A School Operation and Management System

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Declaration of authorship

We, Ranavann CHHEM, Anudeep CHIKKAM, Jeiman JEYASINGAM, Parijat PATEL, Quentin REVEL and Antoine YREUX, certify that this coursework report titled, "A School Operation and Management System" and the work presented in it are our own except the Introduction and Section 1 that has been furnished as this coursework subject by the module leader, Professor Doctor Hong ZHU and has been excluded from the count words and characters.

We swear that:

- This coursework report was done as part of our postgraduate studies in Master of Science in Computer Science at Oxford Brookes University.
- If any component of this coursework report had already been transmitted for any kind of qualification, certification or degree at any institution including this university, this has been plainly declared.
- When we have considered / examined and used every kind of source or that the coursework report is based on collaborative work, this is always precised and properly cited and referenced otherwise, this coursework report is completely our own work.
- Ranavann CHHEM work on subsection 2.4, Anudeep CHIKKAM work on subsection 2.5, Jeiman JEYASINGAM work on subsection 2.2, Parijat PATEL work on subsection 2.3, Quentin REVEL work on subsection 2.6 and Antoine YREUX work on subsection 2.1 and that other sections and subsections were made as a group.

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Introduction

With the advent of mobile and cloud computing technologies, it is perceived that a new generation of school management systems can be developed to automate school operations by taking advantages of frontier IT technology such as big data, cloud computing and mobile computing. It is decided to develop a multi-tenant SaaS application with Google Cloud platform to realise the functions of school management and operation.

This document defines the key functional and non-functional requirements of the system. Section 1 identifies the key types of users of the system. Section 2 states the functional requirements. Section 3 states the key features of the system the design should achieve. Section 4 states the quality requirements of the system. Section 5 analysis the Professional, Legal, Ethical and Social implications of the system and its development.

1 Types of Targeted Users

The main types of the users that the system should support include the following:

- School Managers, such as Headmasters. They will use the perceived system to setup and update the school's website, and enter basic information about the school, and manage the operation of the school, such as maintain student records, and assignment of teaching duties to teachers, etc.
- Students. They are the students of a school. They will use the system to communicate with the teachers of the school and fulfill various study tasks.
- Teachers. They are the teachers of the school. They will use the system to communicate with the students and the school managers.
- Parents. They are the parents of the students of the school. They will communicate with the school and the teachers, and also with each other.
- Event organizers. They organized events that involve multiple schools, such as sport tournaments, science days, etc.
- System operators. They will manage the systems, such as the tenant accounts and perform various maintenance tasks through the system.

2 Functional Requirements of the System

The functional requirements of the system are grouped according to the types of users and could be through a mobile app or web-based interface running on smart phones, tablets, and/or on PC.

2.1 Requirements of School Managers - 18079563

FR-SM-1: Setup and update School Manager account. A user should be able to request of a School Manager account from the PIP online system with the following information, which should be able to be updated by the School Manager once the account is approved. Each School Manager account will be provided with a unique account number.

- School Manager's name and contact information.

FR-SM-2: Setup and update modules. The system should support the School Manager to setup and update the modules. The system should allow the School Manager to specify the following information:

- The basic information about the module, including the name.
- The list of IT Resources necessary.
- The rooms that may be used.
- The required assessments.

The system should allow the School Manager to assess and assign those modules to teachers, and students.

FR-SM-3: Setup and update students. The system should support the School Managers to setup and update the connections to the students so that these students can also operate the smart devices, the services and communicate with the School Managers. The system should allow the School Manager to specify the following information:

- The basic information about the student, including the name.
- The student's PIP account ID (see FR-S-1).
- The list of devices shared with the student.

FR-SM-4: Setup and update teachers. The system should support the School Managers to setup and update the connections to the teachers so that these teachers can also operate the smart devices, the services and communicate with the School Managers. The system should allow the School Manager to specify the following information:

- The basic information about the teacher, including the name.
- The teacher's PIP account ID (see FR-T-1).
- The list of devices shared with the teacher.

FR-SM-5: Schedule 1:1 meetings with the teachers, students, parents, event organizers and system operators. The system should enable a school manager to schedule 1:1 meetings with the teachers, students, parents, event organizers and system operators to discuss all aspects of their school life. There will be a built in timetable system on the platform to display their available dates and busy dates. (See FR-S-4, FR-T-5 FR-EO-6, and FR-SO-5)

FR-SM-6: Connection to each other account. The system should enable each account to be connected and disconnected to a number of other accounts so that they can also communicate together on GSuite. (See FR-S-10, FR-T-7, FR-P-3, FR-EO-7, and FR-SO-6)

FR-SM-7: Manage student records. The system should provide support to School Managers to manage student records, such as students grades, utility bills, and historical data collected from the smart devices, etc.

FR-SM-8: Manage school's portal. The system should provide support to School Managers to manage school's portal, such as PIP and Moodle.

FR-SM-9: Social networking. The system should provide support to School Managers to manage social networks, such as Facebook, Google, LinkedIn, etc. (See FR-EO-5, and FR-SO-9)

FR-SM-9: Statistical Analysis of Data. The System should provide various statistical data, such as other users' feedbacks on devices and services, to the public and/or the registered users.

FR-SM-10: Registration to Event. The system should enable a School Manager account to register and unregister to a number of events. (See FR-EO-4)

FR-SM-11: Feedback on Events. The system should provide a facility to the School Manager to provide feedbacks on their experiences with the events, including comments and star ratings.

FR-SM-12: Feedback on Devices and Services. The system should provide a facility to the School Manager to provide feedbacks on their experiences with the devices and services, including comments and star ratings.

FR-SM-13: Claim / Support on Devices and Services. The system should enable a school manager account to make a claim / request support on devices and services.

2.2 Requirements of Students - 18027425

FR-S-1: Setup and update student account. The system should enable the students to install a mobile app on their smart phones and / or tablets and / or to access a web application and to create a student account with PIP and obtain an account ID number, which uniquely identifies the user.

- Student's name and address.
- Automated payment information (optional), which will be used when payments are need to third party service providers.

FR-S-2: Registration to Module. The system should enable a student account to register and withdraw to a number of modules.

FR-S-3: Setup and update student profile. The system should enable a student to create a profile. A student will automatically be given a profile to setup upon successfully. With the profile, the student will be able to share it among its peers. The following details will be displayed:

- Hobby
- Favourite sports
- Skills
- Previous schools attended

FR-S-4: Schedule 1:1 meetings with their teachers, school managers and event organisers. The system should enable a student to schedule 1:1 meetings with their teachers, school managers and event organisers to discuss all aspects of their education and social events. There will be a built in timetable system on the platform to display their available dates and busy dates. (See FR-SM-5, FR-T-5 and FR-EO-5)

FR-S-5: Setup and update homework assessments. The system should support the Student to setup and update his homework assessments on Moodle.

FR-S-6: Follow grades marking and feedback. The system should enable a student account to follow the grades marking and feedback on each module on Moodle and PIP.

FR-S-7: Claim on grades. The system should enable a student account to make a claim about his grades on each module on PIP.

FR-S-8: Feedback on Modules and Teachings. The system should provide a facility to the Student to provide feedback on their experiences with the modules and the professors teachings, including comments and star ratings.

FR-S-9: Setup and update parents. The system should support the Student to setup and update the connections to the parents so that these parents can also operate the payment of the academic year, communicate to the students and follow the students grades on PIP. The system should allow the Student to specify the following information:

- The basic information about the parent, including the name.
- The parent's account ID (see requirements for parents).

FR-S-10: Connection to each other account. The system should enable each account to be connected and disconnected to a number of other accounts so that they can also communicate together on GSuite. (See FR-SM-6, FR-T-7, FR-P-3, FR-EO-7, and FR-SO-6)

FR-S-11: Registration to Event. The system should enable a student account to register and unregister to a number of events. (See FR-EO-4)

FR-S-12: Feedback on Events. The system should provide a facility to the Student to provide feedback on their experiences with the events, including comments and star ratings.

FR-S-13: Feedback on Devices and Services. The system should provide a facility to the Student to provide feedbacks on their experiences with the devices and services, including comments and star ratings.

FR-S-14: Claim / Support on Devices and Services. The system should enable a student account to make a claim / request support on devices and services.

2.3 Requirements of Teachers - 18027434

FR-T-1: Setup and update teacher account. The system should enable the teachers to install a mobile app on their smart phones and / or tablets and / or to access a

web application and to create a Teacher account with PIP and obtain an account ID number, which uniquely identifies the user.

- Teacher's name and contact information.

FR-T-2: Setup and update modules. The system should support the Teacher to setup and update the modules. The system should allow the Teacher to post teaching materials, and to specify the following information:

- The basic information about the module, including the name.
- The list of IT Resources necessary.
- The rooms that may be used.
- The required assessments.

FR-T-3: Setup and update teacher's profile. The system should enable a teacher to create his/her profile after setting up an account. The profile should be visible to all the users and it should contain below information:

- Qualifications and Specializations.
- University Email Address
- Previous experience
- Taught Modules
- Telephone Number
- Address

FR-T-4: Setup and update assessments. The system should enable a teacher account to create and assign homework for each module to the students.

FR-T-5: Schedule 1:1 meetings with the students, school managers and event organizers. The system should enable a teacher to schedule 1:1 meetings with their students, school managers and event organizers to discuss all aspects of their education and individual performance.

FR-T-6: Mark grades and feedbacks. The system should enable a teacher account to mark each student on each module and give their feedbacks on the student homeworks.

FR-T-7: Connection to each other account. The system should enable each account to be connected and disconnected to a number of other accounts so that they can also communicate together on GSuite. (See FR-SM-6, FR-S-10, FR-P-3, FR-EO-7, and FR-SO-6)

FR-T-8: Registration to Event. The system should enable a teacher account to register and unregister to a number of events. (See FR-EO-4)

FR-T-9: Feedback on Events. The system should provide a facility to the Teacher to provide feedbacks on their experiences with the events, including comments and star ratings.

FR-T-10: Feedback on Devices and Services. The system should provide a facility to the teacher to provide feedbacks on their experiences with the devices and services, including comments and star ratings.

FR-T-11: Claim / Support on Devices and Services. The system should enable a teacher account to make a claim / request support on devices and services.

2.4 Requirements of Parents - 18016754

FR-P-1: Setup and update of the parent's account. The system should allow the parents to install the mobile app on their smart phones, tablets or to access a web application. There also is the possibility to create a Parent's account with PIP and obtain an account ID number, which identifies the user :

- Parent's name and contact information

FR-P-2: Setup and update payment. A page will be created so that parents will be able to pay anything demanded by the school online via the application.

- Parent's name and contact information.
- Payment information (card, bank account number...)

FR-P-3: Connection to each other's account. The system should enable each account to be connected and disconnected to a number of other accounts so that they can also communicate together on GSuite. (See FR-SM-6, FR-S-10, FR-T-7, FR-EO-7, and FR-SO-6)

FR-P-4: View of the child's performance in school. A parent should be able to see his child's grades, any feedback from teachers on any modules on Moodle or PIP.

FR-P-5: Registration to events. The system should provide a facility for a user to respond if they are available on events happening in school. There will be a calendar

on the application where the event's organizers will put every event on different days (every time an event will be created the parents will receive a notification with the app), this way the parents would see which day it is and reply to the event by checking a checkbox saying: "Available" or "Not Available".

FR-P-6: Feedback on events. The system should provide a facility to give feedback on their experiences with the events, including comments and star ratings.

FR-P-7: Feedback on services. The system should provide a facility to give feedback on their experiences with the services, including comments and star ratings.

FR-P-8: Claim or support on services. The system should allow a parent to make a claim or request support on services.

FR-P-9: Access to administrative documents. The user should be able to download and view every administrative document from school. The parents should also have the possibility to upload administrative documents signed by themselves, which will be automatically sent to the school's administration.

2.5 Requirements of Event Organizers - 18027317

FR-EO-1: Setup and update Event Organizer account: The system should provide a facility for event organizer to set-up an account by verifying the following information. The system should update the event organizers account once all the required fields are approved. Each user will be generated a unique ID number which can be used as/in authentication process.

- Event Organizer's basic information such as full name, age, gender, e-mail, phone number, address

FR-EO-2: Setup and update Event Organizer Profile: The system should provide a facility for event organizer to set up his/her own profile after validating his/her account. The profile should be visible to everyone.

- Event Organizer's profile background information such as previous experiences, certifications (If any) etc.
- Event Organizers collaborations, sponsor-ships/partnerships.
- Event Organizers Team members and their specifications etc.

FR-EO-3: Organize cross-school events. The system should enable event organizers to organize events, such as promotion of their research projects, or their new graduates, sports tournaments, Science Fairs, festive events the following information should be consider.

- Detailed Information related to the particular event.
- Entry criteria such as age requirements, division between grades (for eg junior division (grades 6-8) and a senior division (grades 9-12)).
- Required Permissions (From School Managers, Teachers and Parents).

FR-EO-4: Registration for the Event: The system should enable everyone to enrol or withdraw for number of events. (See FR-SM-10, FR-S-11, FR-T-8, FR-P-5, and FR-SO-10)

FR-EO-5: Use of social networks: The system should provide a social networking facility for sharing the events, to make promotions etc. (See FR-SM-9, and FR-SO-9)

FR-EO-6: Schedule face-to-face Meetings: The system should enable Event Organizers to schedule a face-to-face meeting with Students, Teachers, Parents and school managers to discuss, explain and to take permissions to organize particular event and competitions, Science fairs and Sports tournaments etc.

FR-EO-7: Connection to each other account. The system should enable each account to be connected and disconnected to a number of other accounts so that they can also communicate together on GSuite. (See FR-SM-6, FR-S-10, FR-T-7, FR-P-3, and FR-SO-6)

FR-EO-8: Feedback on Events: The system should provide a facility to the Event Organizer to view feed-backs on the events, including comments and star ratings.

FR-EO-9: Feedback on Devices and Services: The system should provide a facility to the Event Organizers to provide feed-backs on their experiences with the devices and services, including comments and star ratings.

FR-EO-10: Claim / Support on Devices and Services: The system should enable an event organizer account to make a claim / request support on devices and services.

2.6 Requirements of System Operators - 18016826

FR-SO-1: Management of tenants (schools) accounts. The system should provide a facility for registering, activating and deactivating various types of tenants (schools) accounts automatically and/or manually. Once an account become active, the main representative should be able to update stored tenant (schools) information.

- Tenants's (schools) name and contact information.

FR-SO-2: Management of users accounts. The system should provide a facility for registering, activating and deactivating various types of user accounts automatically and/or manually. Once an account become active, the user should be able to update stored user information and communicate to the System Operators.

- System Operator's name and contact information.

FR-SO-3: Setup and update devices. The system should provide a facility for the System Operator to set up a smart device installed by a System Operator and optionally to link it to a third party service provider. Such a setup should also be able to be updated by adding new devices and removing installed devices. The setting up and update processes may collect and process the following data:

- Type and model of the smart device.
- Location in the campus (optional).

  em Third party service provider (optional) to whom the data collected from the smart device will be sent to or from whom the data will be received for the operation of the smart device.

FR-SO-4: Setup and update system. The system should provide a facility for the System Operator to maintain the system, such as backup and recover.

FR-SO-5: Schedule 1:1 meetings with the school managers. The system should enable a system operator to schedule 1:1 meetings with the school managers to discuss all IT aspects. There will be a built in timetable system on the platform to display their available dates and busy dates.

FR-SO-6: Connection to each other account. The system should enable each account to be connected and disconnected to a number of other accounts so that they can also communicate together on GSuite. (See FR-SM-6, FR-S-10, FR-T-7, FR-P-3, and FR-EO-7)

FR-SO-7: Statistical Analysis of Data. The System should provide various statistical data, such as users' feedbacks on devices and services, to the public and/or the registered users.

FR-SO-8: Organize cross-company and / or cross-school events. The system should enable system operators to organize events across companies and / or schools, such

as promotion of the acquisition of new softwares, or a specific type of devices (not limited to a particular manufacture) and services.

FR-SO-9: Social networking. The system should provide a social networking facility for the users of various types to share experience and knowledge about web applications. (See FR-SM-9, and FR-EO-5)

FR-SO-10: Registration to Event. The system should enable the System Operators to register and unregister to a number of events. (See FR-EO-4)

FR-SO-11: User Data Management. The system should establish and maintain a database of school managers, teachers, students, parents, devices, services, etc. permanently, and to enable search for historic past data, etc.

3 The Required Key Features of the System

The following are the key features that the system must realize.

KF-1: Dynamic online update of information. The system should realize quick dynamic update of the data about the devices, services, courses, and various types of users, etc. Any update of data should be able to view immediately after the data is uploaded to the system on the cloud. Dynamic online update of information by the users themselves has been recognized as one of the key features of this system.

KF-2: Services across companies and schools. Another key feature of the system is that it should provide services across individual companies and / or schools, such as the link between devices of many manufacturers and service providers. This relies on collecting a large amount of data from a large number of participating companies and / or schools, storing and processing the data in a standard format.

KF-3: Seamless integration. It is important to connect all types of devices from many makers and system components together to make the activities of creation, update, searching and retrieval and deletion of data in a continuous effortless and seamless process. The processes of various tasks of academic automation must be integrated seamlessly.

KF-4: Mobile and cloud native. The system should provide mobile apps for school managers, teachers, students, parents, event organizers and system operators running on various mobile phone/device platforms with graphic user interface, and a web-based interface for the access to the system from desktop computers. It should also provide device manufacturer and service provider company and / or school users with web-based interface for desktop computers to access the system from a more powerful computer. Data from various types of users should be able to be backed up to the cloud and the software functions should be hosted on the cloud, but downloaded to the users' computers, smart phones and / or tablets when needed and seamlessly updated.

4 Quality Requirements

QR-1: Scalability. The system will roll out to start with a moderate scale. At the beginning, it is perceived to host a dozen of school managers, several dozens of teachers, a thousand of students, two thousands of parents, a hundred of event organizers and a dozen of system operators. But, it is anticipated that it could grow fast to a scale of several hundreds of teachers, ten thousands of students, twenty thousands of parents and a thousand of event organizers spread all over the different campus. The system should be easy to scale up.

QR-2: Security. The information about school managers, teachers, students, parents, event organizers and system operators and data from the different campus smart devices, such as audio and video data from smart cameras, and web applications, such as Moodle and PIP, are private and must be strictly protected. Management data should also be protected from unauthorized changes and viewings.

QR-3: Reliability. The system should be available to access 24 hours a day and 7 days a week. Its down time should be less than 10 hours per year. The data uploaded to the system by the users must be stored permanently. No more than 0.0001% of data can be lost at any time.

QR-4: Efficiency. The system should response to users' requests of all types within 5 seconds at all times. The average response time should be less than 1 second.

QR-5: Usability. The system should be easy to learn to operate for all types of users on all types of activities, including setup, update and daily operations. Online help should be provided for users' self-learning of various tasks, for example, through demonstration videos and step-by-step instructions. Manual assistance from System Operators must be minimal, but available through live online chat, Moodle, PIP and GSuite.

QR-6: Maintainability. The system should be easy to maintain by the system operators for backing up the data periodically, recovering from failures, fixing bugs and introducing new functionality. Such maintenance operations must incur with minimal interference to the users.

QR-7: Customisability. The system must enable the users, especially the apps for staff members, professors and students, to customize the system according to their personalized situations in order to meet their specific academic requirements.

5 Professional, Legal, Ethical and Social Implications

5.1 Professional Issues

PLES-PI-1: The system must take in consideration the environment, the finances and many other aspects of the project. The system may have the following:

- Environmental charter
- IT charter
- Quality charter

5.2 Legal Issues

PLES-LI-1: Worldwide, the system must be compliant to the Human Rights Act (1998).

PLES-LI-2: In Europe, the system must be compliant to the General Data Protection Regulation (2018) and the Small Business Act (SBA). The system must have the following:

- Cookies policy
- Data Protection policy
- Legal Notices
- Terms of Use

PLES-LI-3: In the United Kingdom, the system must be compliant to the Computer Misuse Act (1990), the Freedom of Information Act (2000), the Mental Capacity Act (2005), the Statistics and Registration Services Act (2007) and the Ethical Standards in Public Life, etc. Act.

5.3 Ethical Issues

PLES-EI-1: Each user must request consent for specific participation when needed. The system may have the following:

- Code of ethics

PLES-EI-2: Each user must respect the privacy of other people and their data. The system may have the following:

- Privacy policy
- Security policy

5.4 Social Implications

PLES-SI-1: Each user must respect other people including their copyrights and intellectual properties. The system may have the following:

- Credits or equivalent

PLES-SI-2: Each user must request consent for specific participation when needed. The system may have the following:

- Specific consent forms