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Inter-Schools Collaboration and Information Management System: A Case of KISII County Secondary Schools, Kenya

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Abstract: Inter-Schools Collaboration and Information Management System are technologies that support Knowledge Management (KM) in organizations, specifically - knowledge generation, codification, and transfer. The use of KM in organizations is now widely recognized and expected to be an important part of organizational practices. The study focused on establishing an Inter-Schools Collaboration and Information Management System that captures various aspects of school operations for Kisii County secondary schools. A KM system was designed, tested and implemented. The key areas of the Inter-Schools Collaboration and Information Management System that arose from the analysis done include; academics, student admissions, accounts, examinations and sports that encompass the bulk of the information critical for Inter-Schools Collaboration and Information Management System for school management. The researcher employed UML (unified Modeling language) in presenting the Inter-Schools Collaboration and Information Management System at the design stage. The results of the design phase were translated into program Codes using PHP, javascript, HTML, MySql and the wamp server as the implementation environment. The study provided platform that has made it easier, faster, and cheaper to access schools data from the same access point for many secondary schools in Kisii County.

Keywords: Knowledge Management, Collaboration, Information Management System, Inter-Schools

1. INTRODUCTION

Inter-Schools Collaboration and Information Management System (ISCIMS) support Knowledge Management (KM) in organizations in generating, codifying, and transferring the available data into information [1]. Information practices and learning strategies are gaining acceptance in the field of education. At the most basic level, knowledge management helps to improve the use and sharing of data and information in decision-making [2]. In addition [3] noted that professionals are always in situations where they have to think fast and process an array of information results in order to make decisions. This implies that knowledge management holds key to proper decision making in complicated situations. Educators have been using information management tools for years to improve the efficiency of administrative services and the effectiveness of academic programs. Historically, the practice of information management within education has focused primarily on the technical systems that are implemented to collect, organize and disseminate the organization's expanse of quantitative data in areas of management [2]. This research aimed at developing an information system that manages school information for secondary schools in Kisii County. In Kenya, most existing systems are either manual or semi-automated targeting individual schools or automated systems not targeting secondary schools and thus most of the data required about secondary schools can only be accessed manually or through individualized documentations or a school web site. The knowledge users include administrators, teachers, parents, donors, sponsors, students and various stakeholders.

2. LITERATURE REVIEW

2.1 Knowledge Management Concept

[4] define knowledge as understanding gained through experience or study. It is know-how or a familiarity with how to do something that enables a person to perform a specialized task. Further, [5] define knowledge as a "fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information". In organizations, knowledge management is entrenched in organizational routines, processes, practices, documents and norms. [6] says that there are three types of knowledge: tacit, explicit and implicit knowledge. Tacit knowledge exists in people's minds. It is difficult to articulate in writing and is acquired through personal experience [6]. Tacit knowledge according to [5] is present inside the human intricacy and volatile. [7] defines explicit knowledge as knowledge, which is "articulate, capture and distribute in different formats, since it is formal and systematic". Explicit knowledge is codified, recorded and available, and is held in books, journal articles, databases, in corporate intranets and intellectual property portfolios. Implicit knowledge is the middle ground of tacit and explicit knowledge. [8] points out that some knowledge believed to be tacit can be transformed into explicit knowledge. This body of knowledge is referred to as the organization's implicit knowledge. Organizational needs are driven from KMS by looking at the processes supporting KM in organizations [1]. These processes imply required functionalities that a KMS should provide to enable effective KM use.

Knowledge management is a discipline that promotes an integrated approach to identifying, managing and sharing of all of an enterprise's information assets [9]. The information in the database includes the documents like policies, procedures, expertise and individual experiences. Knowledge management issues include developing, implementing and maintaining the approximate technological and organizational infrastructure to enable knowledge sharing. Knowledge management solutions are now key to strategic technologies for large companies to achieving their strategic goals over years to come.

There are three main KM activities in organizations; knowledge generation, knowledge sharing, and knowledge codification [5].

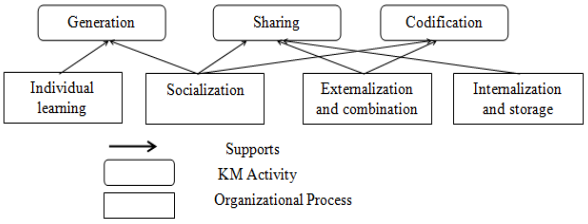

Figure 1: KM activities and supporting processes

[6] explains these activities in an organizational knowledge creation based on interactions between tacit (highly personal) and explicit (formalized) knowledge. He say that the process begins with the enhancement of an individual's tacit knowledge through hands-on experience, supporting the generation of knowledge. Socialization then follows, involving the transfer and sharing of tacit knowledge between individuals. The process for making tacit knowledge explicit is externalization. Dialogues allow the conceptualization of the tacit knowledge and trigger externalization, the transformation of knowledge from tacit to explicit. Then knowledge is combined with existing knowledge and internalized (codified). Once knowledge is explicit, it can be transferred as explicit knowledge through a combination process. This is the area where information technology is most helpful, because explicit knowledge can be conveyed in documents, email, data bases, as well as through meetings and briefings.

2.2 Conceptual Framework

Based on literature the researcher proposes four design aspects to support the KMS functionalities. In the study, the researcher uses a conceptual framework that is based on a synergy of Nonaka's system and Bohjaraju knowledge management systems to come up with a conceptual system for his research:

i. The network design to support sharing
ii. An ontological base to provide a shared language
iii. Meta-knowledge to support organizational memory , and
iv. People or employees or users.

These aspects are described in the framework shown in figure 2.

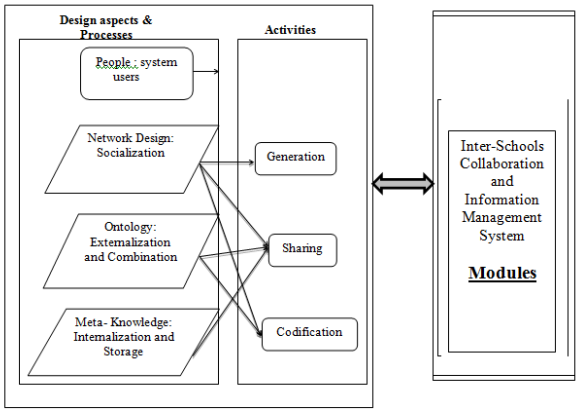

Figure 2: ISCIMS conceptual framework

3. METHODOLOGY

In order to identify the most crucial areas for automation, a sample size of 169 schools (out of Out of the 306 secondary schools in Kisii County) was chosen. This gives a 5.0% margin of error and 95% confidence. Questionnaires were used to gather information regarding the intended use of a Knowledge management system, what type of data will be processed, how the software should handle the data, and how the data can be accessed once in the system. The researcher adopted open ended, dichotomous, multiple choice and declarative questions. The respondents were given between zero (0) and three (3) days to answer the questions on the questionnaires before handing them back. After three days, the researcher collected back the questionnaires for reading and collating the responses.

Since the researcher intended to develop a system, Software Development Life Cycle (SDLC) approach was used. Gerald D. Everett stated that software development life cycle is a way of describing, developing and deploying a software system (Gerald D. Everett, 2007). A variety of life cycle systems for software development exist, but they all include the same constituent parts. All life cycle systems take a project through several primary phases i.e.: Communication, Requirement gathering, Feasibility study, System analysis, Software design, Coding, Testing, Integration, Implementation, Operation & Maintenance and Disposition.

The researcher opted to implement the Waterfall SDLC system as it is a simple software development paradigm. All the phases of SDLC function one after another in linear manner thus the outcome of one phase acts as the input for the next phase sequentially. When the first phase is finished then is only when the second phase will start and so on. The approach assumes that everything is carried out and taken place perfectly as planned in the previous stage and there is no need to think about the past issues that may arise in the next phase. The researcher consulted widely to ensure that all necessary data was captured and no issues left at the previous step.

Figure 3 provides an illustration of the general software development life cycle system.

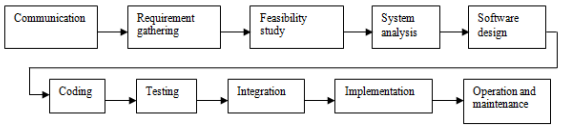

Figure 3: Software development life cycle system (Source: SDLC)

4. RESULTS AND DISCUSSION

4.1 Critical Areas Suggested For Automation

Many of the respondents indicated in their responses that so much information was available for use but the problem was how to access that information. When asked about centralizing that information, many suggested that if their information is centrally placed, they will likely do better as with the availability of information, competition with other schools will increase, enable easy and quick benchmarking, sharing of information among others. They indicated many areas that can be automated to assist in the operations and management with school information.

The most critical areas that were suggested for automation among others included: Academics (Teacher notes, e-books, performances), Admissions (Student admissions, list of student population, instant messaging, inquiries), Accounts(Statements, sponsorships, scholarships, sources of income), Examinations(Examination results, past papers, answer booklets), Sports(Games available, performances, sports infrastructure, requirements, sponsors), Administration (Current projects, completed projects, financing, donations) and Contacts (Post office box, email contact, websites, short massage services, social media contacts, phone numbers).

4.2 System Design

The researcher employed UML (unified Modeling language) in presenting the Inter-Schools Collaboration and Information Management System in a pictorial form. He used the UML standard because the standard specifies, visualizes and

documents artifacts of software systems during software development. The researcher deployed various system diagrams as explained in the following subheadings.

4.2.1 Inter-Schools Collaboration and Information Management System state machine notation

The researcher employed the state machine notation to describe the different states of a component in its life cycle.

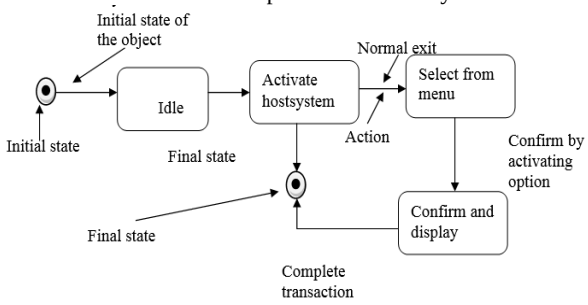

Figure 4: KMS state machine

The state of an activity can be active or idle. Active when the user is executing a given event and idle when such activity is not taking place.

4.2.2 Class Diagram

A class diagram is a graphical representation of the static view of the system and represents different aspects of the application while describing the functions performed by the system. The researcher used class diagram to analyze and design the static view of his system and describe responsibilities of the system. Here are a few of those views.

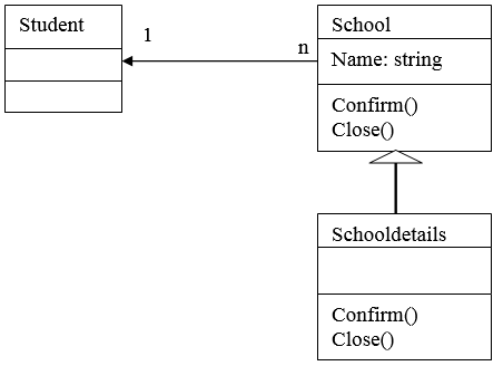

Figure 5: Student class diagram

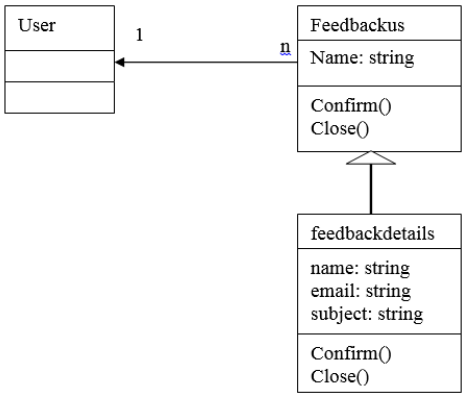

Figure 6: User class diagram

4.2.3 Component Diagram

The researcher applied the component diagram to bring out the physical aspects/ artifacts of the KMS system. These are the elements like those the researcher employed including the executable files and documents that reside in the nodes. The main purpose for the component diagrams was to describe the components used to make functionalities without describing their functionalities.

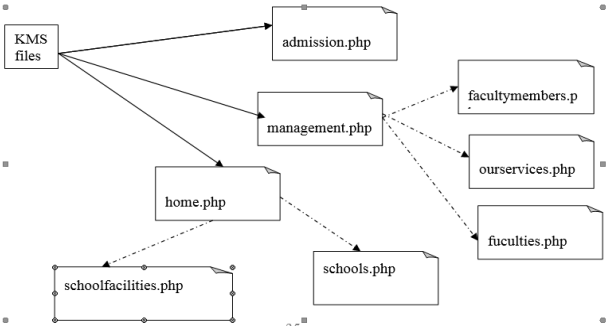

Figure 7: Component diagram

4.2.4 Deployment Diagram

The researcher used the deployment diagram to visualize the topology of the physical components of the system where the software components are deployed.

They describe the static deployment view of the system. Some nodes and their relationships are shown. They describe the hardware components where software components are deployed.

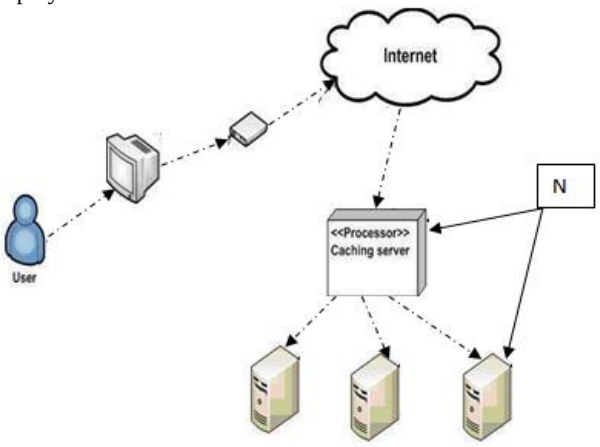

Figure 8: Deployment diagram

4.2.5 Use case Diagram

The researcher used the use case diagrams to capture the dynamic behavior of the system i.e. the behavior of the system when it is running / operating. The researcher implemented the use case diagram in showing the actors, use case and their relationships.

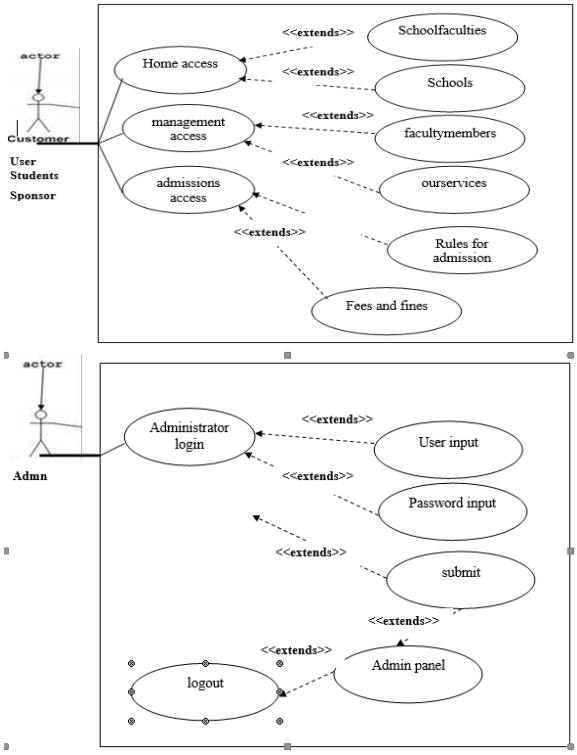

Figure 9: Use case diagrams

4.2.6 Interaction Diagram

The researcher used the interaction diagram to describe an overview of the interaction among different elements in his system. He employed the sequence and collaboration diagrams. The sequence diagrams were used to emphasize on time sequence of messages while he used collaboration diagram to emphasize on the structural organization of the objects that send and receive messages in the system.

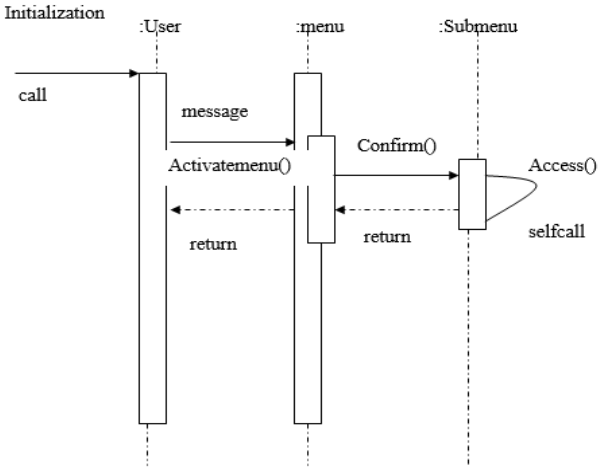

Figure 10: Sequence diagram

The collaboration diagram shows the object organization in the KMS. It indicates how the methods are called one after the other during execution.

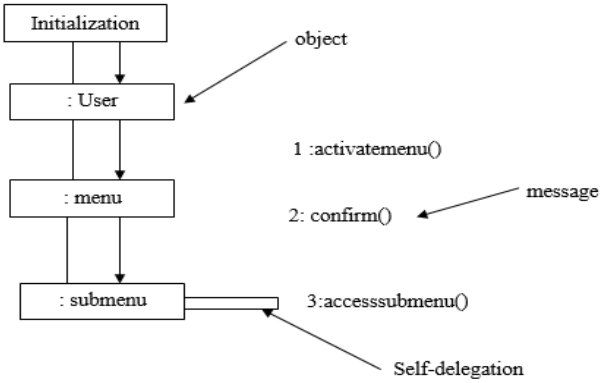

Figure 11: Collaboration diagram

4.2.7 Statechart Diagram

The researcher used the statechart diagram to describe the different states of a component when the system is running. This is because the states are specific to an object or component of the researcher's system. The researcher wanted to clearly show the object, state and even therein.

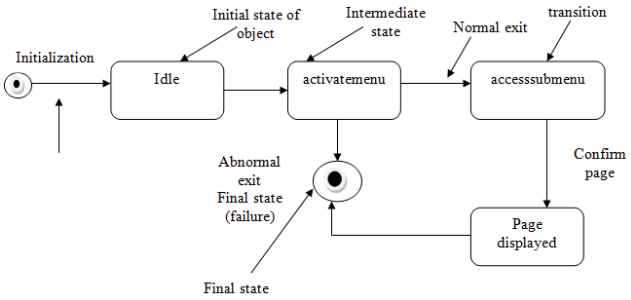

Figure 12: Statechart diagram

4.3 Implementation

The results of the design phase were translated into program Codes. During this Phase the researcher made it his central goal to fulfill the requirements of the Knowledge management system and to meet the design outlined in the design phase. The classes and class interactions developed in the design phase are very explicit. They translate directly into the code generated in the implementation phase. The researcher developed an Inter-Schools Collaboration and Information Management System using PHP, javascript, HTML, MySql and the wamp server.

4.4 Integration

Many components of the knowledge management system are new and needed no integration with other existing software or applications.

4.5 Testing and Validation

In the testing phase, the results of the implementation phase were run through a series of tests to verify that the system meet the goals of the requirements phase. A testing plan was created to allow for unit tests and system tests that were be performed. Unit testing was performed on individual software components. The process of integration brought together all the software components to create a complete Inter-Schools Collaboration and Information Management System to perform system testing in the software system as a whole. Some of the test results are discussed below.

4.5.1 The new system

The researcher was able to develop a system with a knowledge source. When a user wants to access information of a particular school, he / she access the county network and then Kisii County ISCIMS system that shows a screen shown in Figure 13.

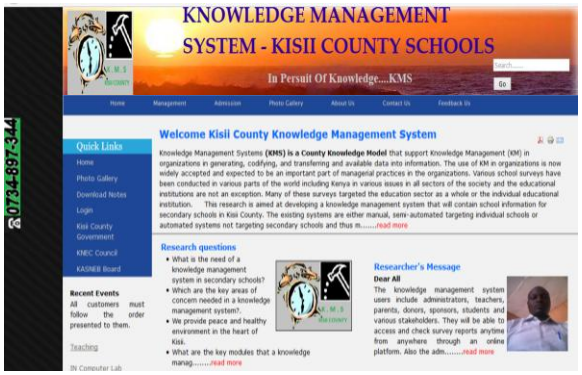

Figure 13: ISCIMS home page

The user can then select an option menu to access some information from any access point.

4.5.1 The system menus

The new knowledge system has many menu options as briefly explained below:

4.5.1.1 Home page

The home page has got seven key components: home, management, admissions, photo gallery, about us, contacts, and feedback us.

4.5.1.2 Home option

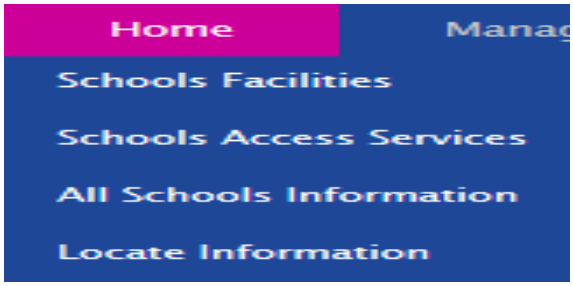

Figure 14: Home options

The home menu option consists of the following list content: school facilities, school access services, school information and locate information options. There is an overall welcome message to the user when he/ she visits the system.

Figure 15: Welcome message

4.5.1.3 Management option

This menu option contain the following options: Kisii county secondary schools, from director of education, principal's message, faculty members in a school, services in a schools and future faculties that can be joined and school performance option. The screen in the next page depicts that.

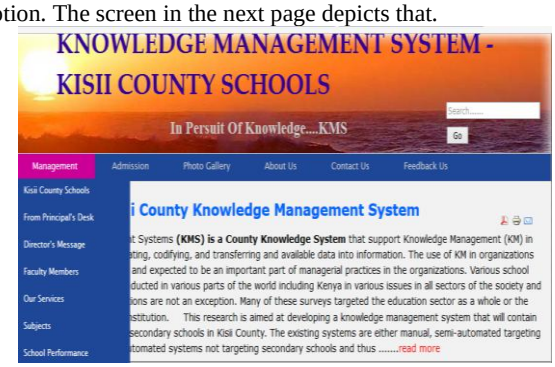

Figure 16: Management option

4.5.1.4 Admissions option

This menu contain three options for rules of admission to various schools, fees and fines by those schools and candidate performance in various schools.

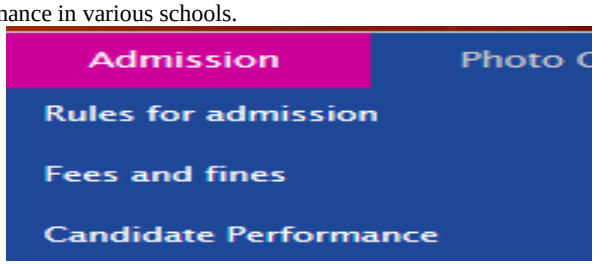

Figure 17: Admission option

4.5.1.5 Photo Gallery

Various schools can display activities of interest in their schools like athletics, science, balls, debates etc

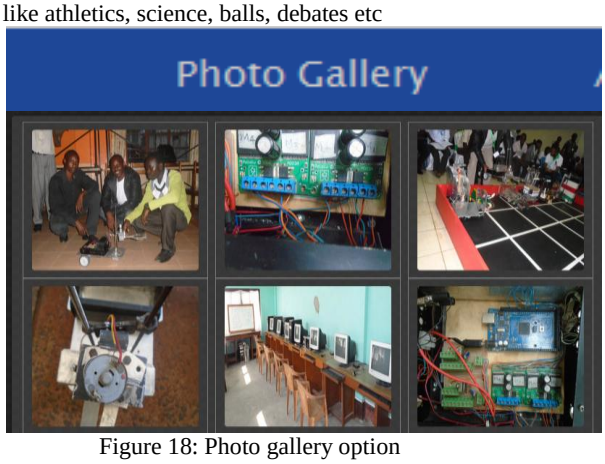

Figure 18: Photo gallery option

4.5.1.6 Contact us

With this option, the developers and school administrations and be contacted for any reason.

Figure 19: Contact us option

4.5.1.7 Feedback us

The feedback us option is used for communication for urgent help when browsing the knowledge system.

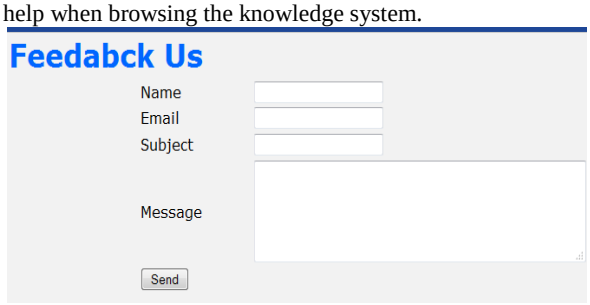

Figure 20: Feedback us option

4.5.1.8 Downloads

Various schools can post important materials that can be accessed and downloaded by users.

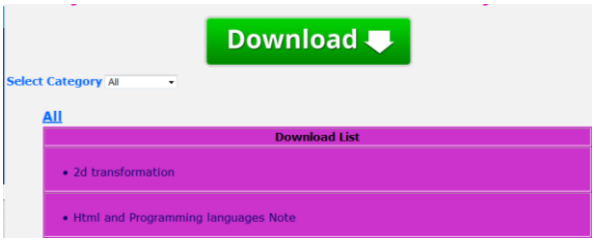

Figure 21: Downloads

5. CONCLUSION

In completion of the study, a new system was developed to incorporate the research findings as discussed above. This study involved two aspects namely: a field study and development of the system and subsequent implementation. The findings showed that the following information is needed by the users: School performance, School fees, Admissions, Accounts, Examinations and sports. All included in the new system.

6. ACKNOWLEDGEMENT

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