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SMART UNIVERSITY IN THE CONTEXT OF DIGITAL TRANSFORMATION

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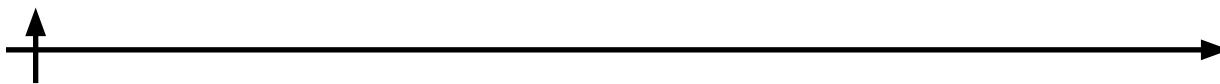
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Abstract. The goal of this article was to figure out the specifics of the Smart University concept in the context of rapid digital transformation. The components of Smart University concept were discovered and studied and various technologies required for a smart university to function as a whole were listed. Based on that the IT architecture for a Smart University was proposed. The proposed university model architecture allows for a monitoring of the campus environment, controls the campus environment, and provides an intelligent service opportunity with the frameworks, as well as placed devices. A rough outline for a project implementation timeline was formed and calculated, and an analysis of benefits and disadvantages of implementing such a project was carried out.

Keywords: Smart University, Digital Transformation, Business architecture, Smart University Model Architecture, Smart University IT Architecture

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SMART-УНИВЕРСИТЕТЫ В КОНТЕКСТЕ ЦИФРОВОЙ ТРАНСФОРМАЦИИ

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Аннотация. Целью данной статьи было выяснить специфику концепции «Smart университет» в условиях стремительной цифровой трансформации. Были выявлены и изучены составляющие концепции «умного университета», перечислены различные технологии, необходимые для функционирования умного университета в целом. На основе этого была предложена ИТ-архитектура «умного университета». Предлагаемая архитектура модели университета позволяет осуществлять мониторинг среды кампуса, контролировать среду кампуса и предоставляет возможность интеллектуального обслуживания с помощью фреймворков, а также размещенных устройств. Был сформирован и рассчитан примерный график реализации проекта, проведен анализ преимуществ и недостатков реализации подобного проекта.

Ключевые слова: умный университет, цифровая трансформация, бизнес-архитектура, модельная архитектура умного университета, ИТ-архитектура умного университета

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Introduction

It was thought that the rapid technology changes experienced today would open a new era in the field of learning. The covid-19 pandemic, which started in Wuhan, China in 2020 and affected the whole world, triggered this change. Research shows that this change is taken 5-10 years earlier. For these reasons, many universities in the world have changed their vision. Even universities using the most traditional learning model had to switch to smart university mode in this process. The learning arena is gradually influenced by technological advances such as e-learning, IoT etc. which are rapidly and absolutely changing the way educators provide instruction and teach students. A Smart University is a university that uses technological innovation within its organization to accomplish its mission (Mbombo and Cavus, 2021).

In order to achieve its strategic goals, the Smart University uses innovation technology within its organization (e.g. IoT, smart devices, etc.) is a university that uses. Technological developments and innovations in the world, especially data systems and innovations in computer technology make the formation of a smart university even easier (Banica et al., 2014; Yathongchai et al., 2013). Anyone can work with e-learning, from teachers to administrators and students. With e-learning, they can reach their goals. And if we compare it with traditional education, it significantly reduces the cost of labor, electricity, etc. lowers costs.

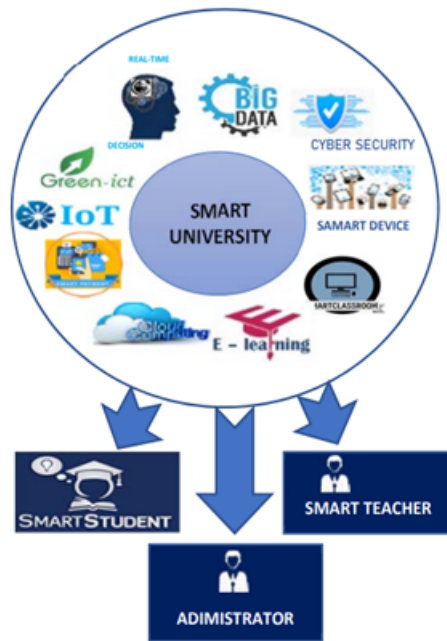
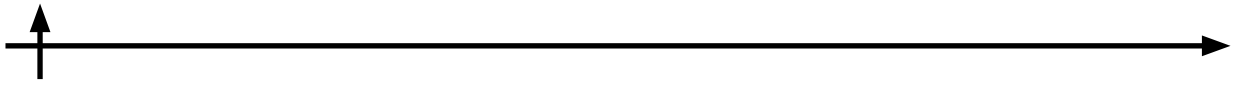


Fig. 1. Payment execution process “AS IS”

Figure 1 shows the representation of the Smart University and the new technologies that distinguish it from a traditional university. As can be seen, the distinction is in e-learning, Internet of Things (IoT), Cloud computing, big data, Green-ICT etc. It lies in the integration of new technologies, including A university with the integration of these new technologies is considered a Smart University. An intelligent learning framework uses IoT as part of new technology it can partner with to improve the quality of its services by providing a personalized learning environment (Stavropoulos et al., 2010). Intelligent institutions not only use IoT to customize learning, but also data size, processing speed, etc. It uses it together with big data to manage the challenges associated with it (Sun and Shen, 2016).

E-learning contains a lot of data. They require a large amount of Audio, Video, Diagrams, Contents, 3D models and information formats. E-learning has revolutionized education. While most universities advocate traditional education, most have now decided to switch to coeducation.

Materials and Methods

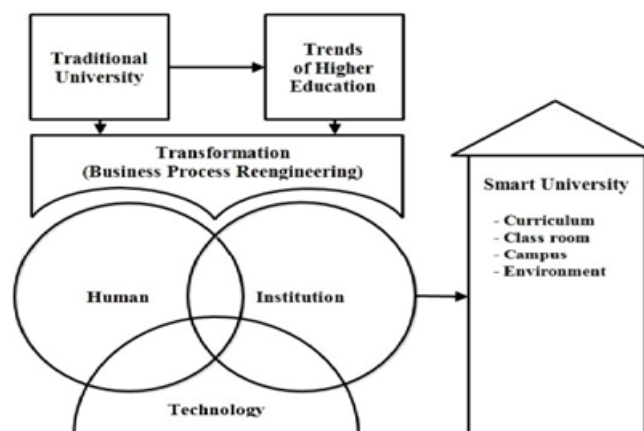
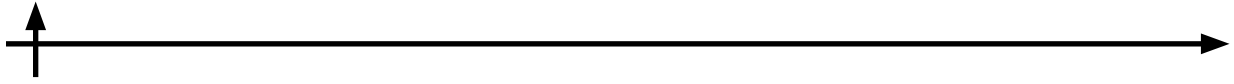


Fig. 2. Smart University Components



It is possible to consider the smart university in 3 points. Technology, Institute, Human.

1. Technology - infrastructure, data and software.
2. Human - Administration, Students, Teachers, Staff, Service providers, and security.
3. Institute – Class Rooms, Faculty, Learning Environment.

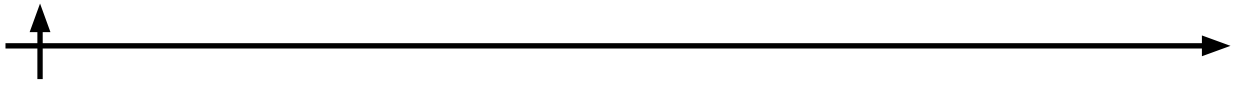
In addition, seven features can be added to the smart university.

1. Smart Transportation
 - In-Campus Navigation
 - Fleet Tracking
 - Smart Parking
 - Intelligent Signage
2. Security & Safety
 - Face Recognition
 - Smart Security Systems
 - Tracking
3. Analytic Data Center
 - Data Storage
 - Research
4. Smart Facilities Service
 - Smart Administration (Registration & Tracking)
 - Smart Facility Management Systems
5. Smart Classrooms
 - Virtual Reality
 - Remote Digital Learning
 - Cloud Sharing Platforms
6. Energy Management
 - Tracking with Devices
 - Smart Street Lights
 - Smart Energy Management System
7. Smart E-Student Card
 - E-Wallet (Students can use this card like a credit card)
 - Records all Personal Data
 - Access to Facilities (Dormitory, Gym, Labs, Classes)

With smart transportation, the number plate of the cars in the university will be read with smart cameras and will increase security. Vehicle density in the campus can be measured from maps. With smart parking and smart signage, students will be told which parking spaces are empty and this will reduce traffic (Kumar, 2018; Recalde et al., 2017). Security and safety will follow students with cameras and recognize their faces with face recognition technology. This will prevent unauthorized access to the school. With smart security systems and Tracking technology, the movements of vehicles and people in the school can be tracked.

The analytical data center can also collect university information, information from smart devices, student & teacher information in a data stroge. The Research Center, on the other hand, can provide services to teachers and students. Smart facilities provide smart assistance in student enrollment and will reduce the congestion that can occur in this process (Daniel, 2015; Shorfuzzaman et al., 2019). And it applies smart management in school facilites (gym, classes, labs) and prevents unnecessary water and electricity loss and saves money. This reduces costs.

Smart classrooms offer students the opportunity to learn in virtual reality. It provides an important help, especially in departments with technical courses. Distance education also helps students. Provides an interactive upload area where students and teachers can share (Paul et al., 2016; Tian and Zhao,



2014). Energy management, monitors the buildings, lights and energy systems on the campus of the university together with smart energy tracking devices. And it prevents wasted energy and saves energy. Significantly reduces costs. Smart student cards make students' lives on campus significantly easier. Students can load money on their smart student cards and use them as credit cards. In addition, students can access the school's facilities by having these cards read to the school's smart doors. In addition, all the information of the students is included in these smart cards.

Adding all these features to smart universities autonomously will make important contributions to smart universities. There will be a significant decrease in costs, security will increase, efficiency from university will increase.

Business Plan

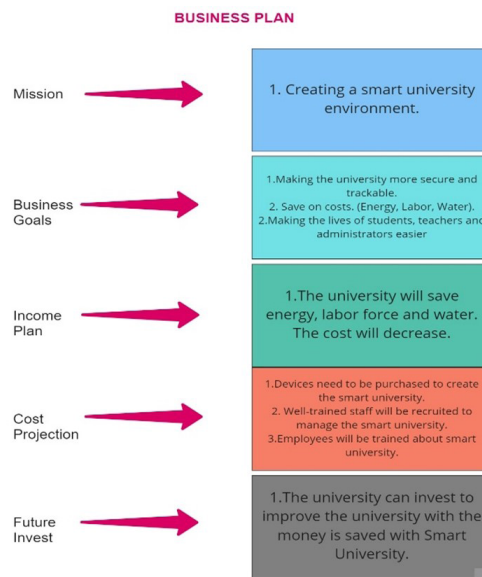


Fig. 3. Business Plan

Results

Smart University IT Architecture

The table below shows the technology required for a smart university to function as a whole. The monitoring layer is important because smart devices, iot devices form the basis of smart university. Without these devices, it becomes impossible to talk about smart university. The monitoring layer collects information with related devices. And it transfers this information to the Business Layer.

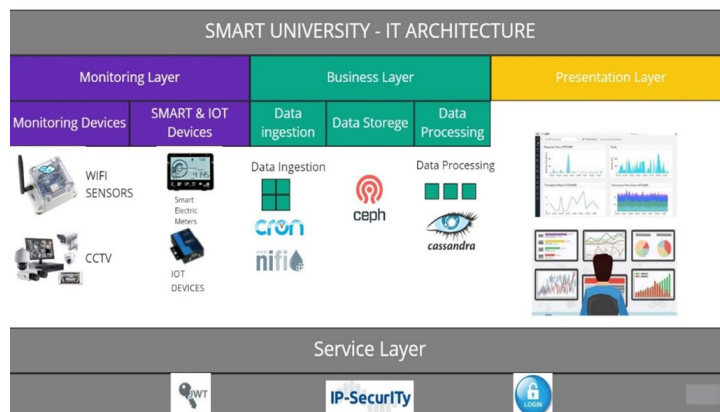
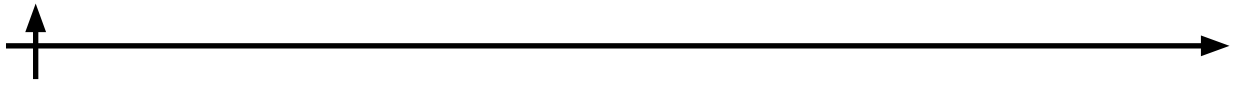


Fig. 4. Smart University – IT Architecture



Business layer can think of it as a storage system. Smart messages from smart devices are stored here (Alonso Secades and Arranz Garcia, 2016; Nazarenko and Khronusova, 2017). The business layer processes and stores data from devices. And after processing, it serves the Presentation Layer. Finally, the presentation layer includes the necessary components for delivering services and information to end users. One of the most important parts is the presentation section. After the data and messages from smart devices are stored in the business layer and transferred to the presentation section, the data is displayed here for interpretation. The services layer includes the global and global components of the service delivery platform, such as registration, login, authentication, connectors, and scripting, and includes security provisioning components (Berman, 2013; Koutitas and Demestichas, 2010; Ozdamli and Cavus, 2021).

Smart University Model Architecture

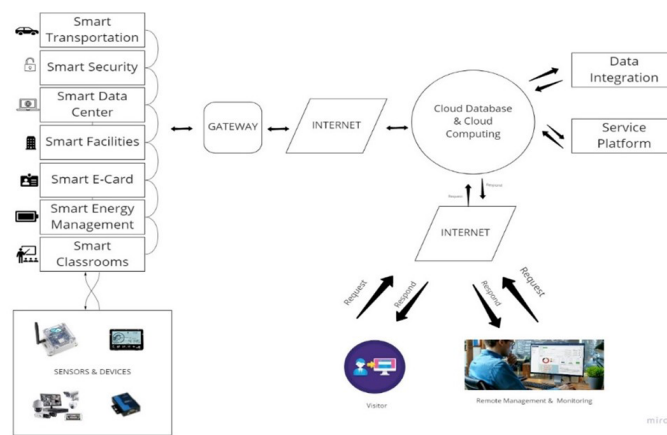


Fig. 5. Smart University Model Architecture

The university model architecture monitors the campus environment, controls the campus environment, and provides an intelligent service opportunity with the frameworks, placed devices, which are the seven features of the smart university. These 7 elements that are mentioned in the Smart University Framework and are important for a smart university. The smart campus system includes hardware and software devices. And cloud database is responsible for storage (Bai and Li, 2020; Karim, 2020). The data integration platform integrates storage data and middleware data to provide comprehensive information, service platforms serve to provide an intelligent application service to the end user.

Discussion

Planning

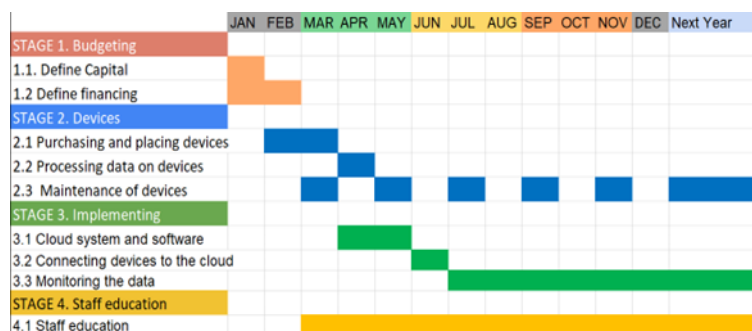
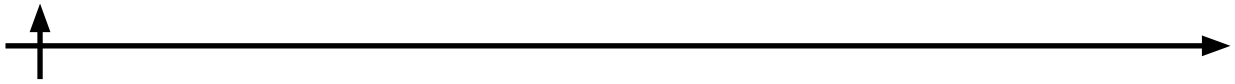


Fig. 6. Planning Process



Planning is a necessary step to achieve a desired goal. And this business requires assignment. Planning is considered as 1 year and the next year as each month. The planning divided into 4 parts. Stage 1 – Budgeting, Stage 2 – Devices, Stage 3 – Implementing, Stage 4- Staff Education.

Stage 1 – Budgeting

Define Capital - Determination of capital for investments to be made, equipment to be purchased and other expenses. It will take a month. January.

Define Financing - Determination of financing for investments to be made, equipment to be purchased and other expenses and after smart university is implemented, a feasibility study should be done to predict the profit or loss situation of the university. It will take 2 month. January and February.

Stage 2 – Devices

Purchasing and Placing Devices - The process of purchasing the relevant devices and placing the devices in their places. It will take 2 month February and March.

Processing Data On Devices - Process of processing and understanding raw data from devices. It will take a month. April.

Maintenance Of Devices - The devices should be maintenance every two months, including the first month after the devices are purchased. This is a necessary process, any technical glitch in the devices can affect the whole process. It will take 6 month in a year. March, May, July, September, November, January.

Stage 3 – Implementing

Cloud System and Softwares - Installation of cloud systems and software. It will take 2 month. April and May.

Connecting Devices to Cloud System - The process of connecting devices to cloud systems and software after deploying devices. June.

Monitoring The Data - Data monitoring process. Every month.

Stage 4 – Staff Education

Staff Education - Smart university is constantly updated as it is a new technology. Therefore, regular training should be continued every month in order to teach our staff this new technology and keep them knowledgeable in this new technology. Staff must be well trained. Because any wrong behavior of the staff can negatively affect the whole process.

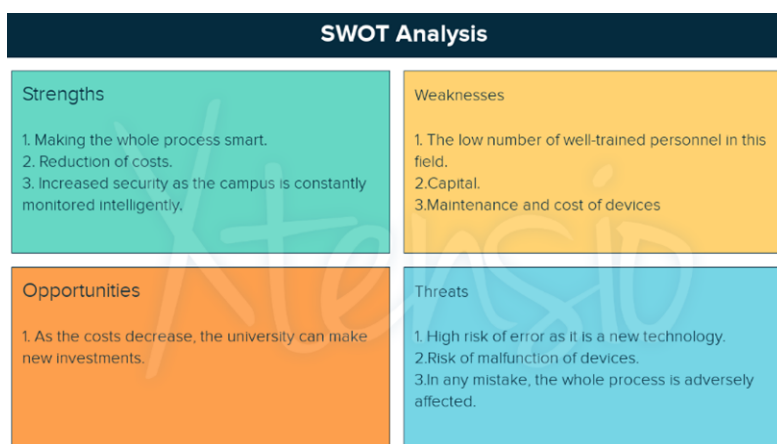
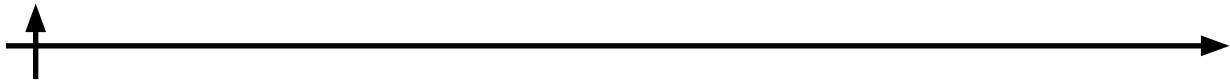


Fig. 7. SWOT Analysis

Conclusion

Technological developments lead to new information in the world. Using this new knowledge of

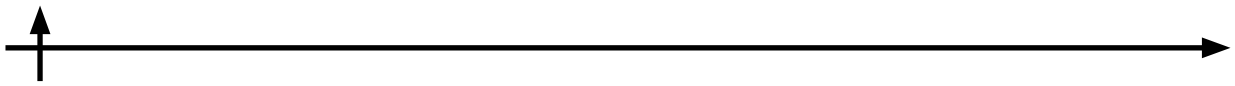


technological developments, companies can intelligently expand and strengthen their operations. These great technological developments are increasing the importance of the tools used. Iot devices and similar devices are an important actor in reading these technological data. Another area where digital technologies should be used is the field of education. Education is the most important starting stone of human life. Countries that formed this starting stone with solid and strong foundations are among the most developed countries of today. A solid foundation of education will enable students to be more successful in the future. For this reason, universities should not be deprived of digitality. With the smart university, students will adapt to the university environment faster. Better efficiency can be obtained from motivated students after better adapting to the university environment. Motivated students will succeed, and successful students mean a better university reputation.

With smart technologies, universities can save fuel, energy, workforce, etc. will provide significant savings in resources. Universities can increase the quality of education, teachers and equipment by investing in more important points with the money they save. And finally, the pandemic in the world showed us that. Normal universities were closed during the pandemic and became inactive. But smart universities continued to operate. This showed the whole world how important smart universities are.

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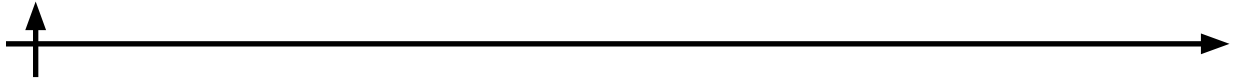
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