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DOSCST Automated State College Admission and Scholarship Test

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Abstract

As Davao Oriental State College of Science and Technology (DOSCST) moves for better and quality education, this study was conducted to have a full grasp of the transactions and processes of the Davao Oriental State College of Science and Technology State College Admission and Scholarship Test (DOSCST SCAST) to improve its conduct. The automation of SCAST, the improvement of its data access and retrieval, security of examination and results data to make the transactions and processes done in a less period of time are the main objectives of the study. Prototyping methodology was used in DOSCST Automated SCAST development. This allows the team to build a prototype within a short period of time and enhancing it as the prototyping iteration process continues. DOSCST-Automated SCAST will have a great role in DOSCST's Guidance Counseling and TestingCenter (GCTC) and to the DOSCST administration as well. This will provide efficient transactions to the GCTC and ease to the examinees during examination. In addition, this will also make way in providing filtered data information to future studies about the DOSCST's entrance examination process. Finally, this study helps in achieving a better and quality education in DOSCST Thus, DOSCST should adopt the conduct of DOSCST Automated State College Admission and Scholarship Test as its basis in accepting new students and in selecting its scholars.

Keywords: Education, Automated, Prototyping, Iteration, Scholarship

Introduction

Idealism is the product of continuous search for perfection. It has become an attitude that everyone geared through constant change that brings out the fresh and best ideas in each of us for a developed way of living. Today's changes enhanced the way of living because people keep up with the changes. They had brought people to higher levels of development that are made as the point of standards for different sectors. The economic, political, education and entertainment sectors are just few of the many dependent groups in technology innovation. Being a part and beneficiaries of the technology innovation, the researchers help push forward for its best and maximum speed of development. As a team, the researchers have agreed to develop software that will help the education sector uplift its standards specifically Davao Oriental State College of Science and Technology (DOSCST).

Thus, the researchers presented the study on engineering a "DOSCST Automated State College Admission and Scholarship Test" to improve GCTC's conduct of SCAST examination. The Automated SCAST used Microsoft Visual Basic 6.0, Microsoft Access 2000 and Windows 98 for the examination.

METHODOLOGY

Developing the DOSCST Automated State College Admission and Scholarship Test for incoming freshman students falls within the transaction processing system. The transaction process of this study is fully illustrated in the theoretical framework. Belonging to the principles of transaction processing system, the researchers decided to use prototyping method for its software engineering system analysis and design. Prototyping is a process that enables the developer to create a model of the software that must be built. It is a method that is appropriate in presenting the capabilities and advantages of the said project. The figure below shows the sequence of events for the prototyping paradigm (Pressman, 1992).

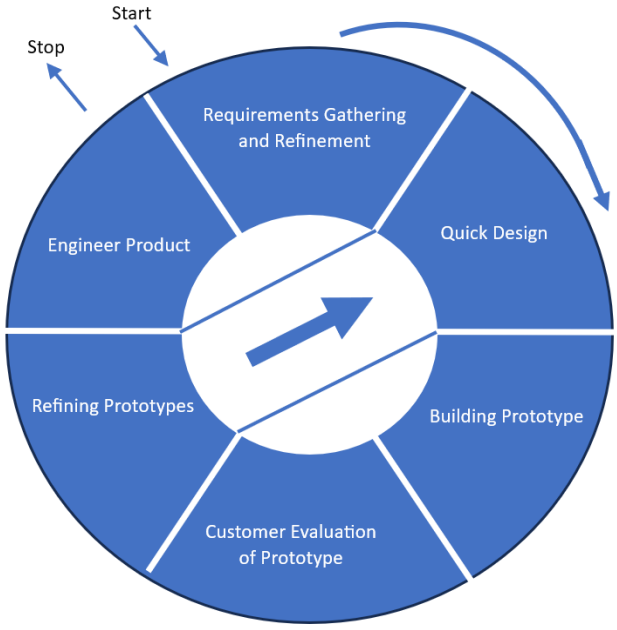

Figure 1. Sequence of events of prototyping paradigm.

Like all approaches to software development, prototyping begins with requirements gathering. The researchers went to the prospective clients in Davao Oriental State College of Science and Technology, particularly the Guidance Counseling and Testing Center which is responsible on conducting the examination of the SCAST. There, the researchers gathered data and some other relevant documents needed in the study, defined the overall objectives for the software, identified the known requirements, and outlined areas where further definition is mandatory. A "quick design" was performed. The quick design focused on a representation of those aspects of the software that will be visible to the user (e.g., input approaches and output formats). The researchers produced diagrams for the proposed system and created model for the prototype. The quick design led to the construction of a prototype. In building the prototype, the researchers developed the interfaces and provided its functionality to the software.

For further enhancements of the program, the clients evaluated the prototype. In refining the prototype, the project team made improvements on the prototype based on the evaluation of the clients. A process of iteration occurred as the prototype was "tuned" to satisfy the needs of the end users while at the same time enabling the researchers to have a better understanding of what needs are to be met. Having done all procedures, the researchers then produced the complete and running applications software as a product.

Result and Discussion

Transaction Processing System is the structure that supports the fundamental principles of the study. It is defined as data input and output as a series of transactions against a database with the process generated from a user's terminal (Sommerville, 2001). Figure 2 shows the components of the Transaction Processing System.

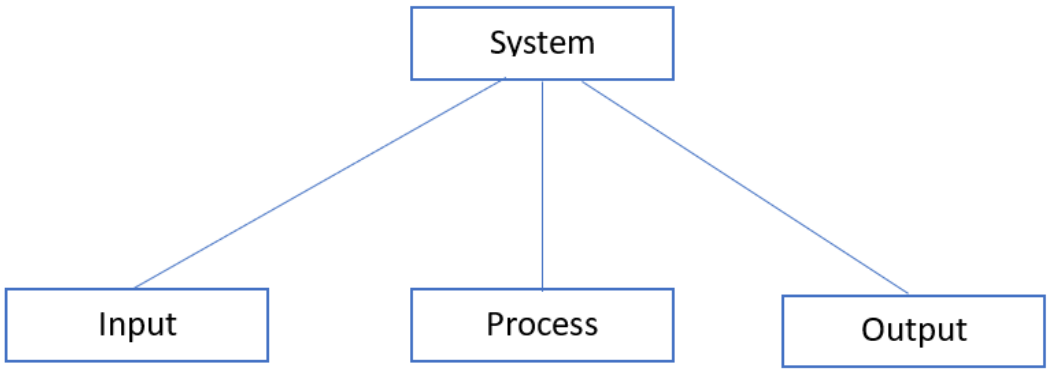

Figure 2. Input-Output process models

An input component read data (input) from a user terminal or system, check the validity of data and correct errors (process), then queue the valid data for processing (output). A processing component takes a transaction from a queue (input), performs some computation on the data and creates a new data record recording the results of the computations (process), and then sends data to a printer (output). An output component read records from a queue (input), formats these according to the output form (process) and then sends data to a printer (output) [Sommerville, 2001].

Transaction processing systems are information systems that process data resulting for the occurrence of transaction exchange. They use a five-stage cycle that includes (1) data entry, (2) transaction processing, (3) database maintenance, (4) document and report generation, and (5) inquiry processing activities.

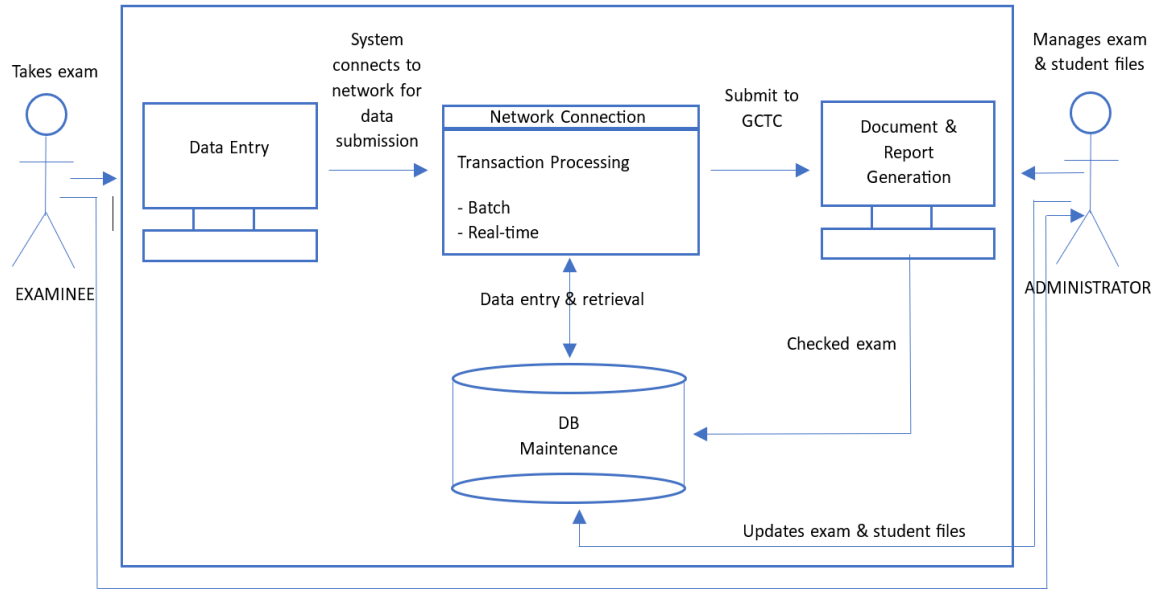

Figure 3. Conceptual diagram of transaction processing.

The system has its two transaction options that both inputs and retrieves data to generate documents, reports and the update of examination and student files. The examinee inputs the required data into the system (Figure 3). The system processes the examination data for submission by automatic checking and storage to the database. Through these transaction processes, the generation of documents, reports and the update of examination and student files can be completely done by the administrator who manages the examination and student files within the system.

Input data

The researchers gathered the data by personally interviewing the GCTC's personnel who are authorized to conduct the entrance examination of Davao Oriental State College of Science and Technology. The team went to GCTC's office to have an interview regarding the conduct of their current manual examination system. From there, the team collects existing forms used in the conduct of examination. The details of the student's information such as name, age, gender, school from and address are also gathered.

After those data will have been processed, it is expected that GCTC will release the following examinee result:

a. Individual result included in this report are the individual examinee name, school from, address and score in each exam category. This report is distributed only to the examinee.
b. All results included in this report are the list of all examinee's name and score in each exam category. This report is distributed to the following offices ODL, Registre, OP, File copy, Scholarship Committee and OSA.

Description of the current cystem

Manual system

DOSCST Guidance Counseling and Testing Center (OCTC) conduct SCAST for admission in the college through manual process. Figures 4,5 and 6 illustrates this process. The GCTC personnel secure the examination data and procedures. They prepare the examination materials and facilities such as instructional guides, test papers, and venue in conducting the exam, and its human resources by training the personnel who will facilitate during the examination period. The facilitator distributes the test papers individually to the examinee, gives an orientation prior to the examination and thereafter signals the examinee to start answering the examination. The facilitator then proclaims to submit the questionnaires as well the answer sheet as the time allotted elapsed. The examinee is obliged to submit the test paper to the facilitator. Afterwards the personnel do the checking of individual test papers. Getting the exam result follows the personnel's computation for the raw score, percentile rank and general weighted average (GWA).

Afterwards, the assigned personnel encode the results to the computer using Microsoft Excel program then print the examination results and other documents. The printed results will be distributed to the following offices: Office of Director for Instruction (ODI), Registrar, Office of the President (OP), File copy, Scholarship Committee and Office of Student Affairs (OSA) and to the examinees.

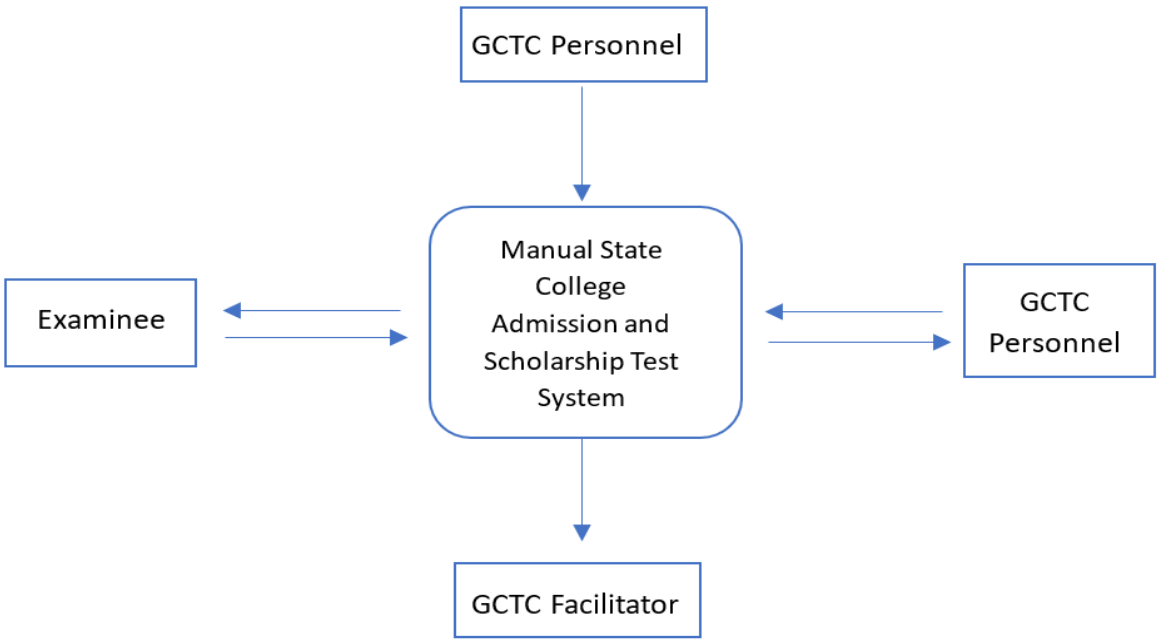

Figure 4. Context diagram of the existing system.

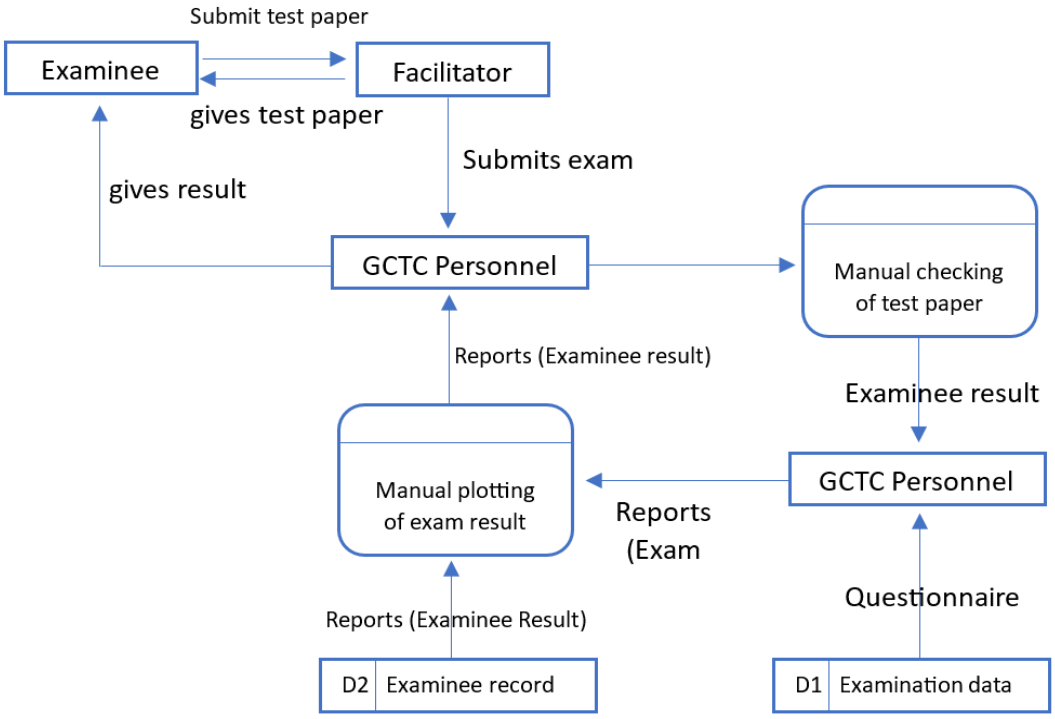

Figure 5. Physical diagram of the existing system.

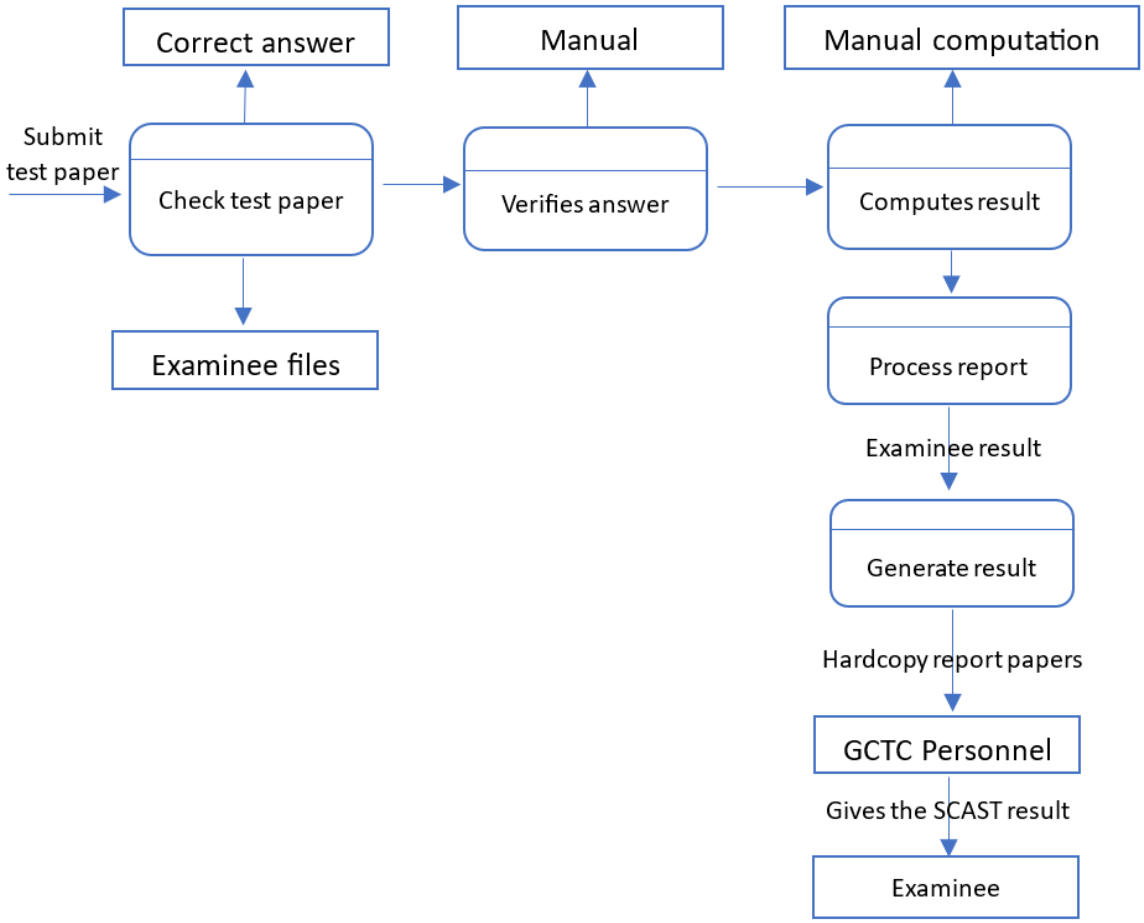

Figure 6. Logical diagram of the existing system.

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Hardware setup

The current manual system uses one unit of a personal computer and a printer in their office to generate reports and other documents.

Software and application being used

The manual system uses Microsoft Excel and Microsoft Word in making reports and documentations.

Personnel

The duties and responsibilities are as follows: the GCTC Head manages the entire manual system transaction; the Examinee takes the provided SCAST question paper; the GCTC Personnel is responsible for obtaining and securing the examination papers, keeping track of examinee records, and preparing reports on the examination results; and the Facilitator/Proctor manages and assists the examinees during the examination.

Requirements analysis specification

The requirements engineering is a process that involves all of the activities required to create and maintain a system requirements document. Some people consider requirements engineering to be the process of applying a structured method, such as object-oriented analysis (Pressman, 1992). This involves analyzing the system and developing a set of graphical system models, which then act as a system specification. Like all approaches in developing software, the system developer analyzes the requirements systematically. Both the developer and client/ end-user take active roles in requirements analysis and specification. Specific discussion was thoroughly done by the team during the consultation with the system user in which both parties reviewed the current system. The results brought out the conceptualization of initializing the manual processes towards automation. After analyzing the design, the prototyping technique was then demonstrated to the client/end-users who gave suggestions to somehow meet their real needs. The system developers then decided to use Visual Basic 6.0 as the programming language, since this supports the rapid application development and Graphical User Interface, MS Access 2000 for database development, MS Word and MS Excel as utilities for documentation. The DFD's, ERD, Use Case and Sequence diagrams were devised to fully understand the requirements of the proposed system.

Use case diagram

Use Case is used to fully understand the fundamental requirements of the system. These are the list of defined use cases of the proposed system.

1. Fills-up registration form
2. Takes examination
3. Submits examination
4. Checks examination
5. Stores examination result
6. Prints examination result
7. Inputs question and answer

Use case diagram description

Use Case #1 Fills-up Registration Form

The examinee fills-up a registration form on the user interface after presenting receipt for examination to the examiner.

Actor: Examinee
Requirements: Receipt for examination
Pre-conditions: Examinee's receipt for examination is valid by examiners verification.
Post-conditions: Examinee's information was sent and stored to database storage.

Main flow:
(1) Examinee presents receipt for examination to examiner and
(2) examiner verifies the receipt [Al].
(3) Examinee logs-in by clicking start exam button to user interface and
(4) the system presents the Registration form.
(5) Examinee enters information (name, age, gender, address, and school from) [E1] and clicks Next button.
(6) System sends the examinees information and
(7) stores it in database storage.

Alternate flow(s):
[A1] The examinees receipt is not valid.
Post-condition-Examination is not given.

Exception flow(s):
[E1] If the examinees had not entered the required data accurately, the system will inform the user to try again.

Note [A1] represents the alternate flow of a process. It is a switch option when there quired process is not met. [E1] represents the exception flows of a process. It is a condition caused by an attempt to execute an invalid operation.

Use case #2 Take Examination
Examinee takes the examination.
Actor: Examinee
Pre-conditions: The examinee has already read the rules & regulations of examination and the system presents the Examination form.
Post-conditions: Examinee submits the examination.

Main flow(s):
(1) After examinee read the rules and regulations of examination, he then clicks the Next button
(2) system presents the examination form.
(3) Examinee clicks the Start exam button [A1] and
(4) starts answering the test questions by clicking on the selected option button
(5) then clicks Next button for the system to display question one by one [E1].

Alternate flow(s):
[AI] Examinee is unable to click the start exam button.
Post-condition:No exam item is displayed.

Exception flow(s):
[E1] Examinee can go back to the number that he/she has not answered.

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Use case #3 Submit Examination
The examinee submits examination after answering the allotted items.
Actor: Examinee
Pre-condition: Examinee had finished answering the allotted items.
Post-condition: Examinee submits the examination and the system automatically checks it.

Main flow(s):
(1) Examinee submits examination [A1] and
(2) the system presents the submit exam button [E1].

Alternate flow(s):
[A1] Examinee's unable to submit examination.
Post-condition-No examination results.

Exception flow(s):
[E1] Examinee can submit examination even if he/she doesn't finish it. The system presents the Submit button.

Use case #4 Check Examination
The system automatically checks the examination.
Actor: None
Pre-condition: Examinee successfully clicks the Submit exam button.
Post-condition: System checked exam and stored it in database storage.

Main flow
(1) Examinee clicks the Submit exam button. Automatically the system checks the exam [A1] and stores it to the database storage [E1].

Alternate flow(s):
[Al] Examinee was not able to submit the exam.
Post-condition No examination is checked.

Exception flow(s):
[E1] Examinee submits examination even if he/she doesn't finish it. The system checks and stored it to the database storage.

Use case #5 Store Examination Results
Database storage stores examination results after the system checked the exam
Actor: None
Pre-conditions: System successfully checked the exam and sent exam results to database storage.
Post-condition: Database storage stores examination results.
Main flow:
(1) System checked the exam and sent exam results to the database storage [A] which (2) stores examination results [E1].

Alternate flow(s):
[A1] Program encounters some system failures

Post-condition: No examination results are going to be stored.
Exception flow(s):
[E1] System successfully sends examination results.

Use case #6 Print Examination Results
Examiner prints exam results.
Actor: Examiner
Requirement: Printer has already been installed to the system.
Pre-condition: Examiner has successfully logged in.
Post-condition: Examiner distributes exam to examinee.

Main flow:
(1) The examiner logs in to the user interface by clicking the Administrator's button [A1] and
(2) system displays the Administrator Password form
(3). The examiner enters the correct username and password. Password is confidential and case sensitive.
(4) The system displays Administrator's form if the password is correct [E1] and the examiner can now do his/her transaction. He can print examination result and distribute it to examinee.

Alternate flow(s):
[AI] Examiner forgets administrator's password.
Post-condition-No transaction will happen.

Exception flow(s);
[E1] Examiner enters incorrect username and password. System will inform the user and recommends entering the correct password and username again.

Use case #7 Input Questions and Answers
Examiner input questions and answers to the system.
Actor: Examiner
Pre-condition: Will be done provided that examiner has successfully logged in.
Post-condition: Examiner input questions and answer, system adds and saves data.

Main flow:
(1) Examiner successfully logged in to the user interface by clicking Administrator's button
(2) Administrator's form is displayed
(3) Examiner can click the following button if he wants to input questions and answers (edit, delete, delete exam) [A1]
(4) Examiner can also do query and documentation such as clicking the (search for results, view results, delete results button)

Alternate flow(s):
[A1] Examiner forgets to add and save transactions.
Post-condition: No transactions is done.

Exception flow(s):
[E1] Examiner can input questions and answers again if he/she had forgot then to add and save

transactions.

Sequence diagram

The interaction of the data and processes are shown in the sequence diagram. It is the step-by-step or sequential process done by the system.

After creating use case diagram, the team creates sequence diagram of the proposed system in order to fully understand the requirements needed.

Data flow diagram for the software

Level 0: The top-level data flow diagram

This is the top most view level of how the data flows within the proposed system (DOSCST Automated State College Admission and Scholarship Test). Referring to Figure 7, there are two actors that interact with the system - the administrator and examinee. The administrator inputs the administrator username and password. The system processes the data input for validation and then allows the administrator to conduct some processes within the system provided that data input is correct. He can manage the exam by entering test questions to the system. All the data entered will be kept by the system for retrieval purposes on the next transactions.

On the other hand, the examinee inputs required information. The system validates if the data inputs are correct. If ok, he can take the examination by providing answers to the questions and then submit it. The system automatically checks the examination and then stores the result to database storage for retrieval purposes on the next transactions.

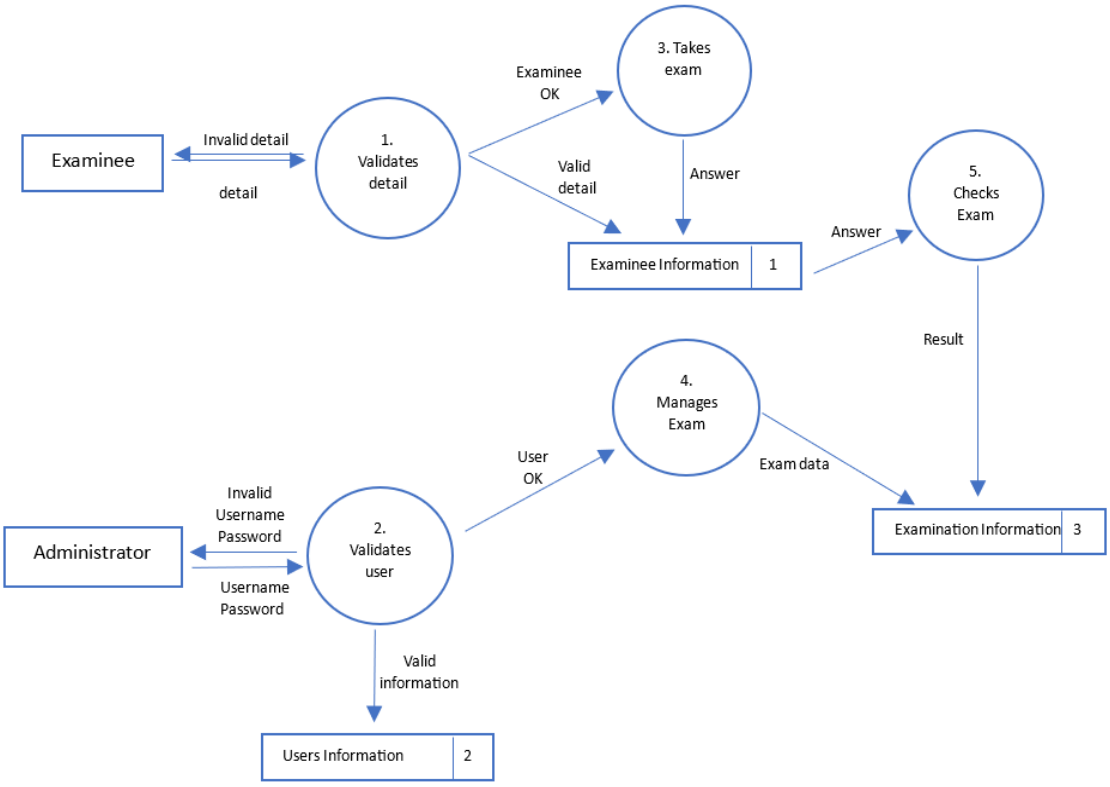

Figure 7. Data flow diagram of the proposed system.

Level 1&2: Validate User info & Examinee detail Process

The system processes user's information & examinee detail and then updates the system database by storing the valid information into it. See Figure 8 & 9 for the illustrations in the next pages.

Level 1: Validate examinee details process

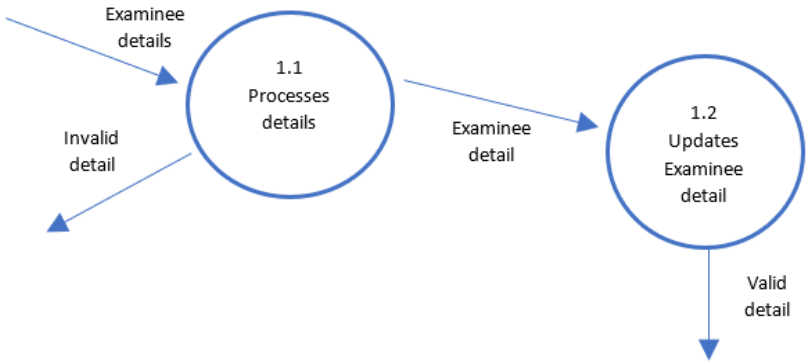

Figure 8. Validate examinee data flow diagram.

Level 2: Validate user information process

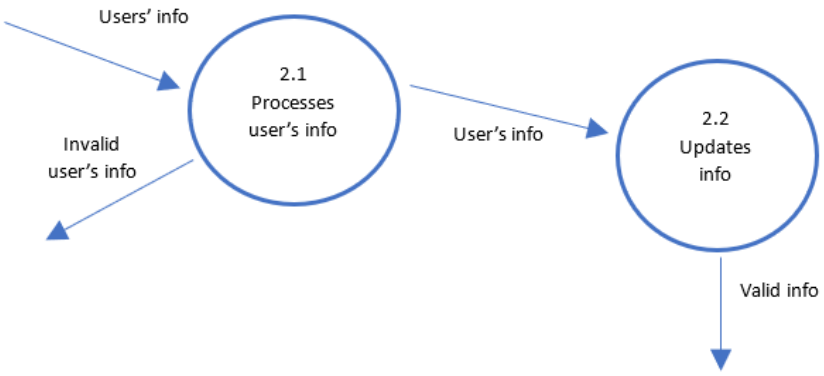

Figure 9. Validate user information data flow diagram.

Level 3: Take Examination Process

Through the examinee's valid data, the examinee is allowed to answer the examination by choosing from the provided answers. The system stores the examinee's answer into its database. See Figure 10 for further illustration.

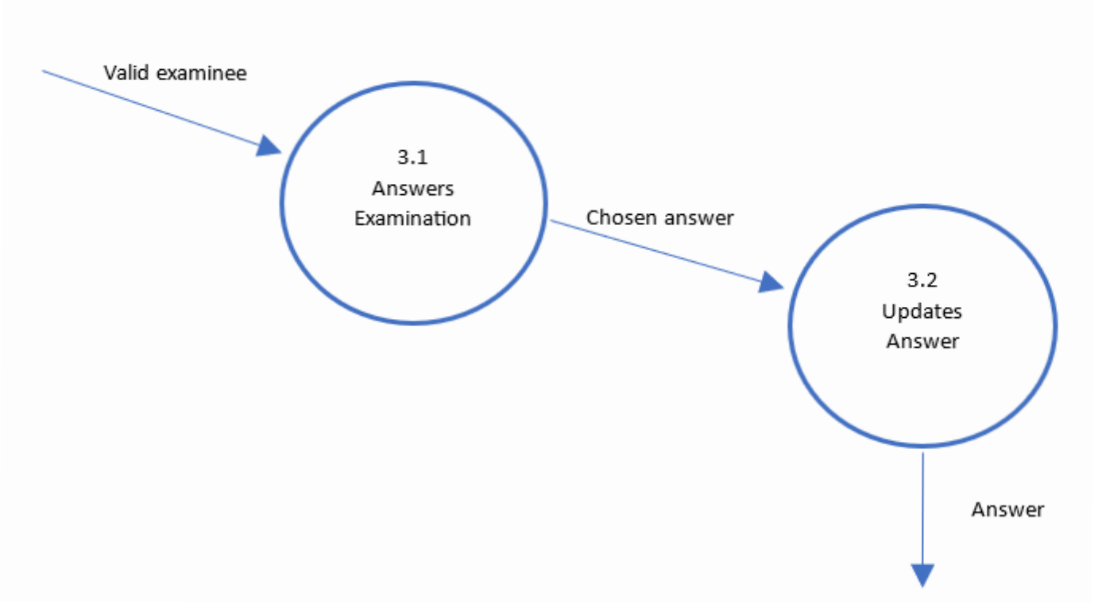

Figure 10. Take examination data flow diagram.

Level 4: Manage Exam Process

The administrator inputs the examination information and then the system stores it to the database by modifying and updating the existing examination data. See Figure 11 for further illustration.

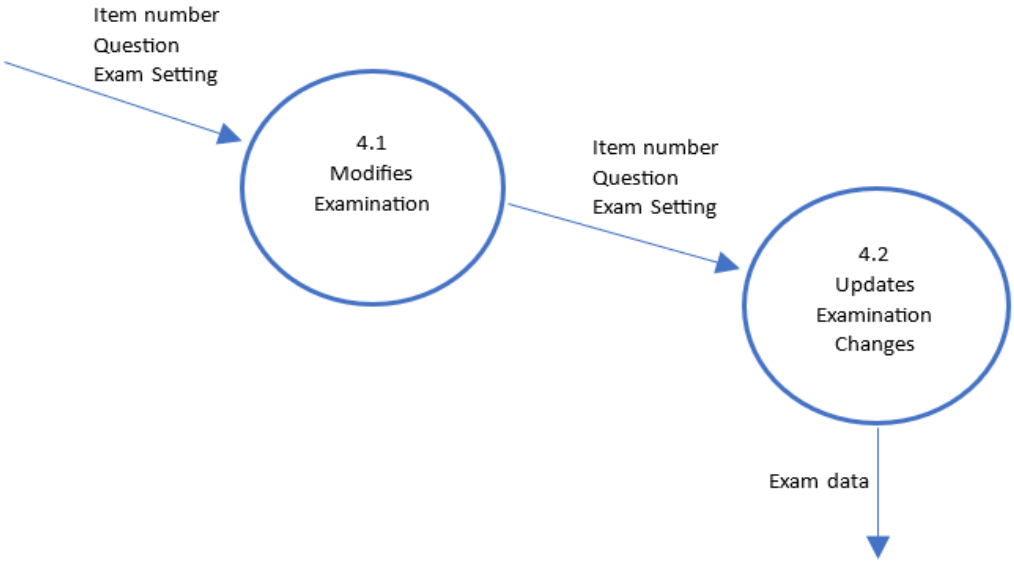

Figure 11. Manage examination data flow diagram.

Level 5: Check Exam Process

The system validates the examinee's answer to determine its correctness. Answers are calculated to complete its record and then generate report from it. See figure 12 for further illustration.

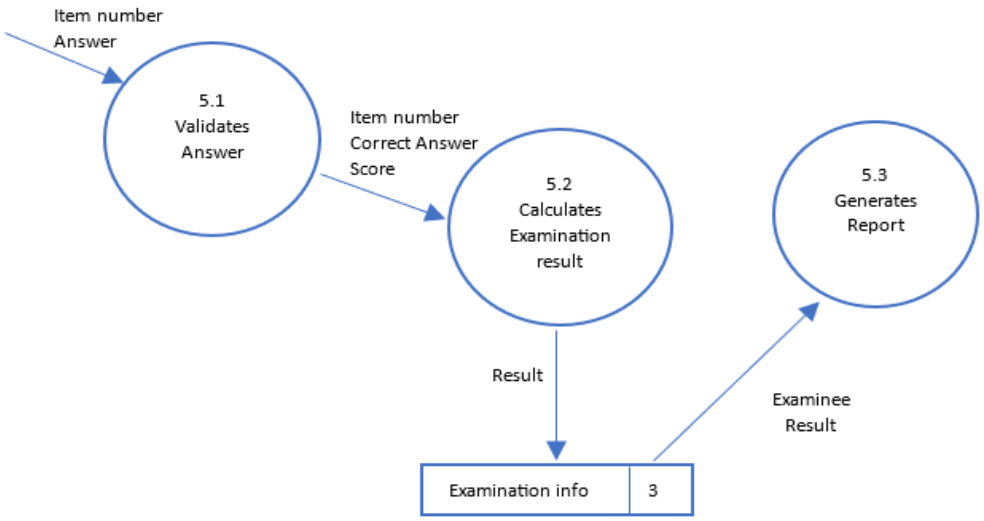

Figure 12. Check examination data flow diagram.

Data Analysis

After analyzing the data gathered, the team builds a relationship diagram needed in storing data into the system. Figure 13 to 14 shows the entity relationship diagram of the proposed system.

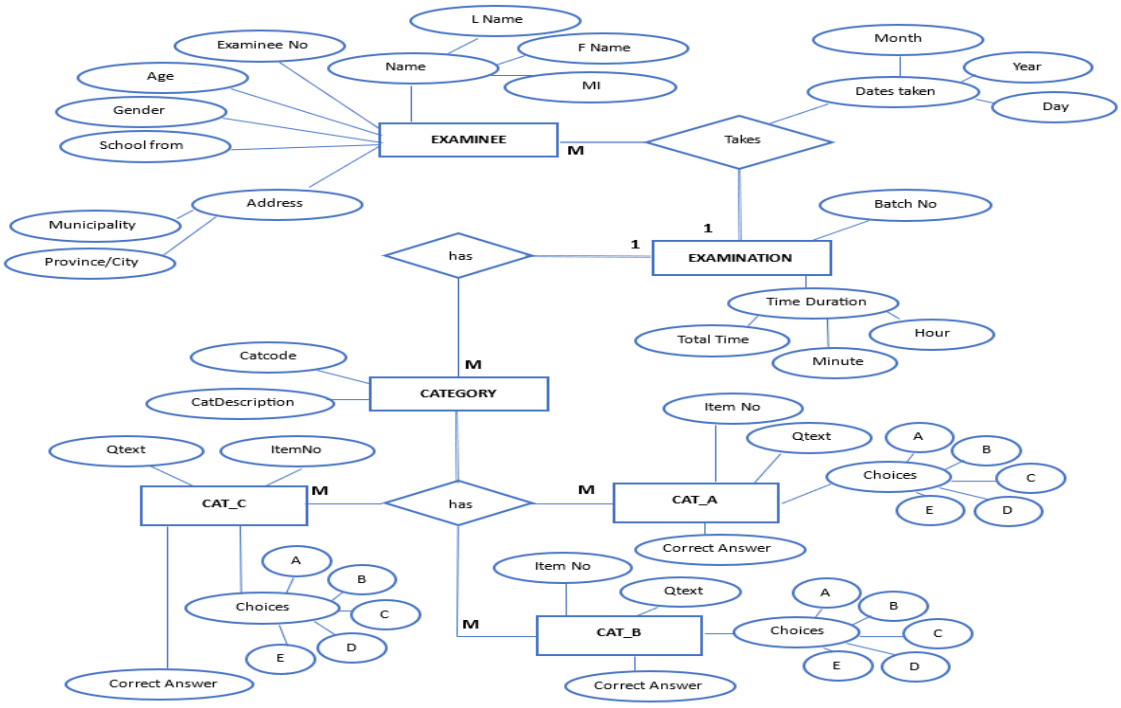

Figure 13. Entity relationship diagram of the proposed system.

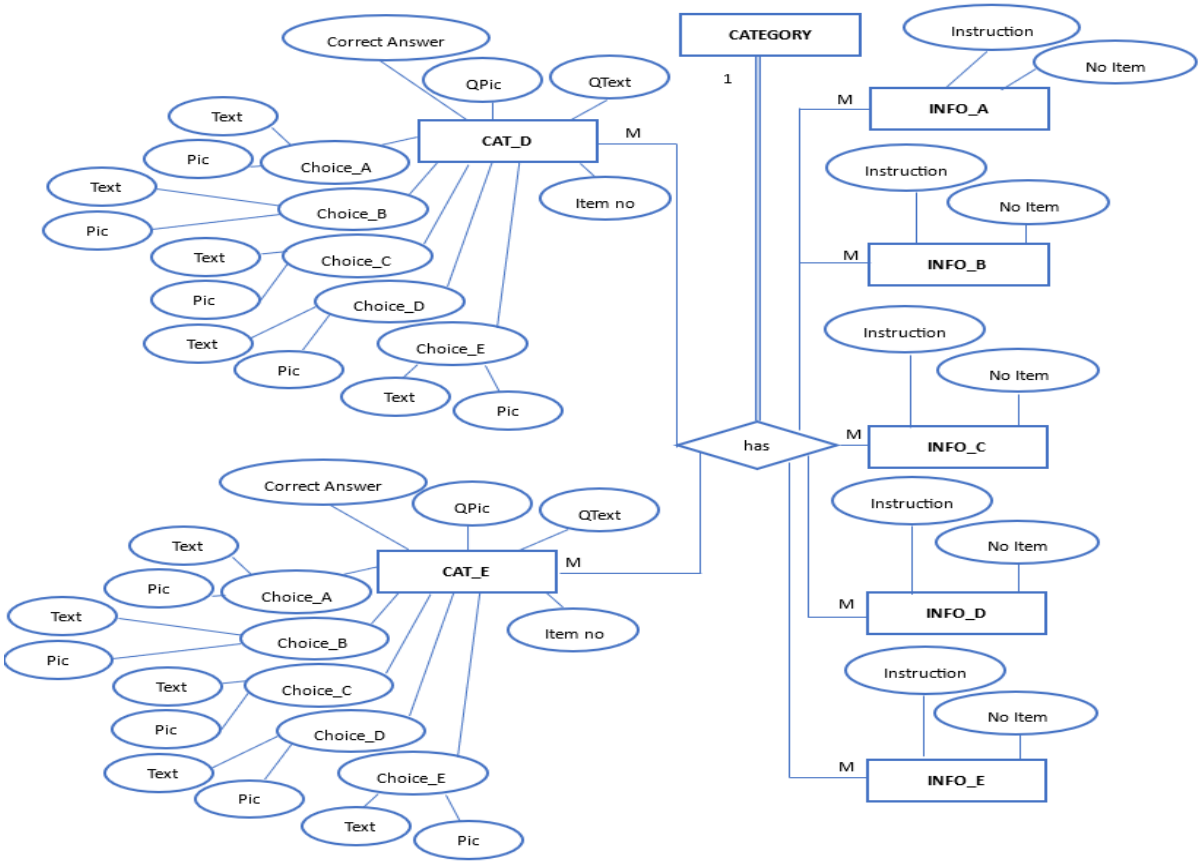

Figure 14. Entity relationship diagram of the proposed system.

SYSTEM DESIGN SPECIFICATION

For the discussion of the design process please refer to the following diagrams on the next pages of this paper.

Menu System

The proposed system contains the different transactions specifically designed for the administrator and examinee. Administrator has the file view of examinee information, examination information, system information and the ability to automatically exit on the system (Figure 15). The three major transactions of the administrator are to manage examination, results, and system settings. Managing the examination enables the administrator to create and view examination. The viewing of results are under the result transaction and setting the system username and password will be done through entering the manage system settings transaction. Through the report transaction, the administrator can produce specific result for the examinee. An extra utility of the system that allows the administrator to create back up of the information that the system contains through converting the database records into MS Excel form.

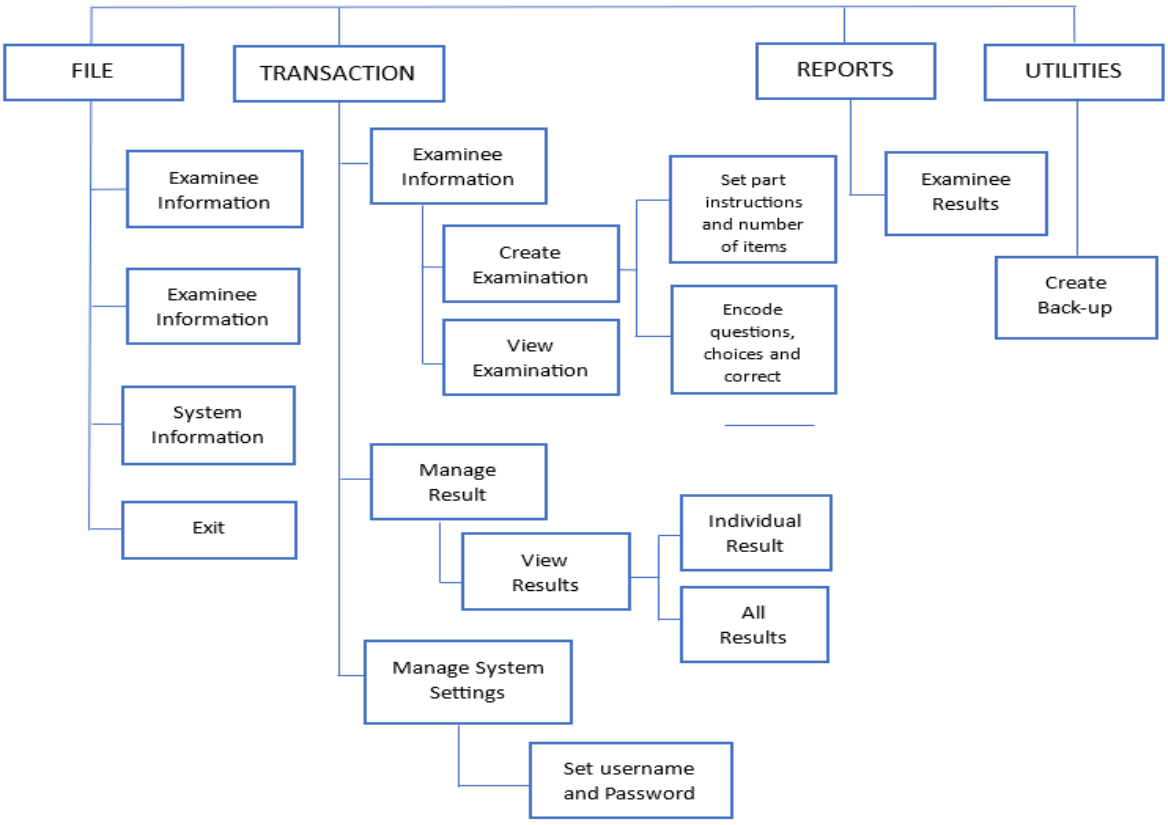

Figure 15. Administrator's Menu system.

Examinee

The examinee's process falls under one transaction. To take examination, the examinee will register by filling-up the required examinee information before answering the examination questions. The next process is to answer the examination questions and then submit it. The submission of the examination also means the direct logged-out from the system. See Figure 16 for the illustration.

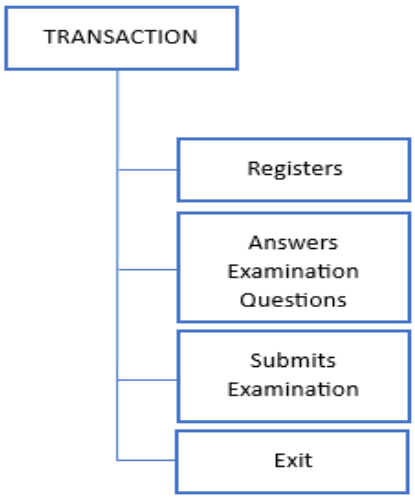

Figure 16. Examinee's Menu system.

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System flow chart

The administrator log-in to the system by entering the required security data: the username and password. The system then validates the administrator's log-in data (Figure 17). If log in data is invalid, then the system sends log-in error message. But, if log-in data is valid, then system allows administrator entry. After the administrator has successfully logged-in, the Administrator's menu will provide the three transactions manage examination, manage results and manage system settings. Selecting manage examination, the administrator sets the examination time duration, test part instructions and no, of items, creates examination and view the whole examination. Selecting manage results, the administrator manages the results of examination. In this transaction, the administrator is able to view, sort, generate report from the results and delete results. Selecting manage system settings, the a dministrator is allowed to change the log-in data. The system requires the administrator to enter the current username and password. If the log-in data is invalid, the system sends a message informing the administrator to enter the valid log-in data. But if the log-in username and password is valid, the system sends a message allowing the administrator to store the new system settings. The administrator saves the new settings by clicking the save button.

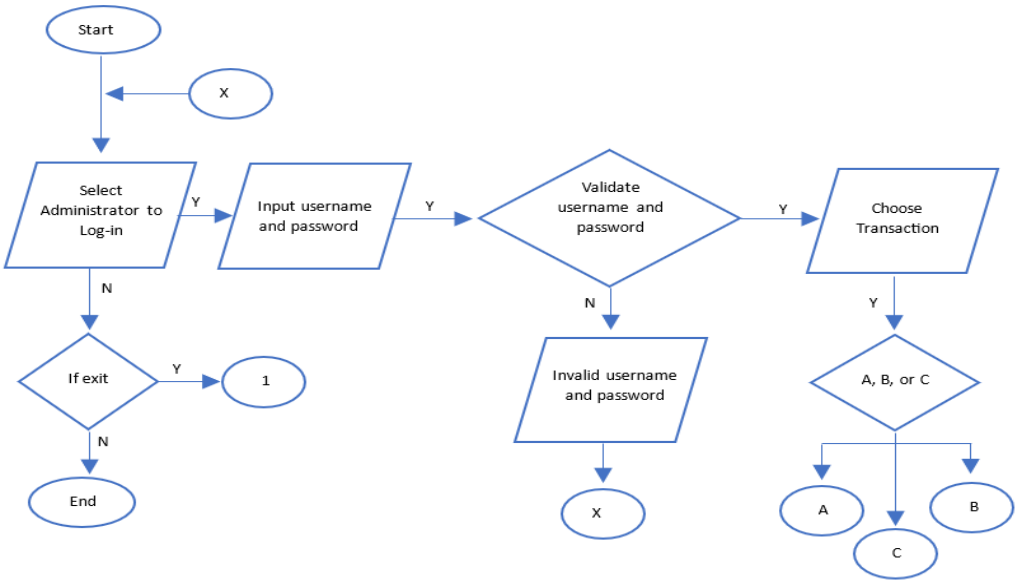

Figure 17. Server-side system flow chart

Examinee

The examinee proceeds to the e-registration form by clicking the Register button (Figure 18) The system provides the registration data entry fields and requires the examinee to f ill-in all required information. The system validates the examinee data, if data is invalid then the system sends a message prompting the examinee to check or fill-up all required data correctly. But if data is valid, the system allows the examinee to proceed to the general rules and instruction form of the examination and then start examination. The examinee selects the test part of the examination and provides answer. The system validates the examinee answers and computes its results or value before storing to the database.

After answering all the test parts of examination, the system sends a message conforming to the examinee that he had finished answering the examination or if the examinee is caught out of time, the system sends a message informing the examination time cut-off and prompting the examinee to submit the examination.

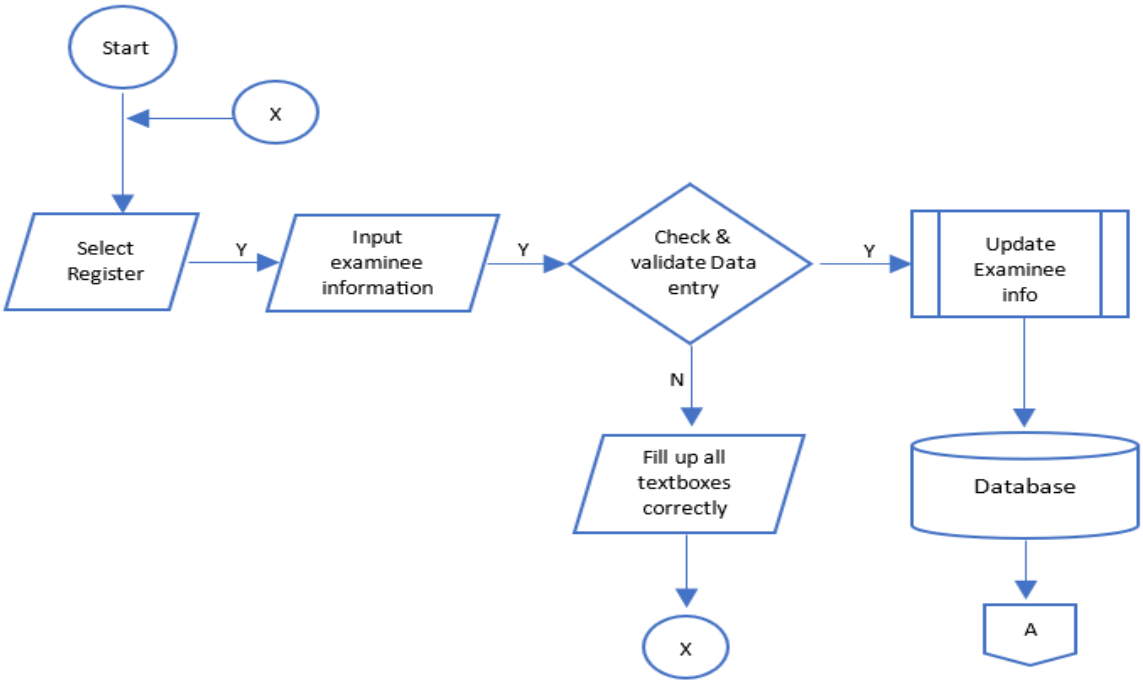

Figure 18. Client-side system flow chart 1.

Systems implementation

Programming considerations, issues and tools

Visual Basic 6.0 is a widely used programming language because of its graphical integration capabilities and extra features like having a built-in database manage and open library for another patch that needs to be integrated. This language is capable of building stand-alone and server-side applications. These are some of the reasons why Visual Basic 6.0 is considered as the easiest programming language used in developing software projects. The team uses the MS Access 2000 as its database storage. This is one of the powerful databases used by software project developers in the world. One of its capabilities is the easy way of establishing a connection to Visual Basic 6.0 applications. This is why MS Access 2000 is continuously used in software project developments.

With DOSCST's most common and currently installed operating system in the computer laboratory, the team used Windows 98 Second Edition in project development effort. It is capable of running applications from different types of programming languages, specifically Visual Basic 6.0 itself. The team also used other programming support tools such as Microsoft Word and Microsoft Excel. These tools are primarily used in producing the project development documentations. The programming tools used in development aided the team in achieving its objectives. But, despite the programming tools' capability, team experience and skills in programming, there are some problems and issues that the team encountered during the project development. First, during the data gathering phase there was not enough number of knowledgeable GCTC personnel to be interviewed as a resource person. Second, the limitation of programming tools.

The Microsoft Visual Basic 6.0 being used is not a full installation package it does not contain the new MDAC (Microsoft Data Access) package. The client-server and inter development components were not included in the Visual Basic 6.0 installation. These

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limitations led to other concerns in the project like image loading and client-server connectivity. The team also encountered problems with the MS Access 2000, Some of the main issues in MS Access 2000 is in its limited client-server capabilities and the limits in storage size. Also, some basic issues have arisen during the documentation phase. The team creates system models and diagrams through the use of MS Word 2000. This software is not designed for software modeling. No other alternative modeling tools are available for free use.

Human resource requirement

Software development team

The chief programmer must have a domain knowledge and experience in using Visual Basic 6.0 programming language and Microsoft Access 2000 database. He should also have the knowledge about the compatibility of Windows 98 operating system to the programming language in developing the project.

Back up programmer

The back up programmer must have sufficient knowledge and experience on the programming language used by the chief programmer. He must also know how to keep track and check the chief programmer's coding methods and techniques. This is very important for there might be times when the chief programmer is unavailable during software testing and debugging.

Librarian

The librarian holds the tasks of documenting the activities during the project development and keeping the documents for basis of reports after the project development.

Users and human factors

There are two system users, the administrator and examinee. Both need skills in basic computer operations such as keyboard handling, mouse clicking and instruction reading and comprehension. Users at the beginner's level should possess these basic computer operations. Another party involve in this system are the programmer and maintenance group. They get involve into the system transactions in terms of system development and maintenance. Through this the system is deployed to the following users: (1) examinee, (2) examiner and (3) programmer and maintenance.

The System

Physical environment

The components involved in the physical environment are the examinee, examiner, workstation, server, and the venue. The workstations are placed in a well-ventilated and air-conditioned room Fach workstation must be in a cubicle to prevent cheating. All workstation are connected through an Ethernet Local Area Network where access from one workstation to another is allowed. The network server printer is placed within the same area but separated from the group of workstations.

The examinee will choose one cubicle where he can take an examination through a workstation while the examiner stays on the server computer and checks the examinees cubicle from time to time to prevent cheating and to ensure good order on the conduct of examination.

Functionality

The main function of this system is to provide the DOSCST a way of automating the SCAST. Storing examination data into the system like questions, choices and correct answers, which will then be retrieved when the examinee takes the automated SCAST and when the administrator generates the results. Constraints for speed, response time and accuracy have always been the questions in managing the system. Due to these, it is recommended that a good network connection among workstations and server must be established.

Interfaces

The system uses two user interfaces that are designed for the administrator and examinee transactions. The administrator's interface provides him the capability of creating on exam and generating results after the examination. Another transaction also allows the administrator to manage the system settings through the administrator's menu interface.

On the examinee's interface, the examinee is first allowed to register thru e-registration form and then read the general instructions and rules and regulation of the examination. After reading the instructional and sample question guides on the orientation form, the examinee can take the examination on the exam form. There are two forms that end the examination: the cut-off time form and the successful take exam form.

These two types of system user interfaces both allow the administrator and examinee to enter and retrieve data while doing some transactions within the system.

Data

The administrator and the examinee transactions do the systems data entry and retrieval. Data entered are stored through the acceptance of data from textboxes, rich textboxes, option buttons and image boxes. On the other hand, data retrieval is also done through this control and using of printed copies in Microsoft Excel sheets. These data are used to generate exams and results for the DOSCST Automated State College Admission and Scholarship Test.

Security

The security of the system lies on the username and password validation prompt before the administrator can log-in to the system. By doing this, the access to information is controlled. The system has two entry methods, the administrator's entry that repairs the username and password: and the examinee's entry that allows him to log-in without being asked by any security validations. By using the system's executable file, isolation of the system data from the operating system is done. Files will be backed-up only when the administrator decides to create back-ups. The same reason applies when he deletes files.

Documentation

The team documented the project development for the purposes of tracking its phases and milestones. This is also useful in project debugging, generating manuals for both administrator and examinee, and for the benefit of incoming researches that may be interested in this project. For the users, the team provides a user manual for the administrator and examinee.
The user manual provides a textual set of instruction that will guide the administrator and examinee in using the system.

Conclusion

With the successive interviews, researches and studies, the team had come up to a conclusion that implementing a new, well-organized, rapid and client-server system, which is the automated examination system is the best thing to do to replaced the manual examination system of Davao Oriental State College of Science and Technology. This could enhance the process of conducting an examination, give efficient and reliable services to the clients and most of all improves the quality standard of education. Another reason that this project is more advantageous as compared to the manual system is its cost saving benefits to DOSCST.

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