements of the new system (CERPS).
3. Develop CERPS.
4. Validate the developed CERPS for acceptability.
5. Determine the extent to which Exam Officers are satisfied with CERPS for use in results' computation and management.

### **Research Questions**

1. What are the objectives of the CERPS?
2. What are the requirements of the new system (CERPS)?
3. What is the level of acceptability of CERPS by experts during the validation process?
4. To what extent are exam officers satisfied with the CERPS for use in results' computation and management?

## Methodology

The Research and Development (R&D) design was adopted for this study. Gall, Gall and Borg (2007) described R & D as an industry-based development model in which the findings of the research are used to design new products and procedures which then are systematically field-tested, evaluated and refined until they meet specified criteria of effectiveness, quality or standard. According to Nworgu (2006), R & D is aimed at developing and testing more efficacious educational products that could be textbook, equipment and curricular. R&D is appropriate for this study because it aimed at using research findings and following specific phases to develop a computerized examination result processing system for use in universities in Enugu State. The design has the following steps: (1) Identifying the instructional goal or goals; (2) Conducting instructional analysis; (3) Analyzing learners and contexts; (4) Writing performance objectives; (5) Developing assessment instruments; (6) Developing and selecting instructional strategies; (7) Developing and selecting instructional material; (8) Designing and conducting formative evaluation of instruction; (9) Revising instruction; (10) Designing and conducting summative evaluation. However, Gall, Gall and Borg (2007) indicated that the above 10 steps must not all be used in a study, but could be modified to suit the conditions peculiar to the study. Thus, the 10-phased R&D model of Gall et al, was modified to 4-phased cycle which fitted into this study:

- Phase I** Needs Assessment (determination of objectives of CERPS and the components of CERPS in terms of input, storage, process and output)
- Phase II** Development of CERPS.
- Phase III** Validation of the CERPS.
- Phase IV** Trial-testing the validated CERPS.

This study was carried out in public universities in Enugu State, Nigeria, which include University of Nigeria, Nsukka (UNN) and Enugu State University of Science and Technology (ESUT). The sample size of the study was 83 first year undergraduate students. The population for the study was grouped in 3 phases. Phase I consists of 157 respondents made up of 97 exam officers and 60 personnel from Exams and Records Unit. These respondents provided information on the required objectives of the study as well as the requirements for the design and development of the new system (CERPS). Phase III consists of 9 respondents made up of three computer education lecturers, three computer science lecturers, and three staff of the ICT Unit. This category of respondents are ICT experts who validated the developed system (CERPS) for acceptability based on its functionality and the extent to which it meets user requirements. Phase IV was made up of 15 examination officers, which consists of three officers from the selected five faculties (Education, Vocational and Technical Education, Agriculture, Engineering, and Pharmacy). These respondents (exam officers) trial-tested the CERPS and rated their level of satisfaction with the new system, on a four-point Likert scale.

The instrument that was developed for the study was also divided into three phases. In Phase I, the CERPS Questionnaire (CERPSQ) was used to collect data from respondents on the objectives and requirements for the design and development of CERPS. In Phase III, the CERPS Validation Questionnaire (CERPSVQ) was used to collect data from respondents (ICT Experts) on the functionality and efficiency of CERPS. In Phase IV, the CERPS Acceptance Questionnaire (CERPSAQ) was used to collect data from exam officers regarding their perception of CERPS. The researchers closely supervised the research assistants in the questionnaire administration and



collection activities.

The reliability of the instrument was determined using Cronbach alpha method, which yielded reliability coefficients of 0.85, 0.96, 0.82, and 0.85 respectively for the four clusters in the instrument developed for the study, while the overall alpha value obtained was 0.86. The instrument was administered and retrieved by the researchers. Mean scores and the standard deviations were statistical tools used to answer the research questions formulated to guide. The decision for answering the research questions was based on the real limit of numbers. The following benchmarks were used for the interpretation of the results of the study: items  $\geq 3.50$  are Highly Required/Strongly Agree (HR/SA); items  $\geq 2.50$  and  $\leq 3.49$  are Required/Agree (R/A); items  $\geq 1.50$  and  $\leq 2.49$  are Slightly Required/Disagree (SR/D); and items  $\leq 1.49$  are Not Required/Strongly Disagree (NR/SD). On the other hand, standard deviation of less than 1.96 were considered as opinions that are very close. Statistical package for the Social Sciences (SPSS) version 21 was used for computation of the data generated.

## Results

This section presents the analysis of the data collected for the study, which were done in tables and arranged according to the research questions formulated for the study.

### Research Question 1

*What are the objectives of the new system (CERPS)?*

**Table 1**

*Mean and Standard Deviation of Responses of Respondents on the Objectives of the Computerized Examination Result Processing System (CERPS) for Universities in Enugu State.*

		N = 157		
S/N	ITEMS	$\bar{x}$	SD	DECISION
1	Register students in the CERPS	4.00	0.10	HR
2	Save students' records online	3.76	0.53	HR
3	Save students' records offline	4.00	0.10	HR
4	Update students' records regularly	3.61	0.49	HR
5	Compute students' results	3.77	0.42	HR
6	Report students' performance intermittently	3.59	0.49	HR
7	Delete students' records if necessary	3.52	0.50	HR
8	Detect duplicate records	3.64	0.48	HR
9	Backup records of students regularly	3.87	0.34	HR
10	Restrict unauthorized access to CERPS (security)	3.89	0.31	HR
11	Regular upgrade of CERPS	3.75	0.43	HR
12	Error handling measures to prevent data corruption	3.65	0.51	HR

**KEY:**  $\bar{x}$  = Mean, SD = Standard Deviation, N = Number of Respondents.

The data presented in Table 1 shows that all the items are highly required objectives for the development of CERPS with mean values ranging from 3.52-4.00 on a 4-point rating scale. The standard deviation of the items ranged from 0.10 - 0.53. This reveals that the respondents were close to one another in their opinions from the mean.

### Research Question 2

*What are the requirements of the new system (CERPS)?*

**Table 2**

*Mean and Standard deviation on the Requirements of the New System*

S/N	ITEMS	N = 9		
		$\bar{x}$	SD	DECISION
1	Student Bio data	4.00	0.10	HR
2	Student results and CAs	3.56	0.53	HR
3	Internet connectivity	3.67	0.50	HR
4	External Backup Storage Device	3.33	0.87	R
5	Computer system with high configuration	3.56	0.53	HR
6	Database software	3.67	0.50	HR
7	High-Level Programming Language	3.56	0.53	HR
8	Document converter such as converting to Pdf, Word, Excel, etc.	3.56	0.73	HR
9	Local Server	3.89	0.33	HR
10	HTML	3.78	0.44	HR
11	CSS	3.67	0.50	HR
12	DJANGO	3.78	0.44	HR
13	Web Browser	3.78	0.44	HR
14	Php	3.33	0.50	R

**KEY:**  $\bar{x}$  = Mean, SD = Standard Deviation, N = Number of Respondents

The data presented in Table 2 reveals that all the items except items 4 and 14 were rated by the respondents as highly required with mean values ranging from 3.56-4.00, on a 4-point rating scale. Items 4 and 14 have mean value of 3.33 ( $\bar{x} = 3.33$ ) indicating that the items are required as components needed to develop CERPS. The standard deviation of the items ranged from 0.10-0.87 indicating that all the respondents are not far from the mean scores since the responses clustered around the mean.

### Research Question 3

*What is the level of acceptability of CERPS by ICT Experts during the validation period?*



**Table 3**

**Mean and Standard Deviation of Respondents on the Level of Acceptability of CERPS**  
**N = 9**

S/N	ITEMS	$\bar{x}$	SD	DECISION
1	Successful creation of students' records	3.44	0.10	A
2	Adding students' records to CERPS'S database is easy and effective	3.33	0.53	A
3	CERPS successfully saves students' records during the registration process	3.00	0.50	A
4	Students' records are automatically updated when modified	3.89	0.71	SA
5	Computation of results in CERPS is accurate and well-formatted	3.56	0.33	SA
6	CERPS produces an excellent report on the student's academic performance	3.22	0.53	A
7	CERPS automatically detects duplicate records during the registration of students	3.89	0.44	SA
8	The delete command in CERPS performs the delete operation effectively	3.11	0.33	A
9	CERPS has the capability of backing up students' exam records on demand	3.67	0.71	SA
10	Detecting illegal intrusion into the new system (CERPS) was very strong	3.22	0.44	A
11	CERPS can handle runtime errors during the implementation process	3.44	0.53	A

**KEY:**  $\bar{x}$  = Mean, SD = Standard Deviation, N = Number of Respondents

The data presented in Table 3 reveals positive ratings of the CERPS by ICT Experts on the level of its acceptability for result processing in universities in Enugu State. Out of the 11 items in Table 3, four were rated Strongly Agree with mean values ranging from 3.56 – 3.89 while the remaining seven items were rated Agree with mean values ranging from 3.00-3.44, on a 4-point rating scale. The standard deviation of the items ranged from 0.10-0.71. This revealed that the respondents were close to one another in their opinions from the mean.

#### Research Question 4

*To what extent are exam officers satisfied with the CERPS for use in universities in Enugu State?*

**Table 4**

***Mean and Standard Deviation on the Extent to which Exam Officers are Satisfied with CERPS***

**N = 15**

S/N	ITEMS	$\bar{x}$	SD	DECISION
1	The CERPS has a standard user interface	4.00	0.10	SA
2	CERPS is easy to use	3.76	0.53	SA
3	CERPS provides quick response to user actions	4.00	0.10	SA
4	I like the way CERPS register and store students' records	3.61	0.49	SA
5	CERPS is great in computing students' results	3.77	0.42	SA
6	I enjoyed using the CERPS for results' computations and management	3.59	0.49	SA
7	The CERPS automatically and successfully graded students based on their Exam scores	3.52	0.50	SA
8	CERPS accurately computes and displays students' class of degree at the end of their University Education	3.64	0.48	SA
9	I will be glad to install CERPS or register to use it online in order to make my job easier	3.87	0.34	SA
10	I am willing to recommend CERPS to my school authority	3.89	0.31	SA

*KEY:  $\bar{x}$  = Mean, SD = Standard Deviation, N = Number of Respondents*

The data presented in Table 4 reveals high level of satisfaction among exam officers on the functionality of CERPS with mean values ranging from 3.52-3.89, on a four-point Likert scale. The standard deviation of items 1-10 ranged from 0.10-0.53. This is an indication that the respondents were close to one another in their opinions from the mean.

### **Discussion Findings**

The results shown in Table 1 revealed that the respondents rated all the objectives of CERPS as highly required for its design and development. These objectives include ability to register students in the CERPS, save students' records online, save students' records offline, update students' records regularly, compute students' results, report students' performance intermittently, delete students' records if necessary, detect duplicate records, backup records of students regularly, among others. This is in line with Dada, Raji, Oyedepo, Yusuf and Saka (2017) who conducted similar study that revealed the vital components of result processing and transcript generation system to include managing courses (user can add new course(s) and view available courses), managing students' data (user can add new student record(s) and view available students' record), managing results (user can add new result(s) and view and process available results in different types), and modifying login details. Also, according to UKEssays (2018), the primary objective of any online transaction processing system is to capture, gather, process, and store transactions and to produce useful documents related to routine business activities to managers.

The data presented in Table 2, provided answers to research question two. The findings revealed that respondents agreed that for the new system to be effective and efficacious, the following requirements have to be met and integrated appropriately: students' biodata, students' results and CAs,





external backup storage device, internet connectivity, computer system with high configuration, database software, high-level programming language, document converter such as converting to Pdf, Word, Excel, etc., local server, HTML, CSS, DJANGO, Web Browser, PHP. This is in line with Dada, Raji, Oyedepo, Yusuf and Saka (2017) who listed the requirements for developing an online result processing and transcript generation system to include HTML5, CSS3, Java Script for client side, PHP (Hypertext Pre-Processor) as server-side programming language and MySQLi (My Structural Query Language Improved) as relational database and WAMP (Window Apache MySQL and PHP) server for local hosting and testing of the new system.

The data presented in table 3, provided answers to research question three. The findings revealed that ICT experts who validated CERPS agreed that the new system creates students' records successfully, adds students' records to CERPS'S database with ease and efficiency, successfully saves students' records during the registration process, automatically updates students' records when modified, results' computation in CERPS is accurate and well-formatted, among others. This finding reveals that there was high level of acceptability of CERPS by the ICT experts. This is in line with Nwangwu (2018) whose study revealed high level of acceptability with a developed Interactive PowerPoint Presentation Design Training Package (IPPDTP) by ICT experts. Furthermore, Table 3 reveals that item 4 (Students' records are automatically updated when modified) and item 7 (CERPS automatically detects duplicate records during the registration of students) had the highest mean score ( $\bar{x} = 3.89$ ), indicating that the new system is accurate and very effective in handling online results. This is in agreement with UKEssays (2018) stating that every functional online transaction processing system must maintain high degree of accuracy, ensure data and information integrity, produce timely documents and reports, increase labour efficiency and help provide increased and enhanced services.

The data presented in Table 4, provided answers to research question five. The findings revealed that exam officers are satisfied with the new system (CERPS). They agreed that CERPS would be of great assistance to their job especially in terms of the arrangement of controls on its standard dashboard (user interface), ease-of-use, quick response to actions, its ability to register and store user records, efficiency in computing students' results, its automatic grading capabilities, among others. This is in line with the findings of Atreja et al. (2008) who stated that the overall course satisfaction in a web-based training was good with more than 75% of the respondents satisfied with the training and 65% preferring web-based training over traditional instructor-led training. A study by Nwangwu (2018) found that lecturers were highly satisfied with IPPDTP in mastering PowerPoint design and presentation. This indicates that the use of software in solving problems provides faster and efficient services than the manual approach. Furthermore, Table 4 reveals that item 1 (CERPS has a standard user interface) and item 3 (CERPS provide quick response to action) had the highest mean value ( $\bar{x} = 4.00$ ). This is consistent with Koltow (2018) who asserts that the most visible element of a software is its user interface - the screens, dialog boxes, buttons, panes, and other parts of the application window. CERPS' standard user interface makes it very easy to use by the exam officers with little or no training since it is user friendly. According to Mehta (2019), the functionalities of an exam software such as user-friendly dashboard, multiple languages, support for multiple question types and formats, detailed reporting, automatic instant results help in smooth operation.

## Conclusion

The study designed and developed a Computerized Examination Results Processing System (CERPS) for Examination Officers in Universities in Enugu State, Nigeria. The findings of the study revealed that the objectives required for the development of CERPS include ability to register students in the CERPS, save students' records online and offline, update students' records regularly, compute students' results, report students' performance intermittently, among others. The findings of the study also revealed that computer systems with high configuration, database software, high-level programming language, document converter such as converting to Pdf, Word, Excel, etc., local server, HTML, CSS, DJANGO, Web Browser and PHP are highly required for the development of CERPS. Furthermore, validation of CERPS revealed that there was high level of acceptability of CERPS by the ICT Experts. Exam Officers who trial-tested the system reported high-level of satisfaction with CERPS, indicating that the software met the purpose and requirements for which it was designed and developed. They agreed that CERPS would be of great assistance to their job especially in terms of the arrangement of controls on its standard dashboard (user interface), ease-of-use, quick response to actions, its ability to register and store user records, efficiency in computing students' results, its automatic grading capabilities, among others. Therefore, with the availability of CERPS, exam officers and the exam unit personnel will be able to use CERPS to enhance the overall management and processing of students' results as well as lead to increased productivity and quality of service delivery on the part of staff and the institutions as a whole.

## Recommendation

Based on the findings of the study, the following recommendations were made

1. Staff at the Examination and Records Unit of the Registrar's Office should be encouraged by the Registrar to make use of CERPS to process student results.
2. Exam officers and the Exams and Records Unit should be provided with modern ICT facilities such as computers with high configuration, internet, etc. that will facilitate the processes involved in results' processing and grading.
3. Government and school authorities should sponsor similar researches that will promote service delivery in tertiary institutions.

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