Web-Based Integrated Scheduling System

by Johny Natu Prihanto

Web-Based Integrated Scheduling System at Universitas Multimedia Nusantara

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Abstract

The digital transformation strategy is carried out on scheduling at the Multimedia Nusantara University (UMN) campus in order to shorten work time and achieve space utilization rates in each semester considering the growth in the number of UMN students and the number of classes in each academic year. Various courses have their own requirements in preparing schedules that must be met so that learning outcomes can be realized. This transformation is carried out by changing the work that was previously done manually by creating a web-based integrated scheduling system for all parties involved. This transformation uses a Digital Maturity Model framework which has 5 dimensions including Customer, Strategy, Technology, Operations, and Culture. The current state for each dimension ranges from 3.17 to 3.73. Based on the results of the interview, it is hoped that it can reach level 4. The gap between the current state and the future state will be minimized by the system built in this transformation project.

Keywords: Digital Maturity Model (DMM), Scheduling, Roadmap, Higher Education

I. INTRODUCTION

Along with the times, digital transformation is increasingly being implemented in various ways. The digital transformation strategy aims to create the ability to fully exploit the possibilities of new technologies and their impacts in a fast and innovative manner in the future (Bones, 2016)[1]. Here are the top 10 digital transformation trends in 2017 put forward by Daniel Newman in the 30 August 2016 issue of Forbes[2]:

a. Adaptability is more important to success than ever

b. Cultivate the importance of user experience

c. Innovation must happen quickly

d. Involves remote workforce

e. The emergence of Augmented Reality (AR) and Virtual Reality (VR)

f. Application Program Interfaces (API)

g. Big data and analytics

h. Digital transformation driven by the Internet of Things (IoT)

i. Smart machines and artificial intelligence (AI) are applied in many lines of life

j. Crush Silo

According to Youssef and Dahmani in their research article in 2008[3], changes in the academic environment and the contribution of digital transformation that occurred were developments in communication technology based in higher education institutions. The proven benefit is increased communication between students and lecturers. Currently, the world of education has transformed a lot, both in the learning process, to various services for the entire academic community. Distance lectures that use an LMS (Learning Management System) and an integrated campus information system from admission to alumni make various processes on campus tidier, faster, and easier.
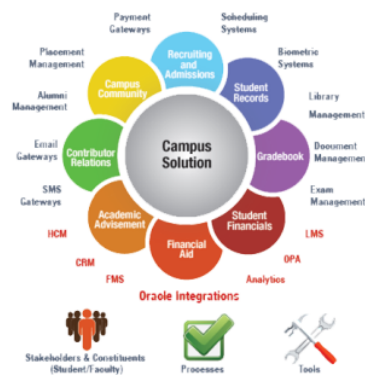
Figure 1. Coverage of Peoplesoft Campus Solutions
Source: emeriocorp.com, 2020

Currently, UMN uses an integrated information system called My UMN. This information system is a product of Oracle. Figure 1. shows the system coverage currently in use, including Recruiting and Admissions, Student Records, Gradebook, Student Financials, Financial Aid, Academic Advisement, Contributor Relations, and Campus Community. But in My UMN, there is no menu for arranging lecture schedules.

The large number of lecturers is proportional to the number of students at universities. This certainly affects the number of classes opened in each semester. Currently, the number of classes running at UMN is 1,678 classes in the odd semester and 1,541 classes are held in the even semester of the 2019/2020 academic year for all levels. Unlike tertiary institutions which have many buildings for each faculty, UMN uses the same facilities to support lecture activities at all levels. This can be a strength as well as a challenge for the Academic Information Bureau (BIA), as the lecture schedule compiler. Become a strength because the effectiveness and efficiency of using space can be maintained. While the weakness of this challenge is that with the limited number of facilities, you still have to be able to manage the schedule for all levels so that lectures run according to the needs of each course. Currently, lecture scheduling at UMN has not been integrated with the system used. So we compiled this project to increase the effectiveness and efficiency of the use of lecture facilities and still pay attention to the needs of each course and the limitations that each lecturer has so that lecture activities continue to run according to quality standards.

Digital transformation simplifies processes and shortens time spent in various fields, including banking, news media, manufacturing, logistics, health, and education. Competitiveness is a complex subject that includes various studies at various levels (Utomo and Budiastuti, 2019)[4]. Therefore, in an effort to increase UMN's competitiveness, digital transformation is necessary. This transformation is not only in the implementation of learning through lectures but also various other supporting activities, one of which is scheduling.

During the digital transformation process, there is a need for an organized approach, strong planning, the involvement of all stakeholders, including those within the organization, as well as experts involved from abroad (Bounfour, 2016)[5]. This is what underlies the importance of creating a roadmap for each digital transformation project. The roadmap becomes a reference for the organization, in this case UMN in carrying out the transformation project so that it does not deviate from the expected results, both in terms of completion, costs, and the workings of the system being developed.

UMN has a number of lecturers and staff in the millennial age range. Generations born in the period 1980 to 2000 are often grouped by researchers into the millennial generation (Satria, 2018)[6]. Millennials are very fluent with digital technology from an early age (Immordino-Yang, 2012)[7]. As shown in table 1. There are 277 UMN employees and lecturers who are in the age range of 20-40 years. This is certainly a distinct advantage for UMN, especially in the implementation of this transformation project later. Because this generation is very fluent with the use of digital technology.

Table 1. UMN Employees and Lecturers Age

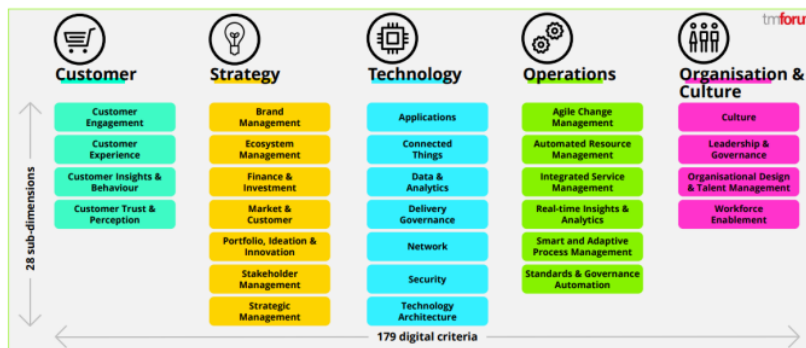| No	Age Range	Total
1	20-40	277
2	41-76	78
	Grand total	355

Source: HRD UMN, 2020

II.METHODS

Figure 2. Dimensions and Sub Dimensions of DMM
Source: TM Forum, 2017

Digital transformation carried out in an organization must use a certain framework from planning, preparation to project implementation. TM Forum in 2016 compiled and developed a framework called the Digital Maturity Model (Davis, 2017)[8]. There are 28 sub-dimensions divided into 179 criteria from 5 DMM dimensions developed by TM Forum to measure the digital maturity level of an organization, including:

a. Customer (Customer)

The Customer Dimension evaluates the way a company provides provisions for customer engagement in seeing organizations as their digital partners through their preferred channels in carrying out activities both online and offline.

b. Strategy (Strategy)

The Strategy Dimension evaluates how well a business can transform to increase competitiveness through a comprehensive digital strategy and a set of initiatives that support the overall business strategy of an organization.

c. Technology

The Technology Dimension evaluates an organization's ability to build, maintain and continuously change a technology environment that is aligned by supporting and delivering business goals.

d. Operations

The Operations Dimension evaluates an organization's performance on operational activities that support the cycle of workflows that support the underpinnings of strategy execution.

e. Culture

The Cultural Dimension evaluates an organization's ability to create an environment for each personnel in the organization to understand how they can make an impact in delivering digital transformation and the ongoing operational environment and work in a way that maximizes success, productivity, and well-being / happiness in the organization.

DMM in its measurement uses a scale in the form of intervals of 1 to 5, with the following details:

a. 1 = Initiating

It is an early and early stage to incorporate digital transformation initiatives into several business operations.

b. 2 = Emerging

There is further discussion about digital transformation initiatives and their inclusion in all routine operations.

c. 3 = Performing

The organization has set clear objectives and formulated a plan that will be implemented in the company.

d. 4 = Advancing

The organization has expanded its company plans and objectives to generate new, innovative ideas to enhance our capabilities in this area.

e. 5 = Leading

The organization is considered a thought leader in this field, regularly leads industry discussions on this topic and has mastered the field.

In the Customer Dimension, the author uses the Customer Engagement sub-dimension. This sub-dimension measures how the campus communicates and interacts with customers through the use of personalized content. As customers, in this case include students, lecturers, and staff of other departments.

Strategy is the next dimension that the authors measure. Strategic Management is the selected sub-dimension. The way the campus applies the rules, methods, and tools to develop and manage digital strategies and enables organization-wide alignment to achieve the results embodied in the campus vision and mission.

Technology is the main driver in digital transformation projects. Well-documented guidelines, procedures and rules governing the development and dissemination of technology to promote sustainable campus values are the focus of the Sub-dimension of Delivery Governance.

Furthermore, Smart Process Management is a sub of Operations Dimensions. Intelligent business process management is designed, automated and optimized throughout the campus ecosystem to measure maturity in this dimension.

In the Cultural Dimension the writer chooses the Employee Enablement sub-dimension. This sub-dimension focuses on measuring how the campus determines and assigns competencies, knowledge, skills and tools to empower the workforce, in this case employees and lecturers to work collaboratively, in the highest level of effectiveness and flexibility. Measurement of all these aspects is intended so that the results obtained can describe the UMN campus maturity level comprehensively.
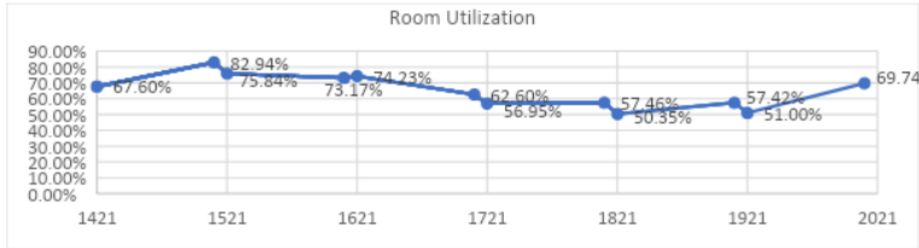
III. RESULT & FINDINGS

Figure 3. Utilization of Space for Lectures
Source: Author, 2020

Adding space or facilities is not the main choice in solving scheduling problems. Because it refers to the room utilization rate which tends not to reach the target set, so far adding classrooms is the last option if there is no possible combination of schedules for various parties or if the study program requires a room with certain specifications.
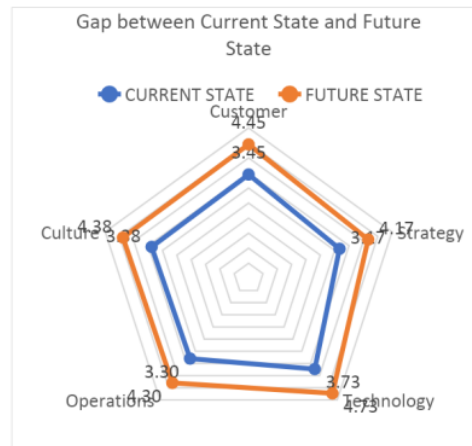

Figure 4. Gap between Current State and Future State
Source: Author, 2020

The Customer Dimension has a value of 3.45 at the Performing level, while for the future it is expected to reach a value of 4.45, namely Advancing. System users who consist of various parties on campus need different authority according to their role in scheduling. Kaprodi / Sekprodi has the authority to determine the code of courses to be offered in filling KRS, the number of classes, and the allocation of lecturers. Some important notes that need

to be submitted can also be inputted in the system, as additional information for the system in generating schedules as needed. The faculty laboratory coordinator is authorized to determine specifications and spaces that suit the needs of each course code. The Building Management team must input and ensure that all facilities to be used in the scheduling are ready for use and match the description of each room. BIA is tasked with creating a web-based integrated scheduling system modeling into an initiative of the Strategy Dimension which has a Current State value of 3.17 and a Future State of 4.17. Until now, BIA has not used a specific system in arranging scheduling. This puts a long turnaround time and risk of errors. It is hoped that with this system, this can be minimized as well as increasing the percentage of space utilization according to the target.

The Technology dimension has the initiative to improve technology in accordance with the system requirements to be made. This is expected to increase the value of this dimension to 4.73. The use of technology that suits your needs is certainly needed, especially in a digital transformation project that uses technology as a tool to achieve the designed transformation.

Automated scheduling becomes the expected target in Operations Dimension. Not only does it reduce working time, personnel fatigue causes decreased accuracy, it can also achieve the target utilization set. This dimension is expected to increase in value to 4.30.

The cultural dimension currently has a value of 3.38, while in the future it is expected to reach a value of 4.38. Campus is obliged to provide education to users according to their role in scheduling. This is so that the scheduling process can run properly.

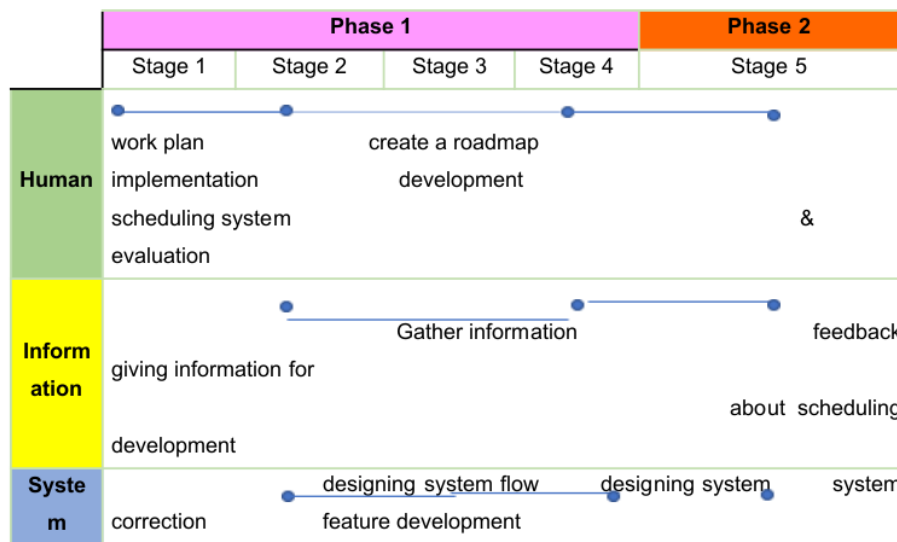|	Phase 1				Phase 2
	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Human	work plan implementation scheduling system evaluation	create a roadmap development			&
Information	giving information for development	Gather information			feedback about scheduling
System	correction	designing system flow feature development	designing system		system

based on UI/UX for exam scheduling

Figure 5. Roadmap for Digital Transformation of Scheduling System

Source: Author, 2020

The roadmap is presented in Figure 5. describes the stages in a digital transformation project for the scheduling system at UMN. The project is planned for completion for this Roadmap consisting of 2 phases and 3 parts. The first phase aims to create a web-based integrated scheduling system, while the second phase is an advanced development of the system so that it can also be used for exam scheduling, both midterm exams (UTS) and final semester exams (UAS). The following is an explanation of each section:

1. Human (personnel)

   Stage 1 begins with making an annual work plan by BIA for the creation of a scheduling system. Followed by stage 2, namely making a roadmap and a digital transformation project report as a background for making the system. At stage 4, it is expected that the phase 1 project has been completed, so that the system can be implemented and evaluate the deficiencies that arise, so that system performance can be better. Furthermore, stage 5 is also phase 2, at this stage the system development is planned.

2. Information (information)

   Phase 1 for this section starts from stage 2, which is to collect all information about scheduling. This needs to be done so that the system created later can answer UMN's needs in completing scheduling in accordance with the applicable regulations. Furthermore, stage 4, this section provides information in the form of feedback on the use of the system for phase 1. Finally, it is continued with stage 5, which is an advanced phase by providing useful information for further development.

3. System (system)

   This section starts phase 1 at stage 2, namely by designing a flowchart for the scheduling system, then continues with stage 3 designing a system based on UI / UX so that this system can meet existing needs quickly and precisely. Stage 4 functions to correct the system if things are not as expected during the evaluation. Finally, at stage 5 the development stage is planned to answer the system's needs for scheduling the exam.

IV. CONCLUSION, IMPLICATIONS & SIGNIFICANCE

Based on the digital transformation project that the author composed, it can be concluded that;

1. UMN as a private campus with about 8,000 students has not used an integrated scheduling system for all parties involved in scheduling.

2. Some of the lecturers who teach UMN courses are non-permanent lecturers, so they have limited teaching time available.

3. The target space utilization that has been set often has not been achieved, because of the limited number of personnel and the large number of classes that must be handled.

4. Due to the complexity of the system and the limitations of the IT Department personnel in the project initiated by the author, the work on this project will be left to the vendor, rather than to the final year students from the Faculty of Engineering and Information.

5. The UMN campus digital maturity level for Customer Dimensions, Strategy, Technology, Operations, Culture are as follows: 3.45, 3.17, 3.73, 3.30, and 3.38, respectively. So it can be concluded that it is at level 3, namely Performing.

6. The digital transformation project for the creation of a web-based integrated scheduling system is scheduled for completion in September 2022. This does not yet take into account the effects of the COVID-19 pandemic.

REFERENCES

[1] C. Bones, Leading Digital Strategy: Driving Business Growth Through Effective E-commerce. London, United Kingdom: Kogan Page Ltd, 2016.

[2] D. Newman, "Top 10 Trends for Digital Transformations in 2017," Forbes, 2016.

[3] A. Ben Youssef and M. Dahmani, "The Impact of ICT on Student Performance in Higher Education: Direct Effects, Indirect Effects and Organisational Change," RUSC. Univ. Knowl. Soc. J., vol. 5, no. 1, 2008, doi: 10.7238/rusc.v5i1.321.

[4] P. Utomo and D. Budiastuti, "Practiced culture toward firm competitiveness performance: Evidence from Indonesia," Pertanika J. Soc. Sci. Humanit., vol. 27, no. 1, pp. 113–124, 2019.

[5] A. Bounfour, 25 Major Trends. Switzerland: Springer International Publishing, 2016.

[6] H. W. Satria, "Jurnal Sosial Humaniora Terapan Studi Observasi terhadap Penggunaan Aplikasi LINE oleh Generasi Millenial Jurnal Sosial Humaniora Terapan," J. Sos. Hum. Terap., vol. 1, pp. 32–40, 2018.

[7] M. H. Immordino-Yang, J. A. Christodoulou, and V. Singh, "Rest Is Not Idleness: Implications of the Brain's Default Mode for Human Development and Education," Perspect. Psychol. Sci., vol. 7, no. 4, pp. 352–364, 2012, doi: 10.1177/1745691612447308.

[8] B. Davis, "The First Step in Digital Transformation? Establishing Maturity," 2017. https://www.cmswire.com/digital-workplace/the-first-step-in-digital-transformation-establishing-maturity/.

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