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## Electronic Student Management System for State Schools in Colombo District in Sri Lanka

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**Key words:** Electronic student management system, Sri Lanka, Colombo district, State Schools, web-based application, desktop application, real time

**Abstract:** Today Sri Lanka has 20,359,439 population and Colombo is an economic capital of Sri Lanka. Also Colombo is considered as an economic city and most of the technological institutes and educational institutes are situated in Colombo district. According to figures 375,187 students attend schools in Colombo district. The Electronic Student Management System mainly designs to the requirements of the government schools in Colombo region of Sri Lanka. This system provides solution of duplicate data entry, inefficient information access and security. Also this system reduces the work load of state schools. The purpose of the website is to provide real time availability to their busy client and also the main functions of the website are to response and transfer data according to the request of the client. Also desktop application provides the same service to clients who are working and who are studying inside the school premises. In future researcher will be planning to develop a website and desktop application which will take some inputs and will generate optimal solutions as the outputs. The ultimate objectives of developing the above web-based application and the desktop application are to reduce the additional costs of the state schools.

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## INTRODUCTION

Sri Lanka is located in the Indian Ocean and is considered as a South Asian Country. According to Economic perspective Sri Lanka can be considered as a third world country and also known as a developing country. There are nine major provinces existing in Sri Lankan Context. According to Sri Lankan circumstance, Western Province is the capital province in Sri Lanka. Western Province consists of three districts<sup>[1]</sup> called (Colombo, Gampaha, Kalutara) also Colombo is a major developed district in the Western Province. According to the statistics today Sri Lanka has

20,359,439<sup>[2]</sup> population and Colombo consists of 2,309,809<sup>[3]</sup> population and also Colombo is the capital of Sri Lanka. Other than that most of the population of Sri Lanka, live in Colombo district and it gets the 1st (11.40% of total pop)<sup>[3]</sup>. According to annual school census reports of Department of Census and Statistics, there available eleven<sup>[4]</sup> educational zones and thirty eight<sup>[4]</sup> educational divisions in the Western Province. Department of Census and Statistics, divides the state schools in Western Province in functional grade (Type) called 1AB, 1C, Type 2 and Type 3<sup>[4]</sup>. In regard to annual school census reports there available 1356<sup>[4]</sup> of functional grade (Type) schools in the Western Province and also

there exists 1236<sup>[4]</sup> Sinhala Medium Schools. Also there available 46,024<sup>[4]</sup> school teachers who work in state schools in the Western Province. Also there exist 975,517<sup>[4]</sup> students who are studying in schools in the Western Province. Likewise, 482,740<sup>[4]</sup> male students and 492,777<sup>[4]</sup> female students who belong to schools in Western Province. In Colombo district, there exist 402<sup>[4]</sup> functioning state schools. These Functioning government schools consist of 40<sup>[4]</sup> boy's schools, 57<sup>[4]</sup> girl's schools and 305<sup>[4]</sup> mixed schools. In Colombo region there available 380324<sup>[4]</sup> students and there exist 361<sup>[4]</sup> schools. Too Colombo region includes 17,846<sup>[4]</sup> school teachers, 187,905<sup>[4]</sup> female students and 192,419<sup>[4]</sup> male students attached to schools in Colombo district. Also Colombo city is considered as an economic city and it includes most quality and technological institutes and educational institutes. There are large number of well-known state and private institutes established in this area. The Electronic Student Management System mainly designs and is proposed to suit the requirements of the government schools in Colombo region in Sri Lanka. This system provides solution of duplicate data entry, inefficient information access and security. The System as a whole will be far more efficient than common methods such as manual inspection and almost as accurate. Also this system reduces the work load of the state schools. Researcher's objective is to develop website which can effectively support real time and efficient desktop application which has high performance and the best feature. The purposes of this website are to provide real time availability to their busy clients and website responses and transfers data according to the request of clients. Also desktop application provides the same service to clients who are working and studying inside school premises. Researcher's planning is to develop a website and desktop application which will take inputs and will generate an optimal solution as the output of selected state schools stakeholders. The ultimate objective of developing the aforesaid web based application and desktop application is to reduce additional cost of state schools.

## **RESEARCH METHODOLOGY**

The Electronic Student Management System provides a more efficient and reliable solution to schools' paper based activities. Currently there is no real-time web based Electronic Student Management System in schools in Sri Lanka. There are several major functions which will be included in the Electronic Student Management System which will be used in Colombo district. Fig. 1, shows the functions of the Electronic Student Management System. In this system, process and actions are performed in real time and there are few manual users. Using this system, Colombo schools can maintain details

of all the students' and information of schools very easily. This system consists of two system components which are called desktop applications and web based applications. Desktop application can be used within the school premises and web based application can access in real time manner. The features of new system are reliability, availability (online availability), security (secure and safe logging), user friendliness (attractive user interface) and accuracy (data filed validation). This new proposed system will have real-time (web-based) mechanism which is a major advantage of the Colombo district schools. It causes to help the customer attraction and to increase the revenue sources to schools. New students registrations, students re-registration and students and teachers attendance and performance can be done using this system. These functions can be done in a short time and with high accuracy by using the proposed system. Payrolls calculation, student's progress, semester Grade Point Average and scholarships, teacher's progress and students' improvement can be easily accomplished through the new system. The Electronic Student Management System consists of several network components with high expense and flexibility, in order to establish the system. Wireless access point, modems, firewall, switch, Wi-Fi Router and Unshielded Twisted Fair cables, Registered Jack-45's, database server and faxes are major components of this system. Also the personal computers, notebooks, smart phones, scanners, printers are other subordinate components of this Electronic Student Management System. Regarding the client, front activities are done using several network components called access point, modems and Wi-Fi Router. Also it includes the personal computers, smart phones, notebooks, Wireless Personal Computers, Tablet are components of the front side of the system. According to the Electronic Student Management System, the personal computer is directly connected to the access point. Both of the Access Point and Personal Computer are established in near locations and using this Personal Computer, the client can access the system through the access point. The Client having a notebook, a wireless PC or a smartphone facilitate to access the Electronic Student Management System access point. The data then goes into the modem and it moves back and forth between the client and the Electronic Student Management System. The data then goes to the Public Switched Telephone Network and gets to the modem on the other end (schools sides). After receiving data from Public Switched Telephone Network, it points to the firewall installed on the school premises. Then firewall checking the reliability and security of the Data Packets. According to the proposed system, one switch and one Wi-Fi router, Workstation and Modem connect to the firewall. The switch checks the data packet destination and sends that data packet to the server. Database is embedded in the server and that data can be

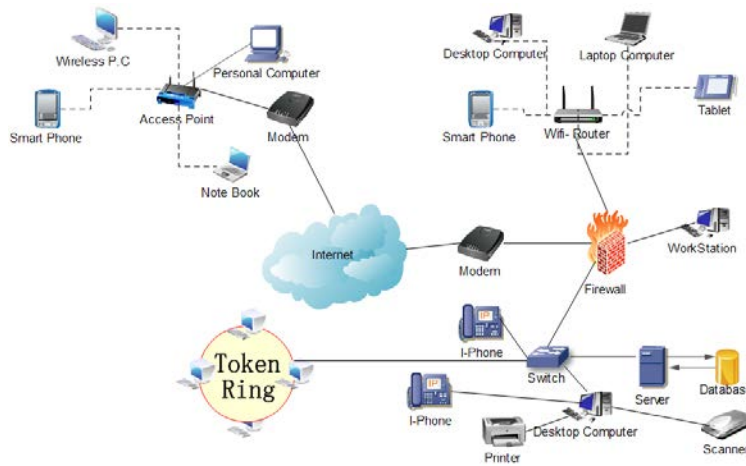


Fig. 1: The functions of the electronic student management system

sent to the client when needed. After examining these data packets, then it redirects to the firewall. After checking the reliability and security of data packets inside the firewall and it directs to the data packets to the modem side. In the modem, it converts digital signal to analog signal and sends to remote access modem through the internet. In the Remote access modem sends those data to wireless access point and remote client gets their feedback using the Electronic Student Management System with reliability and security. On the school side, the database server is directly connected to the switch. Besides that, the Personal Computers ring topology is connected to the switch. In school sides the Wi-Fi Router connects to the firewall. The Wi-Fi router allows users to connect to the Electronic Student Management System using the desktop, laptop, Tablet and smartphone within the school premises. Wi-Fi router is a modification of the normal route. This combination of the Wi-Fi and other equipments can be called and considered as an Intranet. The Electronic Student Management System offers five access levels to users. They are Students, Parents, Teachers, Non Academic staff and Administrators and these parties have different responsibilities and different privileges. Administrators have privilege to access all the functions of entire system and other parties enable the different functions according to their roles in the school.

**Research problem:** Today most of the state schools in Colombo district maintain all the student's details and school details manually. Therefore state schools have to put fair amount of effort to prepare the documents and reports regarding the school details. Currently there are no real-time (web based) mechanisms, in the schools those who are residing in Colombo district and that is a major downside which faces by the schools in Colombo district. It causes to reduce the customer attractions and revenue sources to school and they use desktop applications to do

some school related activities. These applications are not properly integrated with each other. Therefore, some activities may take longer to produce output. There are lots of human errors and duplicate data entry happened when use of existing applications because of not having proper integration of those applications and not proper quality standards. Currently, there is no field validation function in existing applications. Therefore Human makes a lot of mistakes when entering user details. The outputs such as reports regarding the academic and non-academic activities are not satisfied. That is not suitable for schools in Colombo district. Important functions of the school are carried out using the Excel spreadsheet. It is not the best way to handle the state schools in the Colombo district. Because Excel does not produce attractive reports for requested parties and the Excel output reports are not-user friendly. The client does not satisfy himself with the output reports which are prepared by the existing applications. One of the major drawback of applications that are not well developed is the lack of proper security and user privileges. Applications do not provide the access privileges to their users therefore any user can access the applications and its functions. All the undeveloped applications consist of same security mechanisms, also schools share same user names and passwords within the schools to access the undeveloped applications. There is no real-time (web-based) mechanism to respond to urgent requests of busy clients who are in schools in Colombo district. All the school functions are done only on working days. Therefore busy client must wait until working days to perform their activities. Responsible activities such as registering new staff, re-registering students and student and teacher participation were carried out by school staff manually. These activities are vital to school and take a lot of time for data entry and searching. Also calculating payrolls, student progress such as Semester Grade Point Average

and Scholarships, Teachers Progresses and school improvement are done manually. The existing undeveloped applications do not have capabilities to fulfil above mentioned tasks.

**Research solution:** The Electronic Student Management System provides efficient and effective solutions to state schools in Colombo district. Also it causes to reduce additional cost and provides considerable revenue to state schools. Other than that this system can be considered as a first step of technological administration of state schools. The Electronic Student Management System is properly integrated with each other. Therefore, some activities take less time to generate output. This system reduces and eliminates human errors and duplicates data entry, because of integration of applications and within proper quality standards. Also system developer makes a proper filed validations and it reduces the duplicate data entry and human errors. The proposed application produces different layouts, outputs such as reports regarding the academic and non-academic activities. It is suitable for state schools in the Colombo district and the proposed new project will fulfill the important functions of the state schools in the Colombo district as early as possible. Previously all the important functions were done by using Excel spread sheets. The Electronic Student Management System produces attractive reports for requested parties and output reports are very user-friendly. Therefore the client will satisfy with the output reports which are prepared by the proposed system. The Proposed system is user friendly, because it has proper used graphical user interface, images and field validation. Major advantages of the new application system consist of security and user privilege. The busy client can access the system at anytime and anywhere using the Internet. First, researcher reviews the requirements for the development of the system, then collects the information and then the researcher considers the appropriate software development life cycle methodologies. Researcher will draw the Unified Modeling Language diagrams and Entity-Relationship diagrams to gain a thorough idea about the system development and the database design. After fulfilling the aforesaid requirement, researcher will use the Net Framework and PHP language to develop the web based application and the desktop application for the state schools in Colombo district. This will be very user friendly developed environment, so researcher can find error easily. At the end researcher will implement user friendly and attractive web based application and desktop application to fulfil the user requirements, However researcher hopes the system which he is developing for the state schools in Colombo district will be free of errors. The data transfer between access point and networking equipments, then data goes to modem. "Modem" name comes from its functions and it converts analog signal to

digital signal and also vice versa. After the data coming to modem, it forwards and backwards data between client and Electronic Student Management System. After sending the data from Access Point, then the data goes through Public Switched Telephone Network and receives from the other end of the modem (School Side). In school side modem, converts the data to analog signal in to digital signal and vice versa. After receiving data from Public Switched Telephone Network to modem, it is re-directed to the Firewall which is established in state school premises. In proposed system, switch and Wi-Fi router directly connect to the Firewall. After receiving the Data packets to Firewall, it examines the security and sends those data to switch. The Switch examines the destination of the data packets and sends data packets to server. Inside the server, the database is attached to it and sends those data to client. These data packets include the destination and also the switch examines the destination and sends to the firewall. In the firewall perspective it examines the reliability and security of the data packets and sends those data packets to modem. In the modem, data converts to digital signal into analog signal and sends to remote access modem through the internet. In the remote access modem sends the data to wireless access point and the remote client gets their feedback using Electronic Student Management System with reliability and security. In the state school side, database server is directly connected to the switch. And also other Desktop Personal Computer with Scanner and Printer, I-Phone also connect to the switch. The four Personal Computers which connect to ring topology is attached to the switch. In the ring network topology, the state school workstations are connected in a closed loop configuration. Adjacent pairs of workstations in schools are directly connected. Other parts of the state school workstations are indirectly connected, the data passing through one more intermediate nodes. If a token ring protocol is used in a ring topology, the signal travels in only one direction, carried by a so-called token from node to node. In state schools, the Wi-Fi Router connects to the firewall, in this Wi-Fi Router facilitates to connect the Electronic Student Management System using desktop, laptop, smart phone and tablet within the school premises. Wi-Fi Router is a modification of normal router. This combination of Wi-Fi Router and other equipments can be called and considered as an Intranet.

## CONCLUSION

The Electronic Student Management System is mainly designed for the needs of government schools in the Colombo region in Sri Lanka. This system provides solution of duplicating data entry, inefficient information access and security of data. The system is more efficient than the most common methods such as manual

inspection. Also this system reduces the workload of the stakeholders. The Electronic Student Management System will be developed to protect security, duplicate data entry and ineffective information access, etc. Also, this system reduces time consuming, inefficient information retrieving. After developing this system, researcher hopes to increase school's revenues, lower costs and attract new consumer segments and new approaches. Researcher hopes to reduce the workload of the state schools after using this Electronic Student Management System. The researcher recommends that the state school must train their users before they can use the system. It takes some time to the actual usage of the system.

### **RECOMMENDATIONS**

As future works, the researcher aims to establish this system in the whole island (in other districts) and not in other rural districts such as Jaffna and Batticaloa. The ultimate goal of the Electronic Student Management

System is to provide better communication service to students and parents. It also helps to create better interactions in the state schools and eliminates additional cost and workload.

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