# MANAGEMENT AND IMPLEMENTATION OF TRAINING PROGRAMS USING APPSHEET AND APPS SCRIPT FOUNDATION

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***Abstract:*** *An intelligent university management system is built synchronously based on different modules with multi-connectivity. The management and implementation of training programs is a rigorous and highly synchronous process of the school management system. In this article, we introduce the use of Appsheet and Apps Script to build an application to manage the implementation of the training program of a university. The product of this research effectively supports the work of the university, is scalable, and connects with other applications to form an ecosystem of smart schools.*

***Keywords:*** *Appsheet, Apps Script, smart-university, training management, training programs.*

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## 1. INTRODUCTION

Lately, everything is becoming "smart": houses, appliances, cars, even schools or cities. Smart schools have been studied and developed rapidly, leading to educational transformation; connectivity between educational administrators, lecturers, and students is promoted. Smart schools use applications with new technologies in management and teaching to provide the best quality educational services (Kiryakova et al., 2018). Smart technologies have the potential to transform the training management process in educational institutions, so there are many surveys to learn about improving the efficiency and quality of training and attracting students through digital technology applications (Chang et al., n.d.). Such as cloud-based mobile learning, which is the foundation for distance learning. In this way, smart education essentially opens the door to enhancing learning tools and delivering technology-based teaching content (Salah et al., 2014). An internet-connected student computer or smart device can directly access any information source in the classroom or school. Not only that, the connection between wireless devices and the mobile application platform lays the foundation for a new era of smart education (Santana-Mancilla et al., 2013). Mobile applications play an essential role in providing and exchanging different types of information and data, serving almost all areas of

life. The development of mobile applications (apps) exploded in 2010, when Apple's App Store and Google Play appeared in the market, leading to the emergence of what is called the application economy, serving all economic activities, products, and services such as car sharing, autonomous driving, public transportation, co-travel, energy, health, mobility, waste, public safety, water management, and more through apps for users of mobile phones and smart devices. (Dimovski et al., 2020; Kenney & Zysman, 2020; Troise et al., 2020).

In the past, organizations with needs would usually develop their own mobile applications to serve their work. However, this process is quite expensive and time consuming, as it requires high programming skills and expertise. In this paper, we present an approach to using open data to develop mobile applications to manage the training program implementation process, which is one of the components of the university ecosystem. This platform uses Smart Learning, based on AppSheet and Apps Script technology, and requires virtually no coding or programming. It offers enhanced user interfaces, data visualization, and AI-powered capabilities without the need for additional code or other software packages.

## 2. RESEARCH PLATFORM AND TOOLS

### 2.1. Appsheet

AppSheet (AppSheet [online], 2021) is an online platform from Google that allows users to build mobile applications that work on tablets, smart devices, and the web. The database is built on the cloud technology platform without the need for any coding. It mainly targets business and management sectors, such as human resource management, customer relationship management (CRM), project management, and personalized reporting. AppSheet analyzes the structure of the provided data source and automatically generates views that can be displayed in the application. Users can customize the views created by showing or hiding specific columns or writing formulas for processed and aggregated data. AppSheet is free for personal use apps, with monthly charges for commercial apps. AppSheet also offers advanced AI and machine learning features, such as value prediction, optical character recognition (OCR), sentiment analysis, and anomaly detection. Mobile applications based on AppSheet have been used as a solution in many fields. For example, it is used to survey medical facilities (Sylim & Santos-Acuin, 2016), while (Arumugam et al., 2020) the application builds a waste monitoring map on the Google My Maps database.

Users need to be connected to the internet to access Appsheet. Apps can be distributed through Google Play or the Apple App Store, and the application also runs on the web platform, which is very convenient for manipulating computers and working with large datasets. Appsheet is mainly based on Google's cloud infrastructure, allowing users to customize their capacity according to their needs while ensuring security.

Using Appsheet as a tool to build an application to manage the implementation of training programs has many advantages for research groups and users alike. Appsheet does not require users to have high knowledge of programming, and most data is stored in common spreadsheets, allowing users to easily control the data sources (Sylim & Santos-Acuin, 2016). The application's functions are also diverse and constantly updated, meeting most basic needs. The

database is managed by cloud computing, making it easy to expand according to needs. Data is collected and processed continuously, and math operations are performed quickly.

### 2.2. Apps Script

Apps Script (Google Apps Script [online], 2021) is a cloud platform for mobile application development that allows for easy integration with Google Workspace (Gmail, Google Docs, Google Forms, Google Sheets, Google Drive, etc.). Apps Script is based on the JavaScript language and has built-in libraries for Google Workspace. Google provides an editor that runs in a web browser, while the scripts themselves are run on Google's servers. Apps Script can be used to add custom menus, dialog boxes, and toolbars to Google Docs, Sheets, and Forms. Additionally, extensions and add-ons for these services can be developed. Furthermore, it is possible to perform interactions and coordination of various services (such as AdSense and Maps). Apps Script makes it easy to develop and deliver Google Workspace add-ons to a large number of users, either publicly to the world or a private set of users. Many apps use Apps Script to build; for example, Siiman & Mäeots (2019) used Apps Script to assess students' number theory level. Similarly, Rajput & Parekh (2020) used an Android app and Google Sheets to create a light vehicle diagnostic device, the report of which was sent to the owner's email. A similar approach was used by DeBell et al. (2019) to log real-time environmental data using Apps Script with Google Sheets.

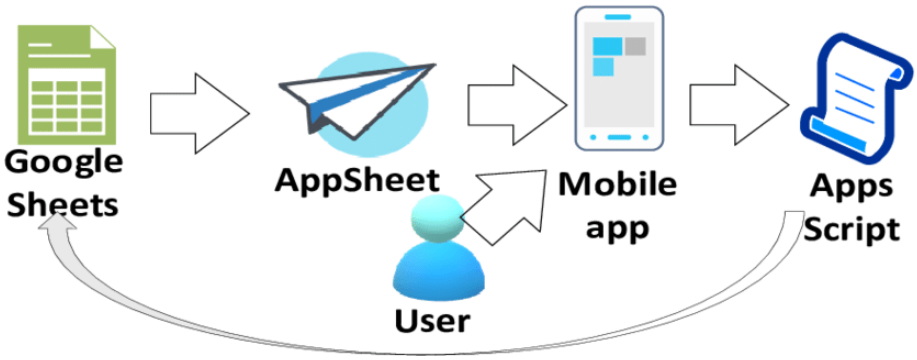


*Figure 1. Mobile application based on AppSheet and Apps Script*

In this article, we use AppSheet's capabilities related to Google Sheets to develop a mobile application that manages the curriculum in a university. The mobile application is illustrated in Figure 1 (N. N. Petrovic et al., 2021), where the relationship between AppSheet, Apps Script, and Google Sheets is utilized. By leveraging the power of AppSheet and building the right script, we have significantly reduced the time it takes to build a mobile app compared to a traditional cross-platform framework (N. Petrovic et al., 2020).

## 3. RESEARCH CONTENT

### 3.1. Training program implementation process

Program of Training is an overall design for a training activity (training course) that outlines all the content to be trained, specifies what is expected of learners after the course, outlines the process required to implement the training content, outlines the training methods and methods of testing and evaluating learning outcomes, and is arranged according to a tight

timetable. The training program represents the level of training, training subjects, admission conditions and graduation conditions, training objectives, standards of knowledge and skills of learners upon graduation, volume of theoretical, practical and practical knowledge, training plan according to the design time, training methods and forms, how to evaluate learning results, and program execution conditions.

Micro-management of training programs is the implementation and administration in the training institution (Phan Huy Hung, 2005). Micro-management is associated with operational and technical requirements, closely associated with the training process, such as the development of internal training regulations, internal management processes, and control of specific training content, assigning, delegating, authorizing, administering specific training programs, courses, etc…. The curriculum is developed for each course and discipline and can be adjusted, supplemented or developed. In universities, training management units coordinate with training departments and other units to implement training programs. Within the framework of the school year, the training program is depicted by the diagram in Figure 2.

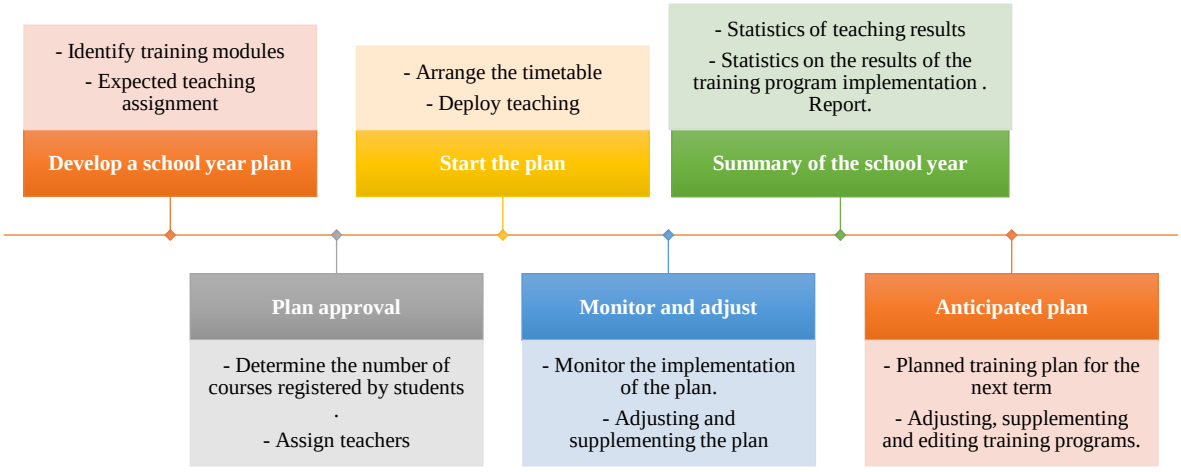


*Figure 2. Training program implementation process*

Using Appsheet and App Script to build mobile applications to manage the entire process above makes it easy to build plans and assign expertise, as the content of the work is done on the same database. In addition, this process's database is connected to other processes, such as managing teachers' teaching and managing student learning outcomes.

### 3.2. The MyHNMU application

The MyHNMU mobile application allows users to input data, including a training program for each course and information about the teaching staff such as professional qualifications, majors, and academic degrees. This information is connected to the personnel management module. Users are authorized to different degrees to use the application, with decentralization according to levels: administrator, manager, and user.

The administrator has the highest authority, can grant permissions, decentralize, and cut off user rights, and can participate in controlling other operations in the application. Managers

are divided into different areas, and they have the right to operate in that area, such as developing timetables, assigning expertise, adjusting and reviewing training programs. For ordinary users, only looking up information and exchanging certain specific content is allowed. In addition, the application can assign permissions to specific individuals through user ID. The implementation process set up on the application is described in Table 1.

***Table 1.*** Managing training deployment on the application

| |
|---|
| Input: User ID; Education program; Team information; Task rating. |
| Output: Training plan; Performance results, task implementation. |
| Steps:<br>1) User ID Grant<br>2) Granting permission to use<br>3) Import training program data<br>4) Team information data<br>5) Determine the school year level<br>6) Develop a school year plan<br>7) Approving the plan at the Faculty level<br>8) Approving the School level plan<br>9) Expertise assignment<br>10) Implement training<br>11) Check, monitor and adjust<br>12) Summary of individual duties<br>13) Report<br>14) Data access |

To use the application, each individual is given an ID, and staff working at the University are issued rights via personal email. Initially, the user's usage rights are also defaulted to the job location. To start using the application, the user needs to log in (Figure 3), filling in information such as ID, role, and password. For the management of training deployment, the administrator is decentralized to update the training program (Figure 4), and human resource managers are granted the right to use, decentralize, determine the norms, and manage the training program.

ID has the role of managing the right to develop the school year plan. The application allows only the courses in the training program to be included in the plan, with selection of courses done by name or course code, and details of the course predetermined.

The MyHNMU application is mainly used on smart devices, however, the web interface is more convenient when performing tasks with a lot of information, and the mobile interface is suitable when looking up and monitoring.


*Figure 3: Log in*


*Figure 4: Training program*

The process of implementing a training program in a school year is divided into four specific workgroups as follows:

Developing a plan. Based on the training program that has been developed, the administrator determines the number of courses to be implemented in the school year. The selected courses must meet the requirements such as the total number of credits for each semester, the prerequisites for the course, and other conditions. Administrators identify the courses to be taught during the school year, using the button "Plan a New Training Major" (Figure 5) and the button "Add Teaching Modules" to do so. The plan is developed for each course and each major, and it complies with the approved Training Program.

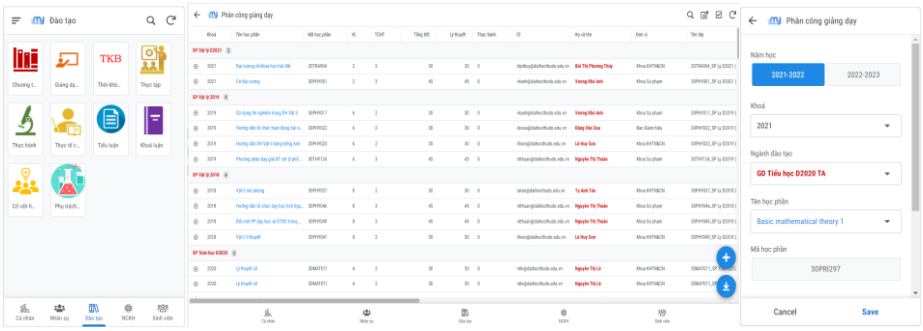


*Figure 5: Develop a teaching plan*

After the functional unit determines the number of courses registered by students, checks the guarantee conditions, and approves the plan, management staff performs the assignment of expertise to lecturers. The administrator uses the button , then clicks on the ID item to select the lecturer for each course (Figure 6). The lecturer's information, such as professional qualifications, academic function, academic degree, and number of teaching hours, is extracted from the personnel database and automatically updated into the module. The process of professional assignment is approved by leadership levels such as the faculty level and school level. When approved, the application will lock the user mode; when it needs to be changed or adjusted, it needs the permission of the administrator.

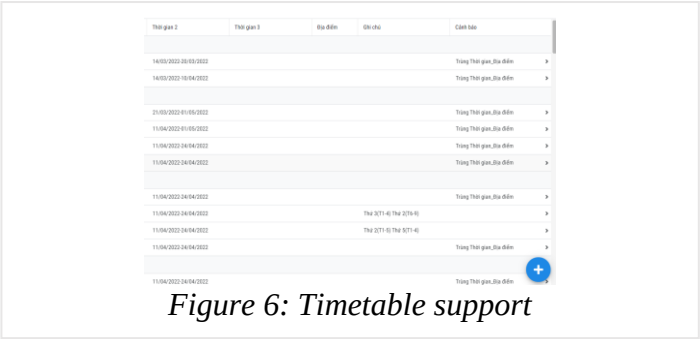

*Figure 6: Timetable support*

Deploying teaching activities, the user plays the role of managing the timetable for the modules, with the application providing information alerts to help arrange the schedule quickly and conveniently (e.g. warnings for the same lecturer, time or place) (Figure 7). The information about the teaching plan is updated to the individual sections of each lecturer as well as the summary table for monitoring.

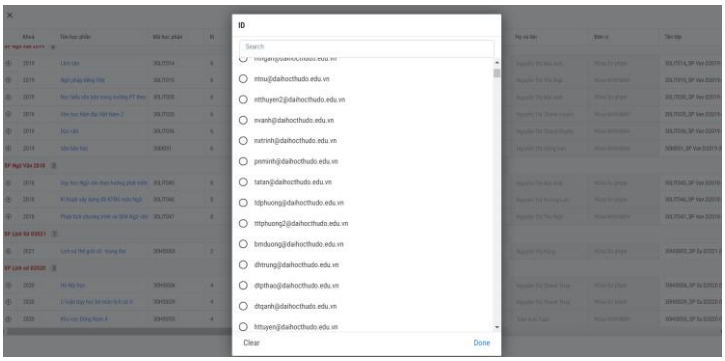

*Figure 7: Teaching assignment*

A summary of teaching results, information on teaching assignment and summary of teaching hours of each lecturer is aggregated (Figure 8), and data is filtered for each individual. Users can look up information in their personal sections; the data filtering tool allows them to look up many different data and information (Figure 9).

*Figure 8: Summary of teaching results*

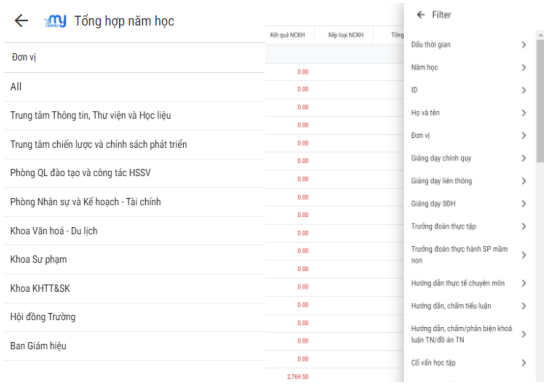


*Figure 9: Filtering tool*

## 4. TEST AND EVALUATE THE RESULTS

Test and evaluate the results by testing the application on two devices: a personal computer equipped with an Intel Core i5-7500 chip 3.4GHz CPU with 16GB DDR4 RAM and 1TB Hard Drive, and Google Chrome browser, and an iPhone 6S Plus (dual core, 2GB RAM) as a representative of an iOS smartphone with 50Mbps download/upload speed and 3G connectivity. Install the MyHNMU app on the iPhone 6S device and use the web interface by accessing the link www.my.hnmu.edu.vn on the personal computing device.

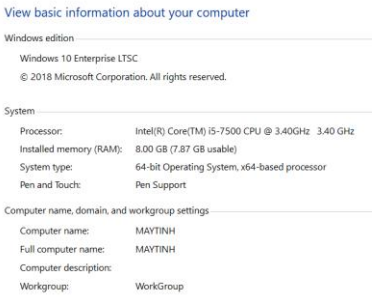


*Figure 10: Computer configuration*

Some parameters were evaluated, such as application load time, data synchronization time, the required memory for the AppSheet application (Publisher Pro package), and RAM usage. We conducted the test on two devices and the results are summarized in Table 2. According to the obtained results, we found that the mobile application built using AppSheet and Google Script takes Google Sheet as its work. The tool has quite a high speed compared to mobile applications developed using cross-platform solutions.

***Table 2.*** Application Testing

| **Content** | **Parameter** | |
|---|---|---|
| Equipment | Iphone 6S Plus | My Computer |
| Operating system | iOS | Windows 10" |
| Equip the device's RAM | 2GB | 8GB |

| | | |
|---|---|---|
| Application loading time | 15(s) | 8(s) |
| Synchronized time | 5(s) | 2(s) |
| RAM Usage (MB) | 258 | 128 |

The testing process shows that the initial application's data loading time takes a long time due to the synchronization of data from Google Sheets, but after the data has finished loading, operations are responded to almost immediately. The data synchronization process is fast, allowing users to use it while updating. For devices, it is more convenient to use the web interface with a personal computer for data entry, while mobile devices are suitable for looking up information and monitoring activities.

## 5. CONCLUSION

Building a mobile application to manage teaching activities on the technology platforms of Google Appsheet, Google Script, and Google Sheet is an effective approach. This approach takes advantage of AI and cloud computing platforms, as well as applications that are constantly updated, so users do not have to worry much about security. The device contains the database, and the application building process also does not require much programming; the generated database is also easily extracted for storage. The MyHNMU application helps manage the implementation of the training program according to a unified process, so the members involved in this process all work on a single, synchronous, and online tool. This helps to minimize human effort while ensuring accuracy and security. In addition to the training program implementation management module, the application also builds many other modules, such as management of scientific and technological activities, individual tasks, etc. These modules are synchronously connected to create an application to manage the lecturer's activities, where all assigned tasks are public, and the data is stored, from which it is easy to make statistics as well as review the progress and results of the lecturer's task performance at the university.

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## QUẢN LÍ VÀ TRIỂN KHAI CHƯƠNG TRÌNH ĐÀO TẠO BẰNG NỀN TẢNG APPSHEET VÀ APPS SCRIPT

***Tóm tắt:*** *Một hệ thống quản lí đại học thông minh được xây dựng đồng bộ trên cơ sở của những modul khác nhau, có tính đa kết nối. Quản lí và triển khai chương trình đào tạo là một quy trình nghiêm ngặt và tính đồng bộ cao của hệ thống quản lí trường học. Trong bài viết này, chúng tôi giới thiệu việc sử dụng Appsheet và Apps Script để xây dựng một ứng dụng quản lí việc triển khai chương trình đào tạo của một trường đại học. Sản phẩm của nghiên cứu này, hỗ trợ đắc lực trong công việc của trường đại học và có khả năng mở rộng, kết nối với các ứng dụng khác để tạo thành một hệ sinh thái của trường học thông minh.*

***Từ khoá:*** *Appsheet, Apps Script, đại học thông minh, quản lí đào tạo, chương trình đào tạo.*