Challenges of Manual Attendance System Towards Student Motivation

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Abstract -Students must attend lectures to get their primary source of knowledge. Lectures and lecturers guide students to have a productive education. Students can be motivated to study by making them attend lectures. As shown in this paper, students' attendance is important, and they can be motivated to attend lectures. Attendance systems in Sri Lanka are mostly manual and paper-based, which means the process from marking attendance to calculating attendance is fully manual. The current attendance system only produces monthly reports, and some only show the final attendance report. It helps students to be aware of attendance, but is unable to motivate students to keep a better attendance percentage. There are many issues in the attendance systems that are currently in use. In current systems, attendance marking data can be manipulated by students. This is a major issue and will damage the accuracy of the attendance data. It will also decrease student motivation towards attendance. A survey was conducted to verify the problems in the current systems and to identify the requirement for a new system. To keep students attending lectures, they must be motivated and as a solution to this matter, an automated system can be built that allows students to see their attendance. The system should include proper methods to motivate students to reach their required attendance percentage for a semester. It should include an option that enables the student to mark and view attendance instantly. Also, there should be a method in the system, where students with lower attendance are identified and notified that their attendance level is low. QR code is a proper method to verify a student's identity in a lecture. From this method, students can be motivated to achieve their required attendance percentage and reduce attendance frauds. This paper shows an in-detail solution to all the above problems, by referring related research papers and by using analyzed data of a performed survey.

Keywords: *attendance management system, manual attendance, challenges, student motivation, attendance verification method*

I. INTRODUCTION

The higher education system in Sri Lanka has a rule where a student must obtain 80% of lecture attendance for a semester to sit for an end semester examination. When a student is unable to obtain the above-mentioned attendance mark that student's individual attendance to each subject module is analyzed. In a situation where the student has less than 80% of attendance for a subject, that student will not be allowed to sit for that specific subject in the end semester examination. The attendance of students in most Sri Lankan universities are taken manually and most of them are paper based. Verifying whether a student is attending to a lecture is identified using the students' signature. For each session of each subject module the student must verify their identity by a signature. After that the lecturer also must verify that they attended to the lecture. By that the lecturer takes the responsibility of all the students who signed in the attendance sheet.

In each month-end the attendance of each student for that month is displayed in a notice board where all the students can see their attendance progress. After the provided lecture hours are over, the data is entered to a system where their signature-based attendance is taken as inputs. The output of this system is an attendance report where it includes each student's attendance as a percentage. This report will help in the process of deciding whether a student can sit for the end semester examination. When a student is unable to fulfill the required

attendance that students end semester examination result will be issued as absent and will have to sit for the exam in the next year with junior students.

Each subject module has a specific knowledge area which need to be covered in a semester. As the primary source of knowledge, the students must attend lectures properly. The requirement of 80% attendance is included in the current higher education system to ensure the students are using this primary knowledge source because when a student is not using this primary source, they tend to have a less idea about the subject module than the students who attended to lectures which will not be fair to the students. Presently most students attend to lectures for the purpose of keeping the attendance at an above rate of 80%. But this 80% attendance rule is not making students to attend lectures. This results in having students who has less than 80% attendance or it results in getting less knowledge about the subject modules which may cause getting bad grades for exams and may not be able to sit for an exam.

The next section of the article incorporates files. The literature continues for this study, phase three. The lookup technique used to be ranked fourth. Provides all the small print about facts evaluation and result the ultimate three components incorporate effects. And recommendation for supporters of this predicament Research, future instructions and closing conclusions.

II. LITERATURE REVIEW

Most higher education institutes use student attendance as a better motivation method to give higher knowledge to students. The primary goal of getting student motivation is to have better student performance for students to learn the proper educational materials. to do that the attendance level of each student must be at a good level. To keep that good level the departmental policies, need to be changed and necessary actions need to be taken for students who have poor attendance. The rule of having above level for a percentage amount of attendance to get the privilege of writing the final exam can be considered as a departmental policy. (e.g., having an above rate of 75% of attendance to get a pass for a subject module) The survey

shreds of evidence that poor attendance leads to poor motivation regarding learning the subject module effectively. To get an idea about student attendance it needs to be monitored regularly. (Muir, 2009)

"Even though attendance is compulsory, establishing a commitment to education is essential if youth are to benefit from what schools have to offer and acquire the capabilities they will need to succeed in the current marketplace." (Fredricks et al., 2004) According to this whether the attendance is compulsory student should have a motivation to use school study materials and services which are offered by schools to get a better education. It is also important to face challenges in school which will be useful to be successful in the current marketplace. "Dropouts are more likely than other students to have poor attendance, display disruptive behaviors, and exhibit early school failure" (Fredricks et al., 2004) This says that the students who don't attend school are more likely to be in the less educated category than students who attend to school.

A group of members in the Engineering & Design Department of Eastern Washington University studied the effectiveness of class attendance towards student success. According to that student in engineering technology are studying in different environments when compared to 20 years before. Because of the technology evolvement, students are more focused to study using the internet and wireless materials. A questionnaire was posed, and it included the questions of whether attendance is important and whether the correlation between attendance and student success change due to the progression of students throughout their degree program. The study included students from different faculties through different students from freshman to senior students. The findings of the paper show that the correlation between attendance and student success progressing from freshman to sophomore to junior standing. (Durfee et al., 2012a)

Student attendance correlates with student success and the correlation changes with the knowledge improvement and progression of the student throughout the years as discussed in the above study. Using this study members of the

engineering and design department did a study to identify whether the relationship between student success and attendance when it comes to different faculty approaches to attendance which includes incentives for attendance, penalties for lack of attendance or no requirement of attendance. The outputs of the study are that students are motivated when attendance is rewarded and that the lecturers should use different approaches to keep students' attendance at a positive level. (Durfee et al., 2012b) Many factors will affect the succeeding chances of firstyear students which varies from personal circumstances to the educational environment. Attendance is one of the factors that will affect first-year students' success. It says that learning in a student-centered interactive environment is important. The study investigates the gap between the success of first-year students and their lecture attendance. The team have done several measures that prove the student participation in lectures affects the success of students. The findings of the article are that the students who met the required attendance percentage have a substantial impact on the exam results and the end year GPA value. (Bijsmans and Schakel, 2018)

Student absenteeism is a problem in schools across the globe that has an overall impact on student performance. Most schools have good attendance overall, but some schools have difficulties reaching the required attendance margin. An approach was proposed that improves the attendance of students which leverages the market target model (Perera, 2019). It was built on association rule mining and probability theory, to target sessions that are most impactful to overall poor attendance. What they did were rewarding students who have full attendance and improved Monday attendance using themes that will excite students. (Moodley et al., 2020)

Using three consecutive studies about techniques of effective classroom management a study was designed to improve higher education student's attendance. The three consecutive studies were pilot study, culminating study, and replication study. For the pilot study male and female students were taken to test the theory and the other two studies include only female students. the pilot study did not include any classroom management technique. The methods they used were taken from student interviews and they were taken as those 3 consecutive studies. Each study followed a method to keep the student motivated. The results of the study are as follows. The culminating study found that the late attenders and poor attendance students have lower grades. replication study had an improvement on student attendance. The replication study included points and credits rewarding method for good attendance which were the findings of the study. (Al-Shammari, 2016) Class attendance is a factor used when calculating a student's final performance for a subject. The attendance marking manual process is time-consuming and the manual process makes it easier to attendance frauds. The system included face detection and face recognition algorithms to verify the students. The results of the study show that face recognition is 98.1% accurate and it will be 94% efficient compared to their current manual attendance process. (Alon et al., 2020)

Computers and laptops are increasingly used currently in society. The education system can get a benefit from using smart devices. Since every person has a computer, they can use it to verify their identity which means the student can mark attendance using the computer. The current attendance systems have manual processes and take the signature as a verification of the identity. When the manual system is compared with an automated system, there are several things that makes the attendance marking process efficient. Automated method takes less time, free of human errors and reduces paper works and other manual procedures. There are many systems for attendance that uses software applications, but the other systems use extra hardware devices such as barcode readers. But this system uses the camera module to identify and read student identity. (Khan et al., 2018).

Existing Systems			
System Name and Icon	Technologies Used	Paid / Free	Web based/ Mobile based
attendoplus Attendo Plus	OpenResty, Nodejs, JavaScript, HTML5	Paid	Mobile and web based
Bitrix24 Bitrix 24	PHP, JavaScript,core-js	Free	Web based
greythr greytHR	React, core-js, Apache	Paid	Mobile and web based
capture Capterra	React, core-js	Paid	Mobile and web based
Time Doctor	PHP, JQuery	Paid	Web based

Figure 1: Existing Systems Technologies

In the higher education system of the Kingdom of Saudi Arabia, the lecturer has the responsibility to monitor student's attendance at each lecture. At each end of the semester, students get an attendance register which includes student attendance to each subject also it includes whether the student has achieved the required attendance rate for each course. (Perera and Liyanage, 2021) Checking student attendance manually takes a lot of time and effort. Also, the lecturer must enter all the attendance data into the university system manually. These reasons led them to automate their system. They considered fingerprint, eye recognition and smartphone attendance systems to take attendance. From all those options they identified that fingerprint and eye recognition also take a lot of time and that the smartphone is the most efficient method to take attendance. The proposed system used the university ID card scanned by the smartphone as valid student attendance and the lecturer is also able to get student attendance details using the smartphone application. (Alghamdi, 2019)

Mobile phone is more personal to students than computers and notebooks Also 99% of the people who are around age 20 to 30 have smartphones. By using the smartphone to verify student identity in lectures will be more time-consuming.

The study suggests that the attendance is taken using a QR code which will be displayed when the lecture is started and then the student has to scan it using their mobile phone to mark their presence. (Porwal and Rastogi, 2020)

III. METHODOLOGY

The study was performed using both secondary data and quantitative data. The data gathered from research were taken as secondary data and the survey data were taken as quantitative data. These data helped in the process of identifying the problems and solutions to those problems. A systematic approach was performed to gather data from research. At first, the related research was found according to keywords and the keywords are Attendance Management System, Manual Attendance, Challenges in taking attendance, Student Motivation and Attendance Verification Method. Then both manual and automatic searches were performed to find the most suitable research. In the searching process, special attention was given to research that were found from ResearchGate and IEEE. The following steps were used in the process of paper selection. As the next step duplicate research were removed. Then read the abstract and keywords of the papers. Then the exclusion criteria were followed to remove the research that are not related to my research area and the papers that are not written in English. Inclusion criteria were followed to select recent papers that can be applied to my study area. As the next step research papers were analyzed. The findings from those papers were summarized in the tabular format as it is an easier method to represent the findings from the literature review.

As the second stage, a questionnaire was distributed among undergraduates as a google form to identify the real requirement. The questions of the questionnaire were designed to gather the details about the current attendance system and the requirement of a new attendance system. The main requirement of the questionnaire was to identify the real requirement and the expected features of the system. The gathered data was presented as pie charts and then the analyzed data were presented in the analysis section of the paper.

IV. ANALYSIS

The table below shows the qualitative data and all the findings from the other research are summarized in the table. To get a clear idea about the challenges and the findings of related research papers, they need to be categorized. The table below shows the summary of these findings.

Table 1. Secondary Data research findings

Title, Author, Source	Findings
Student Attendance: Is It Important, and What Do Students Think? (Muir, 2009)	• Poor attendance will lead students towards poor motivation about studies.
School Engagement: Potential of the Concept, State of the Evidence (Fredricks et al., 2004)	• Students must attend lectures to achieve the required knowledge. • Students who have poor attendance will have a higher possibility of disruptive behaviors in the workplace.
Correlating Student Attendance to Student Success (Durfee et al., 2012a)	• the motivation towards attendance has a linear growth from freshman to senior student.
Correlating Student Attendance Policies to Student Success (Durfee et al., 2012b)	• students respond to attendance when good attendance is rewarded.
The impact of attendance on first-year study success in problem-based learning (Bijsmans and Schakel, 2018)	• Students who have better attendance will have better exam results and GPA scores.
Using Data Mining in Educational Administration: A Case Study on Improving School Attendance (Moodley et al., 2020)	• Rewarding student attendance helps to keep the student's motivation toward their studies.
Enhancing higher education student attendance through classroom management (Al-Shammari, 2016)	• Student attendance can be motivated by making students compare their attendance and by rewarding better-attending students.
Monitoring student attendance using a smart system at Taif university. (Alghamdi, 2019)	• A smartphone can be used as a time-consuming method to take attendance. • University ID is used as a method to verify the student's identity.
Smart Attendance System (Porwal and Rastogi, 2020)	• QR code is a better way to take attendance

Table 2 Existing Attendance Systems

Research Title	Findings
Mobile Barcode based examination attendance system	• Marking attendance using a smartphone is efficient and time-consuming. • QR codes can be used as a method to identify the student's attendance. • Using a smartphone to scan QR codes reduces the requirement of using a lot of hardware.
Monitoring Student Attendance Using a Smart System at Taif University	• A smartphone can be used as a time-consuming method to take attendance. • University ID is used as a method to verify the student's identity.
Smart Attendance System	• QR code is a better method to take attendance.
A YOLOv3 Inference Approach for Student Attendance Face Recognition System (Alon et al., 2020)	• Face recognition is a 98.1% accurate method to verify student's attendance. • Face recognition will have a higher possibility of detecting attendance frauds.
Mobile Barcode Based Examination Attendance System (Khan et al., 2018)	• Marking attendance using a smartphone is efficient and time-consuming. • QR codes can be used as a method to identify the student's attendance. • Using a smartphone to scan QR codes reduces the requirement of using a lot of hardware.

According to these recent research papers, I was able to create a questionnaire and distributed it among KDU Undergraduates as the quantitative data for the research. The questionnaire was conducted to verify the exact challenges in manual attendance system and to identify the requirement of a new system that include features that reduces the challenges in manual systems according to the student's perspective.

The questionnaire contained 6 main questions. It was distributed among 80 to 100 students and was able to get 65 responses in 5 days. The idea of this research paper is to identify the challenges of manual attendance. As one of the main questions, student's satisfaction with the current system should be identified to verify that this current system is either up-to today's demands or whether it required to be changed.
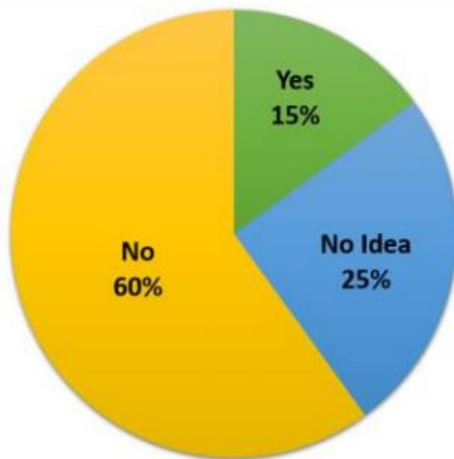
Current System Satisfaction

Figure 2: Questionnaire data about the satisfaction of the current system.

This graph shows the analysis data of this question. According to the results, most students are not satisfied with the current attendance system which means around 60 % of students in the university thinks that the current system is not compatible with today's requirements. Also, almost 15% of students say they are satisfied with the current system. The rest of the students are neither satisfied nor dissatisfied with the current system. Around 25% of the students respond "maybe". A student should be able to make a specific statement about the current system because these students are using this system to mark and view their attendance. If they are not aware of the current system, it means that this system is not keeping the students updated and specifically it does not motivate these students to attend lectures as a clear answer to this question, 60% of students specifically says that the system is not suitable. 25% of students have a neutral response but it gives the message that this system is no longer functioning to satisfy todays requirements. Overall, 85% of students are not satisfied with the current system.

According to the referred research papers and the analysis of the first question, most challenges in current systems can be reduced by using an automated system. To identify the requirement of a new system, a question was asked from students. The question was whether automating the current system could reduce the time it takes to mark attendance. The intention of this question is to find whether automation will reduce the attendance management process including attendance marking, calculating and report generating. It is specifically asking whether an automated system will solve the issue and if not, student can directly say that it will not solve the problem. Below diagram shows the results of students to this problem.

In the results, around 82% of the students say that an automated system will reduce the time in the attendance management process. Around 11% of the student have a neutral idea about whether an automated system will reduce the time which takes to mark attendance. It means that they have no idea about the current attendance process or whether a new system will be the solution to this problem. 10% of students think there will be no difference between an automated system and the current manual system according to the time factor.
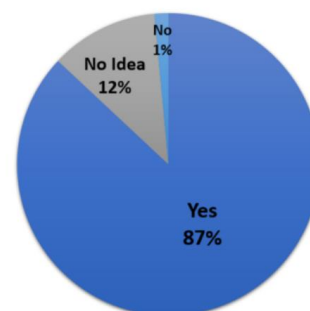

Figure 3: Questionnaire data about students' opinion on time reduction by an automated system.

To fulfil the attendance motivation, students need to have an essential component which is a constant reminder about their attendance. In modern world, every undergraduate student has a laptop or a smartphone. Smartphones have different platforms and building an application should be in a platform where all the students must be able to log in. It means if the application is web based, every student can use the system

easily using a web browser. The solution can also be a mobile application but building a mobile application is not practical because there is more than one platform, and the system should be accessible to all the students. Most of the referred research papers also have stated that a web application will reduce most of the problems in manual attendance. To verify this idea, a question was asked from the students and this diagram shows the results of the question.

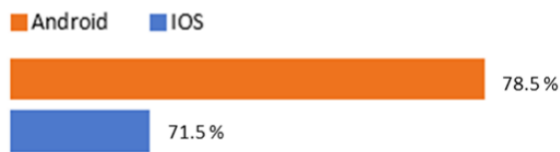### Suitable Operating system

Figure 4: Questionnaire data about the Suitability of Operating systems

According to its results, 78% of the students think an android application is appropriate and 22% of the students think that an IOS based solution is suitable. This shows that the system cannot be implemented in a mobile application. So, it is very clear that a web-based solution will be sufficient to build an attendance system.

To take attendance of the student, there should be an efficient method that will decrease the time it takes to mark student attendance and it should be a practical solution. For that, the survey included 4 methods including the current attendance marking method. The current method used the student signature and according to the chart, around 9% of students like to use their signature as a method for attendance and no more than 1% of students like face recognition. Around 50% of the students are willing to use the method where the QR code is used to detect the student attendance and the rest of the students prefer fingerprint as the method to verify student identity to lectures.
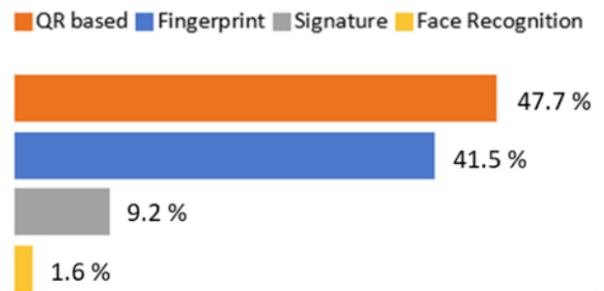
Attendance marking method

Figure 5: Questionnaire data about methods of attendance verification.

According to referred articles, QR code is the most suitable option to mark attendance and the data from the questionnaire also confirms that it is the most preferred method to mark attendance. As the focus of this paper, the student should be motivated by an automated web application and the recent research papers provide sufficient information to identify that this is a proper solution.
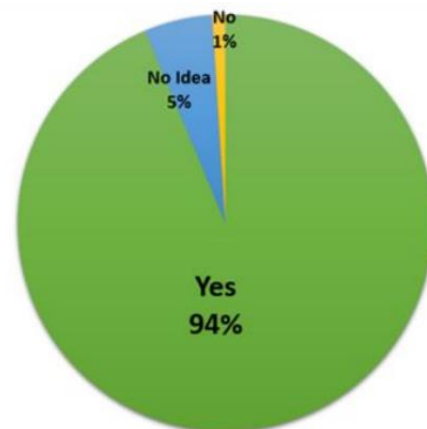
Impact on instant attendance view interface

Figure 6: Questionnaire data about impact on instant attendance view interface

The above diagram shows the results for the question of whether students can be motivated with use of a web-based system and according to survey results, 93% of the students think this is a better method to motivate students. Around 7% of the students have a neutral idea about the web application being motivated towards their attendance. From all the students, none of them say that it will not motivate students.

By considering the overall research findings and existing research papers we can conclude that the students have problems with the current attendance system, and they also have less motivation towards attendance. The motivation can be achieved by the web application by showing student attendance instantly. The suitable method to mark attendance will be the QR based method and automation will reduce the time it takes to mark student attendance.

IV. LIMITATIONS

The primary concern of this study is challenges of lecture attendance and finding suitable solutions to the identified challenges. Attendance is required to motivate students toward their studies. The current manual system does not support students to get motivated but a web application that notifies about students' attendance daily will increase the motivation that students have regarding their attendance. Even if the students are motivated towards attendance students could have troubles attending lectures because of their personal problems. Also, students could lose motivation towards attendance because of the inability to understand the study materials.

The current attendance system indeed takes time from lecture hours, but all the students, teachers and the medical approving doctors have more experience in the current system, and they have a good knowledge about the current system. This will cause problems when moving to an automated system because all the users who are involved in the attendance process are attached to the current system process.

There are many methods to take attendance from students to verify student attendance in the automated system. In the current system, it uses the signature to identify student's attendance but from this method, it is easier to mark attendance without attending lectures which is an attendance fraud, and it is not fair to other students who attends lectures. It also takes a lot of time to mark attendance because every student has put their signature on an attendance register in the middle of every lecture. As the next method attendance can be marked using a student's university ID card. The ID card can include a QR code and when a student attends the lecture, they can scan their ID card using a QR code reader which will take students attendance as input. This method has fewer errors compared to the signature, but this method also takes a lot of time to mark attendance and requires extra hardware to mark attendance. Student attendance can be verified using QR code which also takes a lot of time to take attendance because each student must have the required hardware features, but this method is the least expensive of all the attendance verification methods given above. There are many limitations in each method of attendance input and in the process of automating the attendance system but, an acceptable amount of attendance increment can be achieved from that.

V. CONCLUSION

many research papers and the survey, could see that Attendance plays a huge role in the student's success. To ensure that a student is getting the required knowledge in each subject module, student needs to attend to lectures regularly. When looking at the data that was analyzed, there are more ways to motivate students towards attendance when it comes to lecturer's perspective. As the purpose of this paper is to find challenges in the current manual system, it clearly says that this manual system is no longer suitable for today's requirement. It involves paper-based operations. It uses signature as the method to input student attendance in every lecture and this current system does not include methods to motivate students to achieve the required attendance level. Also, this attendance system takes a lot of time in the process.

Through the survey created, the drawbacks of the current system and the requirement of a new system was confirmed by sufficient responses from student's perspective. The survey included undergraduates from different intakes in KDU. The questionnaire was comprised of challenges regarding attendance. Quantitative data were deciphered using this survey. Based on the questionnaires we recognized the requirement of an automated attendance system. As per the given responses, more than 85% of the students have trouble using the manual attendance system and some of them are not even aware of the current system. All the undergraduates are engaged within the attendance system. The data gathered from the survey proved that the current

system takes a lot of time to collect student attendance. Overall, data gathered from students preferred to use an automated attendance system with a web application. From this survey, it was able to identify that the most suitable method to take attendance from a student is from their fingerprint. There are so many limitations in the process of automating the attendance system. One of the major concerns is the inability to achieve 100% of improvement in student attendance. Moreover, the student's motivation towards studies can be reduced easily from any distraction.

The paper discusses the fact that student's motivation can be achieved by making student believe that attendance is a primary goal that needs to achieve in every semester. lecturers are the ones who are responsible for delivering the knowledge for the student, as if there is no student attended to a lecture the lecturer will fail to give the proper guidance to students. After going through the survey and the data that was collected, one of the main points which was noticed is that the current attendance system is not suitable, and it does not motivate students to attend lectures. Also, manual system leads to attendance frauds, and it will result in reducing the number of students attending to a lecture. According to survey results, the manual system should be upgraded with new features including better method to take attendance, Keeping the motivation towards attendance within students and reducing the time which takes to mark attendance. The contribution of this study is to review the challenges in the current manual attendance system, how the manual system benefit towards student motivation to study and recommend the most suitable method to enhance the issues in the current manual system.

As for the future enhancements After building the proper automated system, attendance marking of students and keeping their attention to lecture will be prioritized. It will involve methods to monitor student's attendance to lectures via web camera module using Artificial Intelligence.

VI. RECOMMENDATION

The research focuses on the challenges of manual attendance system and as a solution to the issues In the current system, a project was proposed which develops the current manual attendance system with an automated system that takes students lecture attendance and calculates the 80% attendance of each student including approved medical reports. The QR-codes will be used as the verification method to identify the student's attendance. In the process of making an automated system, it can be included with a web interface that shows students daily attendance and notify students who has less attendance.

REFERENCES

Alghamdi, S., 2019. Monitoring Student Attendance Using a Smart System At Taif University. Int. J. Comput. Sci. Inf. Technol. 11, 107–115. https://doi.org/10.5121/ijcsit.2019.11108

Alon, A.S., Casuat, C.D., Mal bog, M.A.F., Marasigan, R.I., Gulmatico, J.S., 2020. A YOLOv3 inference approach for student attendance face recognition system. Int. J. Emerg. Trends Eng. Res. 8, 384–390. https://doi.org/10.30534/ijeter/2020/24822020

Al-Shammari, Z.N., 2016. Enhancing higher education student attendance through classroom management. Cogent Educ. 3. https://doi.org/10.1080/2331186X.2016.1210488

Bijsmans, P., Schakel, A.H., 2018. The impact of attendance on first-year study success in problem-based learning. High. Educ. 76, 865–881. https://doi.org/10.1007/s10734-018-0243-4

Durfee, J.K., Loendorf, W.R., Richter, D.C., Geyer, T.L.D., Munson, D.M., 2012a. A formal research study on correlating student attendance to student success. ASEE Annu. Conf. Expo. Conf. Proc. https://doi.org/10.18260/1-2--20810

Durfee, J.K., Loendorf, W.R., Richter, D.C., Geyer, T.L.D., Munson, D.M., 2012b. A formal research study on correlating student attendance policies to student success. ASEE Annu. Conf. Expo. Conf. Proc. \\

Fredricks, J.A., Blumenfeld, P.C., Paris, A.H., 2004. School engagement: Potential of the concept, state of the evidence. Rev. Educ. Res. 74, 59–109. https://doi.org/10.3102/00346543074001059

Khan, R.U., Wee, V.C.Y., Lui, V.W.S., UlHaq, M.I., Khan, Y., Barawi, M.H., 2018. Mobile Barcode based examination attendance system. Int. J. Eng. Technol. 7, 49–54. https://doi.org/10.14419/ijet.v7i3.22.17124

Moodley, R., Chiclana, F., Carter, J., Caraffini, F., 2020. Using data mining in educational administration: A case study on improving school attendance. Appl. Sci. Switz. 10, 1–20. https://doi.org/10.3390/app10093116

Muir, J., 2009. Student Attendance: Is It Important, and What Do Students Think? Transactions 6, 50–69. https://doi.org/10.11120/tran.2009.06020050

Perera, M., Liyanage, S., 2021. Applications and Challenges in Human-Computer Interaction for EEG - based BCI Systems. Glob. J. Sci. Res. Publ. 1, 1–8. https://doi.org/10.1109/TNSRE.2003.814433

Perera, P., 2019. Analyzing the E-Learning Satisfaction Factors Among University Students in Software Engineering Domain.

Porwal, Y., Rastogi, D., 2020. Smart Attendance System. Int. J. Comput. Sci. Eng. 7, 13 –16. https://doi.org/10.14445/23488387/ijcse-v7i6p104.

ACKNOWLEDGMENT

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