



# Using an Electronic Register for Class and Meeting Attendance-Trackie

H.M. Langa<sup>1</sup>

<sup>1</sup> Vaal University of Technology, Vanderbijlpark, Gauteng, South Africa  
hendrickl@vut.ac.za

**Abstract.** Taking an attendance register for a meeting has traditionally been accomplished by means of a paper and pen. Technology provides opportunities to implement software systems to accomplish the same objectives. This paper presents an electronic register, Trackie, which was developed for Android devices. This software system can be used by lecturers to take an attendance register in their classrooms or it can be used in any meeting for that matter. This client-server solution where the server device, which is managed by a lecturer or administrator, for example, is used to manage all details of the attendees. Trackie Client which resides in the attendee's device, can be used as a pen to sign the attendance register that is located on the server device. Trackie can be used independently or in conjunction with Trackie Client. Once the administrator has turned on the server, the attendee is able to sign in using his digital pen, Trackie Client. The attendee then gets automatically added into the attendance register in the administrator's device, namely, Trackie. All attendees can sign in simultaneously, which saves time for signing an attendance register. If the attendee sign in successfully, Trackie Client will notify him, otherwise he will be notified that he is not registered.

**Keywords:** Trackie, Client, Attendance Register, Use Case Diagram, Unified Modeling Language

## 1 Introduction and background

### 1.1 Introduction

For most formal and professional meetings, taking an attendance register is a common practice. This is accomplished by circulating a paper and pen that attendees normally fill in and sign. [9] also recognized the process of managing registers with pen and paper. Once the register has been signed, then it is returned to administrator who process it further or file it. This can be a boring, cumbersome and a tedious exercise from the attendee's point of view as well as the administrator's point of view. It is also prone to fraudulent practices [12] by students or attendees where one can forge a signature of another. Most attendees fill in the document for the sake of filling it in and that becomes evident in the hard-to-read handwriting. Sometimes the administrator may even trash the paperwork owing to its unreadable state. Technology brings along

with it the elegance in taking attendance registers and maintaining these important documents so its use is beneficial to professional entities such as business as well as academia. One of the inspirations for this innovation is the requirements by the auditing and accreditation bodies like the Engineering Council of South Africa (ECSA) which has a requirement that attendance registers for class activities should be kept as evidence of student attendance. The lecturer has, at his disposal, a tool to keep such a record elegantly and seamlessly to accomplish this mandatory statutory requirement. Attendance registers are important documents to keep track of student information and performance as well as the credibility of an academic institution [9].

## 1.2 Background

The first question to design a class or attendance register can be taken electronically using the android development environment. The second question to design a database management system that can be retrieved whenever and manipulated when necessary. The third question is how to design a protocol to access and manipulate the database of the attendance register remotely or locally. The attempt to answer these questions are presented in this paper.

To answer these questions, a possible design approach is explored and investigated. The first question has to do with developing a suitable mobile platform to implement the design. The second question has largely to do with maintenance of records of the students or clients in an efficient manner. The final question is an answer to speed with which the attendance register can be taken as well as the remoteness or locality of taking a register as influenced by the impact of COVID-19 for example. Owing to COVID-19 pandemic, remote teaching and learning has become normal in universities and the requirement of attendance register keeping is still maintained [13]. Exploration and review of what other researchers have done follows in section 2.

## 2 Literature Review

### 2.1 Trends and Technologies

Traditionally, taking an attendance register has been done by a rollcall. Names of the attendees are called and ticked off on a piece of paper which is then stored as evidence of attendance [4]. Clearly this method wastes a lot of lecture time which is undesirable. It is also not secure as records may be lost [9]. Research has been conducted to improve this by automating this process by means of Radio Frequency Identification techniques (RFID). It was [10] estimated that the amount of time wasted in taking a register in a lecture is 10 minutes in a normal class size. Other schemes of using the RFID technology involves the use of a microcontroller based system and Arduino microcontroller to read and log information into an SD card [7]. The finger identification using biometrics is one example of such techniques, and by using other solutions. Biometrics is an electronic system of identifying or verifying a unique individual's identity through the use of measurable biological traits such as physical and or behavioral attributes. For example, some system are designed such the student puts

his finger to record his ID and attendance data [11]. Meaningful and accurate information is provided by attendance tracking and management systems in many organizations [1]. During the worldwide corona virus pandemic, many of these organizations were forced to innovate while others were simply stuck with no means to monitor attendance of the employees and staff members. The application of the software varies from industry to industry. In the context of a university, the clients would be students, whereas in the context of a company, the clients would be employees or staff members. Combining mobile devices and cloud computing is another technique that has been used to design attendance register systems [5]. In this scheme, data is stored outside of the mobile device. A server analyzes, processes and stores data in the cloud which is server itself. Cloud computing is a new paradigm of computing that has drawn some attention because of its benefits. The business owners do not need to plan storage infrastructure, servers or network infrastructure. One drawback could be internet connection problems, which something common nowadays.

Other researchers have explored the use of cameras and decentralized block-chain technology [6]. When cameras are used, then facial recognition algorithms are used to identify individuals which are emerging trends in technology that have been adopted in tracking and tracing humans. Some of the technologically advanced countries like China are already using this technology to a very large extent. Advanced camera systems can also be used in artificial intelligence to automate the taking of attendance registers in schools and thereby lessening the burden on teachers and paper work [14]. Cellphone play an integral part of modern life and make communication between people extremely convenient [8]. From since phones were only black and white screen, they exponentially evolved to hi-tech devices indispensable in the modern society. Modern phone can take high quality videos, they can be used as an electronic book, they can be used to store file and books, they can be used for navigation, they can be used as personal assistants, and they can be used for banking and playing games.

### 3 Methodology and Design Architecture

#### 3.1 Use Case Diagram

The diagram shown in Fig. 1 shows a Use Case diagram for the Application. A Use Case diagram is part of a suite of methods and techniques that are used in software design and typically shows how the system is used. It explains how the system works. A high-level view of a Use Case refers to its systems, actors and relationships. It explains how users interact with the app and what the app actually does. Complex ideas can be communicated in a simple way using a Use Case Diagram.

The Use Case diagram is not the only diagram used when developing a system. The collection of these diagrams is referred to as the Unified Modeling Language (UML).

Among the list of UML diagrams to use when modeling, designing and documenting a complex system are Use Case diagrams, Sequence diagrams, Entity Relationship

diagrams, UML Class diagrams, Activity diagrams, State Machine diagrams, Package diagram etc.

UML helps software engineers in the design of complex systems using object-oriented programming. Fig 1. Shows actors of the system, namely, the administrator and the client. The administrator can be the lecturer who is responsible for taking an attendance register in his or her class. The other actor is the client which could be the student himself, for example. If the lecturer decides to let the student register their attendance by themselves, the he could circulate the device in the class and students can sign in in the device. Another design approach could be where the client signs the register remotely. In this case a separate device could be used as a digital pen to sign the register from a different location. So the external device would access the database in the host devices and make necessary alterations in it.

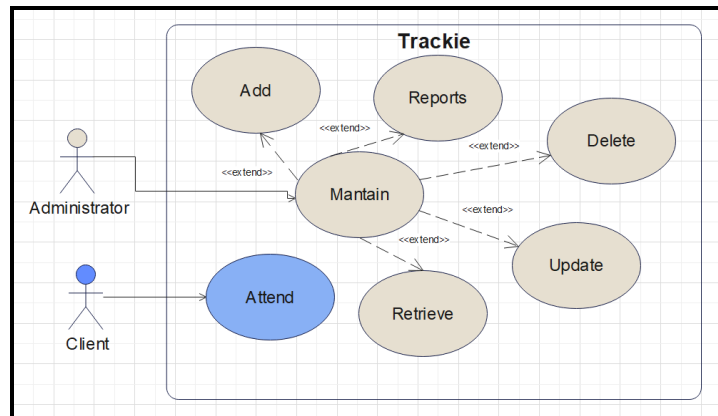


Fig. 1. Trackie Use Case Diagram.

The oval shapes are called Use Cases and they are located with the box or rectangle which is called the boundary of the system. The Use Cases contained within the boundary of the system are Maintain, Add, Reports, Delete, Update, Retrieve, Save and Attend. The outputs of these Use Cases will be explained further in the Results section.

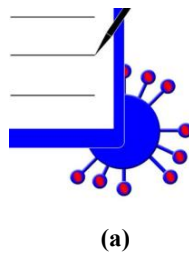
## 4 Functionality, Features and Results

### 4.1 Starting the App

In this section, the functionality, app features, and results are discussed. The functionality is part of the results that are realized as the outcome of the design methodology that was followed. Features of the app are also an outcome of following the SLDC is

software engineering. Once the app has been downloaded and installed in the mobile device, an icon as shown in Fig. 2(a) appears. When it is clicked, the screen as shown in Fig. 2(b) is shown.

This application is a database application that stores information about the client. This information includes the Key, Name, ID Number Cell Number, Email Address, Address and other information that the administrator deems important to keep and track. The user interface is shown in Fig.1 below. Please note that the first paragraph of a section or subsection is not indented.



**Fig. 2.** Trackie: (a ) App Icon and (b) App User Interface.

The Key is a unique number. A unique number is a number that is used only once to identify a student or a client. In a university, students are identified by their unique student numbers. In a work place, employees are identified by their unique employee numbers. In a meeting, attendees can be identified by their ID numbers since everyone who is a citizen of any country would have an ID number. However, there is a drawback with using ID numbers that most people do not prefer that option. Another unique number that can be used is a cell phone number. A cell phone is probably the most widely available option to use as a Key.

The default screen has to retrieve, update, save, delete, reports and to exit the application. The reports screen has a number of features that facilitate reporting activities. The first line written 'Register' is a dropdown menu that contains two items: 'Register' and 'Normal'. If register is selected, all queries concerning registers can be processed. If normal is selected, queries related to general searches of information in the database are enabled. In this case, the database can be searched by various keys, like by key, by name, by email, by cell, by ID and so on.

## 4.2 Reports

It is essential to report in a database application. In this section, the functionality, app features, and results are discussed. This application is a database application that stores information about the client in a business setting, or the student in a university setting. Fig. 3(a) is a screen arrived at when the Repots button is clicked.



Fig. 3. Trackie: Reports User Interface.

The interface a several section to it. The first section is a dropdown menu. The second section is a date picker which allows the user to select the date when using the application. The next item is the dropdown list written 'View All'. It has two items in it, the View All item and the Normal item. The View All item is a filter that allows the user to retrieve all attendees w were present in a particular meeting in a particular date. He next item is 'Search keyword'. This keyword is used in conjunction with the 'Normal' filter as shown in Fig. 3(b).

Fig. 4 show an example of an attendance register report of the 26<sup>th</sup> March 2023. On this particular date, only 4 attendees or students attended the class

```

Register: Mar 16, 2023
=====
217136834 E1 M Lithole Engineering Research Methods 4A 16 Mar 2023 09:17:53
218241682 E1 NF Mathye Engineering Research Methods 4A 16 Mar 2023 09:30:13
222386622 E1 KJ Mukeba 222386622 16 Mar 2023 09:23:22
223856835 E1 IJ Ilunga Engineering Research Methods 4A 16 Mar 2023 10:32:29
=====
4 items
=====
Group ID: E1
=====
End

```

**Fig. 4.** An Example of an Attendance Register

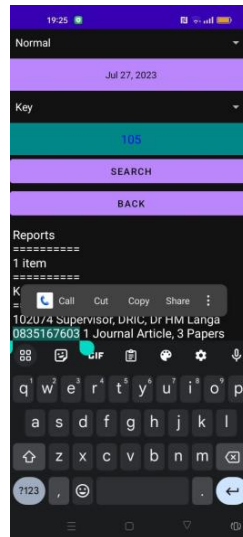
The dummy student number was used as the key in this example, but other unique numbers can be adopted. In the instance of a class, it logical to used student numbers as seen in the report. The dummy initials and surname of the student are show, the module for which the student is registered for and the date and time of attendance.

The database can be queried for information the search keyword and the appropriate filters. A client might or might not be in the system database. If the client is not in the system database, then he needs to be registered. This done in Fig. 2(b) user interface by capturing all his details and pressing the 'Save' button. If the client is already in the database, the system will notify the user otherwise the client details will be saved in the system. The details need not be all entered in the system since there is an option to update later. But the 'Key' parameter is mandatory. The name is also a logically required parameter but it is not mandatory.

Fig. 3(b) shows an example of a search when the user wanted to retrieve all records that contain the name 'Zulu'. To do this, the name is typed in the search keyword area the 'Normal' filter was selected then the 'Search' button was pressed. The app retrieved the records that contained the name. Different search criteria can be utilized to retrieve desired information. One can search by name, or by email, or by ID or any search criteria chosen. possible due to the portability of mobile devices.

### 4.3 Filing Attendance Registers

Storage in the device may be limited in which case every time a register is taken for a day, it can be stored in some file in a computer, for instance. In order to do this, the attendance register is sent by email or any other app using the share button as shown in Fig. 5.



**Fig. 5.** Attendance Register Filing Screens

The screen shows the configuration during the submission process. To get to this screen, the user presses and hold the finger on the text. The app will generate a number of options like 'Define', 'Cut', 'Copy', 'Share' and other options that are hidden within the three vertical dots on the right. The user should select 'Select All' in option menu to select all the text.

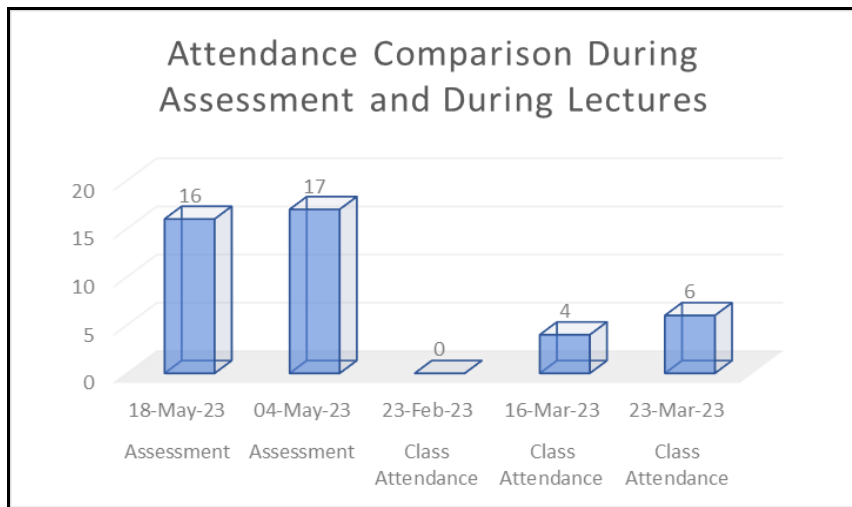
After the user has selected all the text then he can choose an option from the option menu to submit the assignment. Any platform of choice can be used as shown in Fig. 5 such as email, sms, messenger, whatsapp, bluetooth, drive etc. are made available to the user or student. Obviously, the desired platform should be installed in the device in order to make use of it to send the assignment. If the email is used for example, then the lecturer receives the email with assignment in the email that he provided to the students.

### 4.4 A Comparison Between Assessment and Lecture Attendance Rates

There are other benefits that can be derived from this app. For example, the lecturer may be interested in the behavior of his students in terms of class attendance over a



period of time. Perhaps the lecturer may wish to analyze the relationship between the student's attendance with respect to success. Fig. 6 below reveals important information about the behavior of students in a class of 17 students. It shows that when students are writing an assessment, their attendance was 94% in their first assessment and 100% in their second assessment. But when it comes to attending lectures, the attendance was 0% on day one, 23% on the next lecture and 35% on the third lecture. So, the conclusion can almost be drawn that students do not attend their lectures. This could be attributed to the impact that COVID-19 had when a remote emergency teaching mode was introduced. It could also be a culture built in the system and environment the students find themselves in.



**Fig. 6.** A Comparison in Attendance of a Class of 17 Students During Assessment and During a Lecture Period.

Regardless, the application reveals useful information for the lecturer or administrator to act upon. It also reveals gaps that may need improvement such as identifying those students that did not write their assessments or following up on those students that do not attend lectures.

## 5 Recommendations and Future Research

### 5.1 Introduction

Normally, when using pen and paper to take an attendance register, a pen is used to sign that register. Future work can be conducted to investigate whether the student or client can be able to register remotely. It would be convenient and elegant. It would also save a considerable amount of time Therefore designing an app that enables sign-

ing a register remotely can be achieved using client-server technology or some other techniques like web technology.

## 5.2 Client – Server Technology

How does the attendee sign the register? Client-server technology makes this to be possible. All the attendee does is that he simply opens his app on his device and enters his ID and signs in on his device. If he is registered in the server device, he then gets a message that says “Welcome Dr HM langa” if that is the name he used to register otherwise message “You are not registered”, will be displayed on the device.

## 5.3 Web Technology

Another technology that can be used is the web technology. This technology has an advantage that the register can be taken regardless one the attendee’s location around the globe. Unlike the client-server system that would be limited to a specific network, the web application does not have such a limitation. The web server application as implemented by [9] needs more automation functionality.

# 6 Conclusion

## 6.1 Recommendations

Future work on developing a client server software can significantly reduce the time it takes to take a register. Circulating a device i.e. a cell phone in the class can take some time as was mentioned in the literature review. It is therefore an opportunity for researchers to investigate a fast and efficient way of enabling the attendees to sign in simultaneously.

## 6.2 Conclusion

This paper has presented a state-of-the-art software for taking a register in a class or in a meeting. The main advantage of this tool is that it is completely paperless. Useful information such as attendance statistics can be drawn from the app.

## References

1. Saraswat, D., Bhattacharya, P., Shah, T., Satani, R., Tanwar, S.: Anti-spoofing-enabled Contactless Attendance Monitoring System in COVID-19 Pandemic. *Procedia Computer Science* 218, Elsevier B.V. 1506 – 1515. (2023).
2. Othman, M., Ismail, S.N., Noradzan, H.: 2 An Adaptation of the Web-based System Architecture in the Development of the Online Attendance System. 2013 IEEE Conference on Open Systems. *IEEE Xplore 2013* (Kuala Lumpur, Malasia) 2013.
3. Othman, M., Ismail, S.N., Raus, MD., The Development of a Web Based Attendance Register System (AES) for Higher A demic Institution: From Feasibility Study to the Design

- Phase. *IJCSNS International Journal of Computer Science and Network Security*. 9 (10), (2009).
4. Effah, A.A., Ackatiah, C.C., Oppong, F.N., Frimpong, E.A.: Biometric Attendance Register. 2020 IEEE PES/IAS Power Africa, (Nairobi, Kenya) 2020.
  5. Majid, O., Al-Shezawi, Jabar H. Yousif, Ibtisam A. AL-Balushi.: Automatic Attendance Registration System based Mobile Cloud Computing. *International Journal of Computation and Applied Sciences IJOCAAS*, 2(3) 2017, ISSN: 2399-4509
  6. Bálint, K.: The connection of a Blockchain with Students' Attendance Register based on Security Cameras. *SISY 2021 • IEEE 19th International Symposium on Intelligent Systems and Informatics IEEE Xplore*, (Subotica, Serbia) 2020.
  7. Ehikhamenle, M., Okeke. R.O.: Design and Construction of an RFID Based E Attendance. *International Journal of Engineering Research and General Science* 5(1), 2017, ISSN 2091-2730.
  8. Chen, C.: Nokia and strategic agility. *African Journal of Business Management*. 7(26), 2597-2602 (2013) DOI: 10.5897/AJBM12.1154.
  9. Olagunju, M., Adeniyi, A.E., Oladele, T.O.: Staff Attendance Monitoring System using Fingerprint *International Journal of Computer Applications* (0975 – 8887) 179(21) 8-15 (2018)
  10. Adeniji, V.O., Scott, M.S., Phumzile, N.: Development of an Online Biometric Enabled Class Attendance Register System. Cunningham. P., Cunningham, M. (Eds). pp. 1-8. *ITS-Africa Conference Proceedings* (2016).
  11. Adiono, T., Setiawan, D., William, M.J., Sutisna, N.: Cloud Based User Interface Design for Smart Student Attendance System. 2021 International Symposium on Electronics and Smart Devices (ISESD) IEEE Xplore, (Bandung, Indonesia) 2021.
  12. Lambe, S.M., Mule, S.D., Jamadade, S.V., Arkile, A.V.: Fingerprint Based Attendance System Using Atmega328p. *International Research Journal of Modernization in Engineering Technology and Science* 5(1) 594-596 (2023).
  13. Mpofo, N., Kaondera, C., Sidume, F., Tamukate, R., Verna, R.: Data wrangling for virtual attendance: A conceptual model. *roc. of the International Conference on Electrical, Computer and Energy Technologies (ICECET)*, 2021 IEEE Cape Town-South Africa (2021).
  14. Balint, k.: Possibilities for the Utilization of an Automitized Electronic Blockchain based Students Attendance Register using a Universities Morden Security Cameras. *Acta Politechnica Hungarica* 18(2), 127-142 (2021)
  15. Silva, N.C., Samayani, D.A., Alejandro, J.P., Camero, M.Z., Sulla-Torres.: Development of a mobile application for the registration and control of attendance of university students based on Machine Learning. 2nd LACCEI International Multiconference on Entrepreneurship, Innovation and Regional Development - LEIRD 2022: "Exponential Technologies and Global Challenges: Moving toward a new culture of entrepreneurship and innovation for sustainable. ISBN: 978-628-95207-3-6 ISSN: 2414-6390 Virtual Edition, December 5 – 7, 2022.

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

