

## Development of an Object Oriented Model for Internal Auditing Process for Education Institute

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**Abstract-** The technology plays an essential role and help the organizations to work better and maximizing their operation achievements. The IT auditor plays an increasingly important role in helping organizations to manage and respond to risks. The aim of this paper is to gather some of the internal auditor's skills to be available for other auditors in education institute and collect the experiences of the auditors to design a system and also help internal auditors to manage their tasks in a systematic way by automating the accounting files. The proposed system will help the internal auditor to take a good, fast, and more accurate decisions and to provide an internal auditing system for education institute. The study used the object oriented models to design the internal auditing system.

**Keywords:** IT auditor, object oriented model, internal auditor, UML.

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### I. INTRODUCTION

With the ever increasing reliance on information technology and increased complexity of computer installations, internal audit departments can no more rely on generalist auditors to provide assurance in the areas related to information technology. A solid IT knowledge foundation (e.g. obtained from IT academic study or actual IT work experience) seems to be necessary to meet the internal audit mandate [1].

The financial accounting and reporting system of any firm, regardless of country, is heavily dependent on the internal control structure of a firm. An integral component of any control structure is an effective internal audit department [2].

The institute of internal auditors (IIA) defines internal-auditing as an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. In a broad sense, internal auditing helps a business to achieve its goals by continuously evaluating and honing the processes of risk management, control, and governance. With regards to accounting, internal auditing is used to deter and investigate fraud, safeguard assets, and make certain that financial reporting is timely and accurate. Internal auditing also ensures that a company's accounting policies and procedures are in compliance with laws and regulations [3,4,13]. Internal auditing is conducted in diverse legal and cultural environments; within organizations that vary in purpose, size, complexity, and structure; and by persons within or outside the organization. While differences may affect the practice of internal auditing in each environment, conformance with The IIA's international standards for the professional practice of internal auditing (Standards) is essential in meeting the responsibilities of internal auditors and the internal audit activity[7,12]. Internal auditors deal with issues that are fundamentally important to the survival and prosperity of any organization. They have a professional duty to provide an unbiased and objective view. They must be independent from the operations they evaluate and report to

the highest level in an organization like a senior managers and governors. Typically this is the board of directors or the board of trustees, the accounting officer or the audit committee. To be effective, the internal audit activity must have qualified, skilled and experienced people who can work in accordance with the code of ethics and the international standards. Internal auditors have to be independent people who are willing to stand up and be counted; their employers value them because they provide an independent, objective and constructive view. To do this, they need a remarkably varied mix of skills and knowledge. The audit environment is a unique and highly complex decision-making environment. There are sources of error and inconsistency that are unique to the audit environment. Personal computers and other changes in technology have had and will continue to have an impact on the audit environment. In addition, the audit decision making environment is process oriented and not results oriented [4,8]. Internal auditors those individuals who perform the activities of the internal audit function. Internal auditors may belong to an internal audit department or equivalent function[11].

There are many types of audits; the Internal audit activity will determine which kind of audit process (or a combination) to perform based on a formal risk assessment process. A financial audit reviews the recording and reporting of financial transactions. The purpose of this type of audit is to provide management with assurance that financial information is complete and accurately recorded in the municipalities financial records and that these records support the information shown in the financial reports[13].

Information system auditor's main objective is to formulate an opinion about the effectiveness and the contribution of information systems to enterprise objective. His/her judgment can be influenced by factors such as his/her knowledge of the organization information systems, and the degree of risk of misstatement through errors. More generally, the purpose of IT audit is to evaluate IT controls. IT auditor assesses and advises on the following aspects of information technology:

effectiveness, efficiency, exclusiveness, etc. Although there is no common understanding regarding the appropriate evaluation theory, however, there are three main concepts that structure the audit process: information systems processes and domains, audit criteria, and audit framework. The internal auditing profession exists within an organization to serve both management and the organization in providing recommendations and suggestions for continuous improvements [6].

The IT auditor plays an increasingly important role in helping companies manage and respond to risks [21].

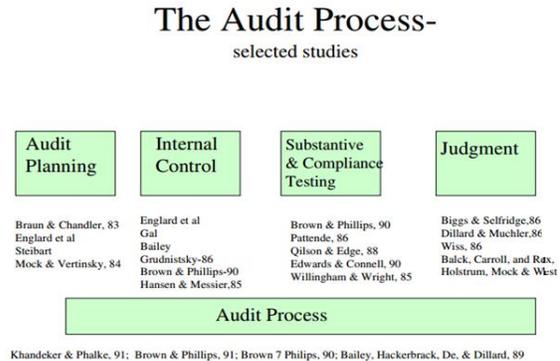
Object-oriented design is suggested as a method of design encompassing the process of object-oriented decomposition and a notation for depicting both logical and physical as well as static and dynamic models of the system under design. There are two important parts to this definition: object-oriented design leads to an object oriented decomposition and uses different notations to express different models of the logical (class and object structure) and physical (module and process architecture) design of a system, in addition to the static and dynamic aspects of the system. Object-oriented analysis emphasizes the building of real-world models and using an object-oriented view of the world. Object-oriented analysis defined as a method of analysis that examines requirements from the perspective of the classes and objects found in the vocabulary of the problem domain [18]. An object by itself is intensely uninteresting. Objects contribute to the behavior of a system by collaborating with one another. Instead of a bit-grinding processor rapping and plundering data structures, a universe of well-behaved objects that courteously ask each other to carry out their various desires are exist [19]. Class diagram is one of the static diagrams in UML, it addressing primarily structural characteristics of the domain of interest, it also allow capturing the responsibilities that classes can perform, without any specifics of the behaviors. Other static diagram types are provides perspectives that are not directly related to database systems. A database system is usually part of an overall system, whose underlying model should encompass all the different perspectives[20].

## II. PREVIOUS STUDIES

Bailey *et al.* (1985) proposed first auditing-based system The Internal Control Model (TICOM) which implement artificial intelligence techniques in the system. TICOM is an analytic tool that aids the auditor in modeling the internal control system and querying the model in order to aid the auditor in evaluating the internal control system. TICOM was implemented in Pascal [6,8].

David and Miklos (2003) noted that the audit knowledge domain has two main forms of systems, first form is supporting the audit process itself such as audit planning, analytical review, internal control evaluation and second form is supporting estimates to be made by corporations and being reviewed by auditors such as bad debt estimation, loan loss estimation or even in the tax area with tax accrual verification. Many of the important studies, serving as the base of evaluation of feasibility of particular approaches were

performed in the five years 1985-1990. A symbolic chart placing studies in relation to the step in the audit process is described in Figure (1) [5].



**Figure (1): Selected Studies in Audit Process [5]**

Holstrom (1984) identify four different sources of error and inconsistency that occurs when the internal auditing processes are run by the humans:

1. Judgment errors occur when there is a departure from a generally accepted criterion.
2. Judgment inconsistencies occur whenever there is a difference between judgments, given the same data set and objectives, regardless of whether a generally accepted criterion exists.
3. An error in overall judgment occurs when the auditor issues an incorrect audit opinion.
4. An inconsistency in overall audit judgments occurs when different auditors render significantly different audit opinions based upon an identical set of financial statements and an identical set of audit evidence[6,14].

Hogarth (1985) said that computer programs can be used to improve the consistency of human responses and mitigate errors in the internal auditing process [6,17].

In 1999 Ramamoorti used both quantitative (26 variables) and qualitative (19 variables) risk factors as input variables in the models. The risk was defined in an internal auditing context. The models were in the context of a public state university. The quantitative data were downloaded from the University of Illinois Financial and Administration System. The qualitative risk factor values were elicited from audit staff using a pre-defined scale from 0 to 9. The eventual number of variables selected to construct the models were in the 7 to 18 range. The research project included a Delphi study and a comparison with statistical approaches, and presented preliminary results, which indicated that internal auditors could benefit from using ANN technology for assessing risk [6,9].

In 1991 McKee's suggested that AICPA statements on standards for attestation engagements (SSAE), attestation standards might play a critical role in the audit of expert systems, and although it applies to independent CPAs, it may also provide useful guidance to internal auditors. Attestation standards indicates that an audit should be done by someone who has adequate technical knowledge and proficiency, in this case in expert systems verification and validation, and in the specific domain [6,10].

In 1995 O.Tom *et. al.* examines computer usage by internal audit departments of Canadian and U.S. firms. Internal audit departments in the United States use computers more overall than do Canadian internal audit departments. In addition, the nature of computer usage varies between the two countries. Canadian internal auditors have a stronger preference for microcomputers over mainframes than do those in the United States. Internal auditors in the United States write their own computer programs more than do Canadian internal auditors. These findings do not support the presumption that countries with similar accounting and business environments and close economic as well as geographic ties will have similar internal audit departments [2].

In 2004 Jenny Goodwin has compared features of the internal audit function between organizations in the private and public sector. Several aspects has been carefully examined in which include organizational status, using internal audit as a "tour of duty" function, outsourcing of audit function, risk management, and interactions with external auditors. The study is based on a survey done in Australia and New Zealand organizations. Survey was done to indicate the length of time spent by respondents in internal audit process and it has appeared that internal audit has a higher status in the public sector rather than in private sector entities. On outsourcing survey indicated that both sectors engaged in some outsourcing of internal audit activities particularly in information technology and system. The percentage outsourced is quite similar between these two sectors. Author has also discussed on the major activities affiliated with internal audit, specified as financial audit and internal controls, risk management operations and systems audits. The author has explored internal audit interaction with external auditors from the perspective of the chief internal auditor and results indicated there are no significant differences between public and private sector responses [22,23].

Jayalakshmy *et al.* (2005) has highlighted the pressures auditors would face in the era of globalization and challenges in order to maintain trust and integrity. The authors have reviewed a wide range of articles and journals published and covered areas of audit fraud, true and fair view interpretation, auditor independence and role of internal auditors. This is analyzed by many authors such as Hillison *et al.* (1999), where the authors have discussed the role and responsibility of internal auditors in the detection and prevention of fraud. In addition, Roufaiel and Dorweiler (1994) expressed that computer fraud is easy to commit but difficult to prevent and therefore, the auditors should define their responsibility for computer fraud. The authors have defined the lack of independence, integrity and credibility of the auditing profession on the role and responsibility to detect and prevent audit fraud [22,24].

Russel Jackson (2004) explored the auditors approaches in utilizing the audit tools, software and how technology evaluation affecting their practices. The author has illustrated the Internal auditor's 10th annual software survey in discussing the issues interconnected with audit software in United States. The author observed that the limitation of implementing audit

software particularly concerned with cost implication, failure of software to meet audit departments needs, and resistance in training to auditors. The author has cited the key note presented by several experts in the audit-related software who had various experience in implementing and maintaining the software inside the organization. Richard Lanza (2004), as one of them, an audit manager, and founder of AuditSoftware.net has shared his extensive experience in the fields by suggesting several method in ensuring the successful implementation of audit software in the organization. Richard Lanza noted that, although audit programs in general are simple to open, they can be complex to run. This can be achieved through interactive training, and continuously monitor the learning process. Lanza (2004) has noted that the business sponsor (management) might reluctant to accommodate and approved the training since they perceived the training time might led to un-productivity. The author also disclosed much information on the type of software adopted in the organization, its popularity, reliability and overall satisfaction. Many audit related software enable an organization to subscribe to and implement them in the organization. However, several issue on reliability and consistency arised when those software are not meeting auditors expectation. The author also discussed on the availability of open-source software available in the web format. Using open-source software has distinct operational advantages. Auditors with very specific software needs may have to look beyond the built-in capabilities of available products and consider crafting their own audit tools. The author also observed customization in developing fraud-auditing techniques. The article does not provide any detailed analysis on impact of technology advancement and availability of complex audit software could promote to efficient and effective audit performance[22,25,26].

Romas Staciokas and Rolandas Rupsys (2005) has aimed to understand internal audit functions, explore implication of IT and analyze advantages of internal audit in the organizational governance. The author has explored the origin and acceptable definition of internal audit by reviewing literature, comparative analyses, and review latest research. The definition of Internal audit has continually changed and revised decade by decade, and still facing certain issues understanding of internal audit function and it position within the organization. At present, the function of internal audit includes not only of internal control effectiveness, fraud investigations or assistance to external auditors, but also identification of organizational risks, consultations to the senior management with regard to risk management, process improvement or global operations. It is vital for all members of organization (management, accountants, audit committee, etc.) to have same and adequate understanding of what internal audit is all about. According to author and supported by Ruud and Bodenmann (2001), it is important to understand needs and expectations of internal and external decision makers towards internal audit function. The author has also explained that there is some independency problem faced by internal audit being as an integral part of organization. In exploring the implication of IT, the author has defined the significant

benefits of IT in auditing process. Auditors aided by IT based application; computer assisted audit tools (CAATs) increased effectiveness of internal audit in the organization. On the other hand, IT development for example, automation and computerization had increased risk of discontinuing organizations activity, data loss, network breakdown and influence business monitoring and control process. The author has reemphasized the aim of internal audit function is to monitor, evaluate and improve risk management, controls, and governance process. Unfortunately, the author has not provided enough analysis on how different corporate governance's approaches can influence internal audit process in the organization [22,27].

Harrison and Datta (2007) compared the user perceptions of feature level usages and application level usages and suggest that user perceptions of overall applications overshadow their perceptions of independent features, suggesting application-level lock-in effects and pointing out the difficulty in vendor attempts to unbundle features from feature categories and applications [22,28].

According to Kim *et al.*, (2009), technology features have a large impact on technology acceptance in the internal audit profession as influencing system usage, perceived usefulness, and perceived ease of use. System usage, perceived usefulness, and perceived ease of use are high in basic features and low in advanced features. Technology features will have a large influence on technology acceptance in other professions [22,29].

Holstrom (1984) was identify different sources of error and inconsistency, followed by Hogarth (1985) who suggests computer programs to improve the consistency of human responses and mitigate errors.

Most prior works were talking about auditing computer systems in a perspective of how it overcomes the hardships of auditing, and what are the benefits that will add to the auditing process.

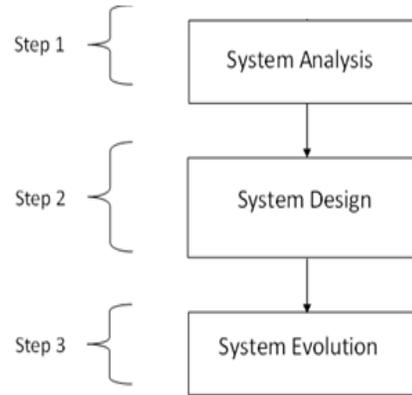
The overall objective of the internal audit activity is to provide all levels of management with an independent assessment of the quality of the internal controls, administrative processes and the extent to which they are assisting the municipality in achieving its strategic objectives in terms of the integrated development plan (IDP).

The proposed system is a system to help internal auditor in their job and take their experience to build a good system.

### III. METHODOLOGY

An object oriented system was developed to manage some of problems that face the internal auditors and become an assistant tool to the internal auditor to help them in taking decisions. SQL server was used to design and implement the database of the system. The object oriented data modeling was used to system in the analysis phase. The system was coded in visual basic and the user interfaces were designed using Microsoft visual studio. The internal auditing system was

developed in three steps, the first step was the analysis step, the second step was the systems design, in which the features and operations of the internal auditing were described in details, including process diagrams. At the last step of internal auditing system development methodology the system was developed and tested, this step was termed as system evolution step, these steps are illustrate in the following Figure (2).



**Figure (2): Internal Auditing System Development Methodology**

#### A. System Analysis

An information about internal auditing was collected and data extracted from books, papers, web sites, and mainly from human auditors. Data were gathered from the internal auditors by asking question, some interviews made with the employees of the department of internal audit in the education institutes.

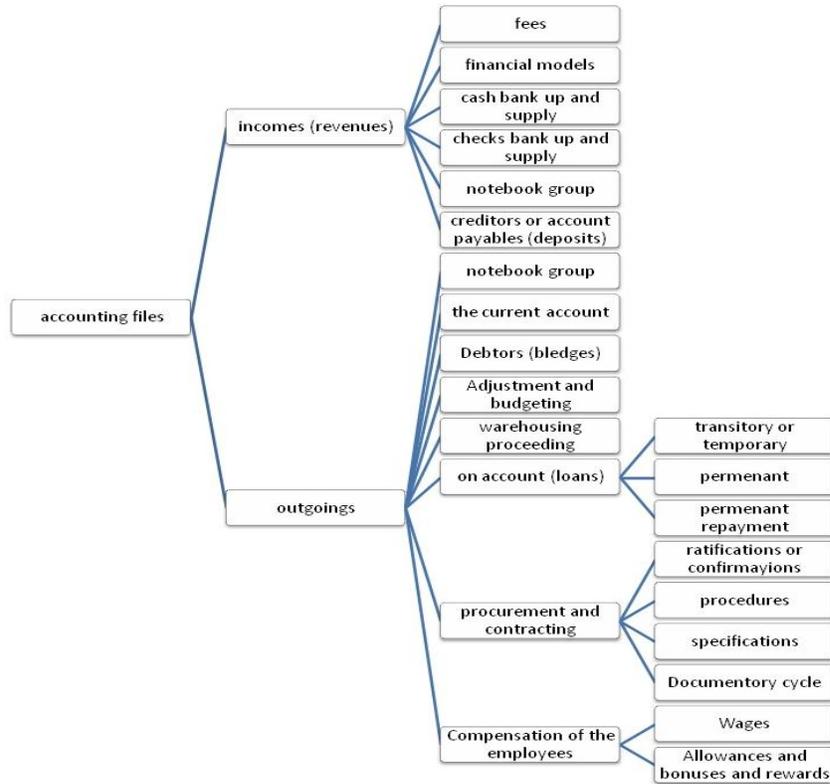
#### B. System Design

In this step the dataflow diagrams (DFD) for the proposed system was described, and the entities of the internal auditing system was modeled as objects.

##### 1) Dataflow Diagrams of the Internal Auditing Processes

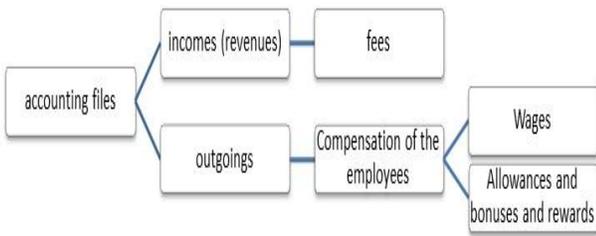
Firstly, the audit structure on accounts files presented by accounts auditing tree as shown in Figure (3). The accounts files divided into two groups:

1. Incomes: state all the proceeds of the organization divided into six branches (Fees involving impose and cancel of government fees and taxes, financial module, cash bank up and supply, checks bank up and supply, notebook group, creditors).
2. Outgoings: state the expenses of the organization it is branched into eight branches (the notebook group, the current account, the debtors, the adjustment and budgeting, the warehousing proceeding, the loans which also divided into its sub branches, the procurement and contracting and its sub branches, the compensation of the employees and its sub branches).



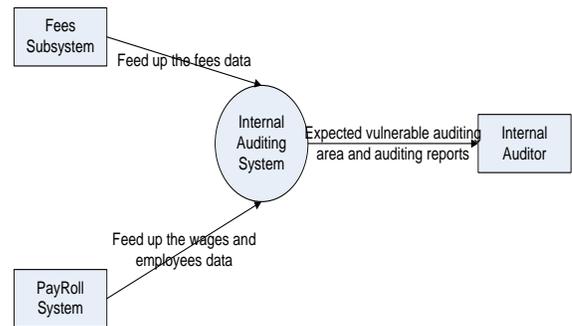
**Figure (3) Accounts Auditing Tree**

These two groups was summaries depend on education institute. The summary of the data that can be used in this paper shown in Figure (4).



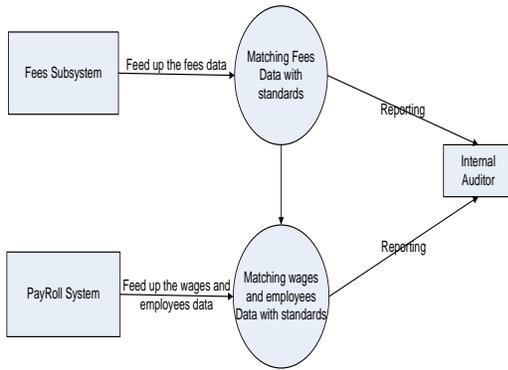
**Figure (4) The Summarized Accounts Auditing Tree**

Secondly, the auditing processes were modeled into dataflow diagrams (DFDs), the context diagram or level (0), which shows the environmental elements with which the system interfaces; there are two subsystems that are used to feed the internal auditing system for educational institute, as shown in Figure (5).



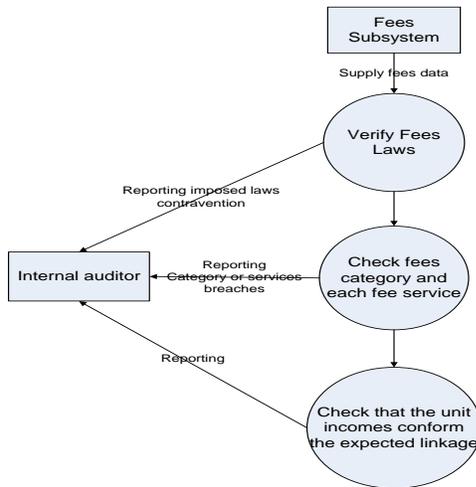
**Figure (5) Level (0) Internal Auditing System with Environmental Elements**

The level (1) diagram which illustrate the overall flow of auditing processes, which the auditing process divide into two ways according to the files will be audited, if the audited files are incomes files fees then the accounts system supply the accounts files needed and the internal auditing system matching these files with the expected incomes, and report the internal auditor. If the files to be audit are compensation of employees then the payroll system supply the needed data, the internal auditing system audit these data, and reporting the internal auditor, as shown in Figure (6).



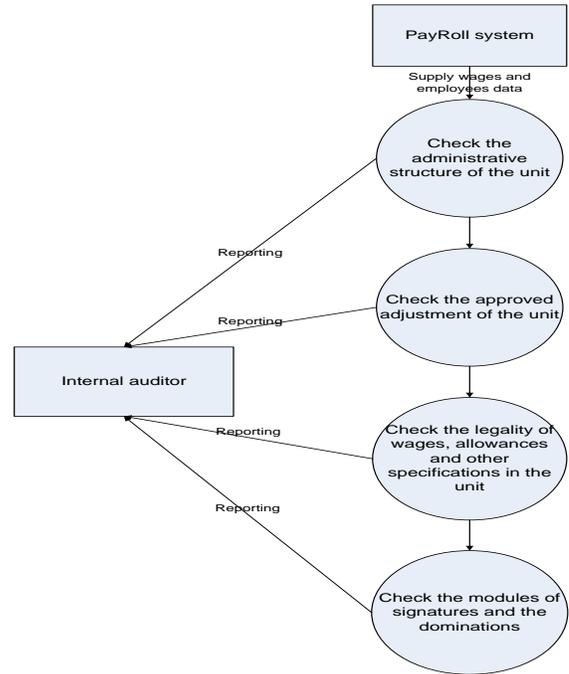
**Figure (6) Level(1) Auditing Processes Depend on the External Data Source**

The level (2) diagram which illustrate the fees and compensation of employees auditing processes. The fees auditing process starts when the accounts system supply the fees, here the internal auditing system firstly verifies that the fees imposed or canceled by formal laws, then it check the category of each fee and the service its offer, also the internal auditing system assure that the unit incomes are impeded in the approval budget, at the end the system report all the results to the internal auditor as shown in Figure (7).



**Figure (7) Level (2) Fees Auditing Processes**

The compensation of employees auditing process starts when the payroll system supply the employees compensation, here the designed system firstly checks the administrative structure of the unit, then it check the approved adjustment of the unit, also the internal auditing system assure that the unit incomes are impeded in the approval budget, after that the system reports all the results to the internal auditor, these steps shown in Figure (8).

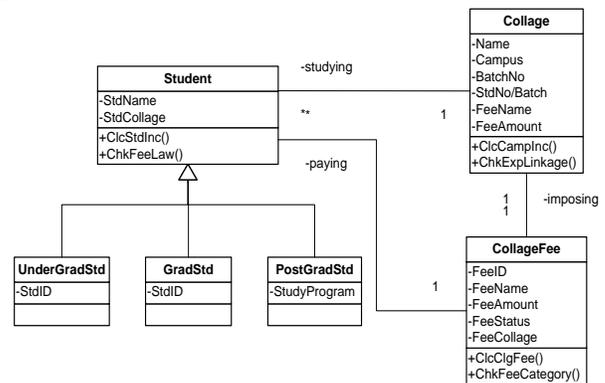


**Figure (8) Level (2) Compensations of Employees Auditing Processes**

2) *Object Oriented Modeling of the Internal Auditing*

In this stage the internal auditing entities were modeled into objects using object oriented modeling techniques[15] and unified modeling language (UML)[16]. The proposed system depends mainly on two external sources, which take the processes of the system into two different ways of execution, thus, any participation of the two external sources will be modeled separately.

The first external source is the fees subsystem was modeled, it's consist of six object classes Student, UnderGradStd, GradStd, PostGradStd, Collage and CollageFee, as shown in Figure (9).



**Figure (9) Object Class Diagram of the Fees Subsystem**

Then the second external source was modeled, it's consist of eleven object classes Employee, Professor, AssociatedProfessor, AssistantProfessor, Lecturer, TeachingAssistant, EmpSalary, Loan, DegreeSalary,

DegreeAllowance and DegreeDeduction, as shown in Figure (10).

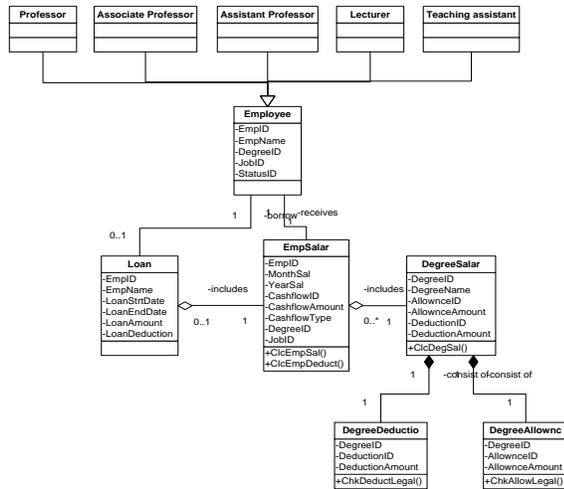


Figure (10) Object Class Diagram of the Payroll System

C. Internal Auditing System Evolution

In this step the system databases, codes, and user interfaces were designed.

IV. RESULT AND DISCUSSION

After login into a main form which ensures the privacy of the auditing process and details. The interface gives the internal auditor two choices to perform, the incomes auditing and the outgoings auditing.

A. incomes auditing

The incomes auditing interface appear when the incomes auditing button was pressed, this screen gives the internal auditor two choices for incomes auditing, auditing the collage incomes and auditing expected incomes, and also gives the ability to go back for the main screen to choose another type of files to audit it. The internal auditor select the collage he/she wish to audit its incomes from the list of collages impeded, thus the fees of the selected collage will be audited and the audit results displayed, the results represent the student number, the student name, the paid fees, the semester, notes that explain the reduction and the increment of the paid fees from the imposes fees, and the collage.

The auditing of the actual incomes of the campuses according to their expected incomes, which appear when the auditing expected incomes button. The interface displays the campus, the actual incomes, the expected incomes, and notes about the variance between the actual and the expected incomes.

B. Outgoings Auditing

Firstly, the outgoings of the current month were represent, and the following details will displayed: the employee number, the employee name, and the employee wage. Then the auditor have two options of auditing, audit the employees' compensation, and confirmations of outgoings.

Results of auditing employees' wages detail the results of auditing process in the compensation, listing the employee number, the employee name, the employee working degree, the employee status, the employee last wage, the wage modification which illustrate in form of signs the differ between the last wage and prior wage of employee, and the notes that state the reasons of the modification and the details of modification. The results of auditing process on the outgoing according to their confirmations, detailing the exchange item, the actual expenditures, the confirmed expenditures which generated by the auditing system using the exist information about the employees and their factual compensation, and notes that explain the reasons of differ between the actual expenditures value and the confirmed expenditures value.

The results show that the system is expected to reduce the complexity of internal auditing environment, the internal auditor need not to remember the details of the last auditing process or go back and match the earlier files and results of the earlier proceeded audit, also help the auditor to take a good decision.

The proposed system also has reduced some sources of error and inconsistency which appear in internal auditing process like the judgment errors that occur when there is a departure from a generally accepted criterion, judgment inconsistencies that occur whenever there is a difference between judgments, given the same data set and objectives, regardless of whether a generally accepted criterion exists, an error in overall judgment occurs when the auditor issues an incorrect audit opinion, and the inconsistency in overall audit judgments occurs when different auditors render significantly different audit opinions based upon an identical set of financial statements and an identical set of audit evidence. Also it increases the verifiability of different views in the internal auditing process, agreeing with Hogarth's opinion.

V. CONCLUSION

The aim of this Study was to develop an internal auditing system using object-oriented modeling. The study concludes that the object oriented modeling is capable of developing such a system without any problem, where the internal auditing elements can be manipulated as objects and their processes can be manipulated as methods. Using object oriented modeling simplify the modeling of the internal auditing process and clarify the vision of the auditing tasks for the system analyst and programmer. Furthermore using object oriented modeling minimizes the needed time to create such computer systems. Moreover the study concludes that the internal audit departments can utilize the computer to a great degree in the performance of their audit tasks. Also the internal audit department can use the proposed system to maximize the integrity of the internal auditing procedures.

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