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The proposal of an agile model for the digital transformation of the University Hassan II of Casablanca 4.0

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Abstract

Universities 4.0, have been working for many years on modernizing their services to adapt to new practices and stakeholder needs. However, their experience is not necessarily capitalized in the form of a model that can be used by the traditional university, and even if they do, it will not, in any case, be an adapted model, because the challenges are different. This is why we tried through this work to understand our context, to study the models proposed by other researchers and to capitalize our research by proposing an agile model that aims to enable an adequate digital transformation: Case of the University Hassan II of Casablanca (H2C).

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1. Introduction

The education sector is one of the last industries that has started changes because it is classically attached to old methods and practices. However, because of the digital transformation and the beginning of the use of new technologies, professors are beginning to make changes, their institutions using platforms that allow communication and activities with students, placement of study materials, evaluation tests, and even in the material composition of their classes, all at a faster pace than expected.

However, it remains difficult to overcome the various cultural, budgetary or structural constraints linked to a brutally vertical hierarchical model. So how can traditional universities transform themselves while facing various challenges?

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In order to address this problem, this research attempts to assess the current state of the Moroccan university and identify the most significant means, raised in the literature, to facilitate the implementation of the digital transformation of H2C. In the following pages, the telecom infrastructure and its key role for digitalization, university 4.0, the challenges, the models proposed by other researchers and our proposal will be presented.

The first section of this work covers the literature review. The second is dedicated to the presentation of the results and the proposal: an agile model for mutation and the third is a conclusion that presents and synthesizes the most striking information of the work performed and initiates a discussion on some gaps not covered by this study.

2. Literature Review

2.1. The evolution of the telecommunications industry is its key role for digitalization: 5G as an example

Today, telecommunications technologies occupy a very important place in the daily lives of individuals, organizations, universities and research laboratories. This trend is justified by the many advantages that the telecommunications field has offered, notably in terms of remote interconnection, file sharing, data transmission quadruple Play: (i) Internet access, (ii) Fixed telephony, (iii) Online television and (iv) mobile telephony [1][2].

Telecommunications techniques have evolved over the last few decades, from zero generation to fifth generation (5G) in a short period of sixty only twelve years with recent technological innovations such as the virtualization of machines and systems, the SDN paradigm (Software Defined Networking) [3][4], cloud computing or the Internet of Things (IoT). Thanks to this evolution, several services and benefits are available to the operator and the end customer.

The exponential evolution of smart device video services has encouraged global initiatives to expand fifth-generation (5G) mobile and wireless communication systems. The growing number of smart devices and the gradual number of bandwidth-intensive mobile applications that require higher spectral efficiency than 4G systems poses significant challenges in 5G. [5][6].

The expected technical particularities of 5G will allow the creation of different business opportunities, for example, 5G is intended to give end users an enhanced user experience with typical user throughput of at least 50 Mbit/s downlink and 25 Mbit/s uplink, lower and stable end-to-end latency below 10 ms, improved coverage both outdoors and indoors, and higher WAN capacity [7].

2.2. the characteristics of University 4.0 and its evolution since version 1.0

Students in Education 1.0 have acquired information in the form of a routine by a member of the academic staff, often imposed by the courses. As a result, in Teaching 1.0, students were consumers of information and resources entrusted to them for their studies. The massification and the much greater diversity of students have called into question the traditional teaching structures and styles.

About 20 years ago, education 1.5 appeared and learning management systems/virtual learning environments (LMS/VLE) with their aspirations gained popularity. Teachers have begun to improve face-to-face experiences with digital resources.

Education 2.0 was born when, in the mid-15th century, the invention of printing changed the dynamics of the system of reproduction and sharing of knowledge. Meanwhile, books have become the verticals of knowledge dissemination. Then and with the arrival of Web 2.0, Education 2.0 began to leverage its techniques to improve and challenge traditional approaches to education. Open educational resources and participatory content have enabled different approaches for more information and knowledge. An excellent example of Education 2.0 is the Reverse Classroom.

Education 3.0 is the current teaching in the age of Internet and information technology, is characterized by rich, inter-institutional and intercultural educational opportunities.

Unlike Education 3.0, where education takes advantage of developing techniques and becomes more digital through forms of online learning materials, Education 4.0 will shift the focus from teaching to learning by placing the student at the center of the process. In other words, education will shift from the traditional instructor-led model to the student-led model. The goal is to enable students to acquire knowledge and skills that will enable them to grow throughout
their lives. In addition, students should be the best of themselves and chart their own path individually while learning the required topics of their profession.

For this reason, each student’s academic background is supposed to be different, even if they take similar courses. Below some characteristics of the university 4.0 (not exhaustive): (i) Faculty: in addition to full-time faculty, industry participants act as part-time faculty for classroom and online courses. (ii) Curriculum and pedagogy: subject decided by the learner; individualized learning. (iii) Research: Ease of data sharing has removed geographical barriers to collaboration. (iv) Funding: fee-based funding systems in online and classroom programs. (v) Infrastructure: investment in technology infrastructure to support blended learning. [8][9][10]

2.3. University 4.0’s digital transformation and its interaction with the outside world

Using digital techniques in education shapes the modernization of societies, driving growth and competitiveness through a better skilled workforce and more jobs. The ability to govern complex problems, to be entrepreneurial and to think creatively using digital resources become essential skills for the opportunities brought by the digitalization of our society. Educational organizations, in particular higher education providers, must assimilate digital techniques into teaching and learning activities, enabling students to acquire the digital skills necessary to encourage innovation and employment [11].

The digitization of higher education and the transfer to university 4.0 is a strategic objective of several universities. For example, the University of Geneva has proven digital as a transversal axis that concerns all its activities and has included it in 2015 in its strategic plan. He thus perceives himself as “an actor of digital change”. This includes the development of digital infrastructure and services, digital education and research and its challenges, the introduction of new ways of disseminating knowledge or the improvement of some administrative processes [12].

Universities play an unreplaceable role in nation building because of their mastery of knowledge and practices and their ability to convert them into development and growth. There is no established correlation; However, we note that the developed economies had a very advanced and developed higher education system and a commitment to the economic and social branches of practice. The transition to version 4.0 was the subject of several studies and this concerned several areas, for example, Healthcare 4.0 [13], Oil and Gas 4.0 [14], Agri-Food 4.0 [15], Agriculture 4.0 [16], Textile Learning Factory 4.0 [17], Smart operator 4.0 [18], Construction 4.0 [19], Materials 4.0 [20].

The list is not exhaustive, however the major point in common and that the transition to industry 4.0, the evolution of the telecommunications industry and network infrastructures, and the technological contributions of the digital era are the key drivers of this change. Our study has the same goal: the mutation, except that the context is different, we want to focus on the digitalization of the Moroccan University Hassan II of Casablanca (H2C).

Similar research and studies for universities have already been conducted in order to propose models enabling this mutation to 4.0. A study [21] was carried out in 2017 that explains the transition to University 4.0 through a circular concept map that mixes the components of the higher education system with the returns of the digital era. This work was criticized in 2019 by another study [22] as it only stops mentioning human resources, support services and lifelong learning topics, without showing the importance of properly and efficiently managing hardware and software processes. So a new model of eight levels in a pyramid form was proposed to cover this gap.

2.4. Challenges of the Moroccan University

Universities in Morocco face a marked difference between the perspectives of students and employers on the one hand, and the ability of these institutions to meet their expectations on the other, This increases the pressure on them to develop their educational programs and maintain continuity, in the context of the constant changes in regulatory laws competition and need for funding.

The report [23] includes a diagnosis of the situation of the countries of the region, regarding indicators of the situation of the digital economy. These data show that Morocco has an intermediate level, if not low. In particular, in terms of literacy and broadband infrastructure. Weaknesses result from the lack of a comprehensive strategy and governance. Until recent developments (Digital Morocco 2020 and Digital Agency), digitalization was not a priority in the government agenda. The analysis, in particular on the basis of international benchmarking elements, has shown that there is a weakness in the national content of websites used by the public, the weakness of the ecosystem approach
in the policies implemented and the weakness of human capital. Despite efforts, the indicators show that Moroccan education is structurally weak. This is due to the State’s reluctance to support scientific research, as well as the lack of academic environment in Moroccan universities [24].

Universities have worked over the past few years to share a unique model of education for all students who do not meet the different requirements to meet the challenges of growing student numbers and the need for digital transformation. However, universities are still unable to determine the financial capacity required to meet these specific needs.

3. Result

The concept of agility was first announced as a management concept in 1991 by the Iacocca Institute of the University of Lehigh. Since the beginning of the notion, it has become increasingly applied in many industries both as a management practice and as a research subject.

Agility is the capability to respond rapidly to change in an uncertain and changing environment. On the other hand, agility is a way to create more change for the organization Agile methods focus on people, technique and processes while collaborating with stakeholders and adapting to change to take advantage of windows of opportunity. It is a model that allows organizations to use market knowledge and partnerships to exploit profitable opportunities in a volatile market. This idea was extended beyond the borders of the organization to include the stressed need for strategic alliances, knowledge transfer, information sharing, Alignment of Resource Capabilities and Effective Leadership Practices Agile management provides methods to respond quickly to changing conditions. [25][26]

We proposed the adoption of the agile approach to take advantage of the power of the agile approach because during the literature review we found that the existing one is not flexible enough to face the challenges of the Moroccan university. Agility will make it easier and faster to spend, adapt and act on change. For example, agile organizations, in general, have the ability to deliver lower manufacturing costs, increase market share, meet customer demands, enable the rapid introduction of new products and reduce/eliminate value-added activities and increase competitiveness. Thus, the agile organization is considered the winning strategy in the 21st century, as it helps organizations become market leaders in a highly competitive market with volatile stakeholder requirements.

The cost of agility can be associated with actions such as the purchase of flexible machines, efficient information systems for real-time information sharing, improved ability to meet sudden demand, additional staff to appropriately manage additional production volumes and reduced production time. This means that universities need to dedicate different sets of resources to maintain the high levels of flexibility and speed needed to be agile in order to proactively encounter unexpected external changes (A very good example: the COVID-19 pandemic).

On a practical level, the main operational problem is whether an organization, for example, can act quickly and correctly. With this in mind, IT systems and tools and associated organizational IT capabilities - for example, Business Intelligence - can help middle and senior managers to act quickly and more accurately. [25][26].

In this study, a 7-level process management model is proposed as shown in Figure 1 in managing the digital transformation process so that universities do not fall behind in the 4.0 trend. The DTO entity cover the management of the 7 processes and applies multi-criteria decision support methods while remaining agile to help the university face challenges and those that have benefited from agility.
3.1. The Office of Digital Transformation and Multi-Criteria Decision Support

The transfer is a program that consists of a set of projects that will require both macro-management under the direction of an empowered committee that we call the digital transformation office (DTO) and micro-management in the various processes. Its role is to govern and orchestrate the functioning of this whole and those by putting an adequate organization while remaining in tune with the policy and strategy of the university.

The DTO, managed both the digital program and prepared the current life and those by putting in place new processes and adapted the existing. Thus works in agile mode, because it will allow us to see the evolution of the program after each iteration, to set up a "tip" of the different projects that work. It makes it possible to prioritize real needs, digitalization is enriched according to our demands. And we realize a significant financial gain.

Each process and the team that manages it is interacting with the DTO, the latter’s responsibility is to send the input data to trigger the processes for example (the storage unit for the Number 1 process), then it will consolidate the output of the various processes involved, and then it will apply a multi-criteria decision support method adapted to make the right decision and choose the right solution while remaining agile and flexible.

3.2. Management of Physical Resources

This is an iterative process that begins with an analysis of material resource needs, taking into account current and future needs. Its progress is linked to the macro-planning defined by the DTO which has a vision on all the digitization projects and on the needs escalated by the different business lines.

Requests for changes can be expressed in two ways: DTO, which formulates the requirement under a specification that determines the preliminary quality data, for example: the storage, speed of the internet and the budget or the team responsible for managing the material resources that must share with the DTO the cost and the expected gain.
That said, it is necessary to separate the project mode or a well-defined schedule since the launch of the program, and the everyday life that is characterized by the appearance of new needs or new technologies, counter-budgetary that can impact the initial choices.

3.3. Business Intelligence and Data Warehouse Management

The objective of this process is to ensure the collection of data from the various sources to enable the emergence of clean, useful and relevant data for the appropriate analysis and decision-making needs. This process is synchronized with the first to ensure optimal technical choices and budget constraints. There are two approaches: either a competent team in this field that will take care of all the ETL phases (Extract, Transform, Load) or with the help of a provider. Also, another choice can be made between buying tools or renting/Cloud. In any case, synchronization with the DTO and the team that operates with in the first process is necessary.

As mentioned earlier, the choices will be made by the DTO by applying a multi-criteria decision support method to help the university cope with changes on the one hand (agility) and on the other hand to face challenges (budget for example). if we take the case of COVID 19 and its impact on Moroccan universities: cannot easily have reports that can help us make appropriate decisions for each category of students so that we can, for example, determine the cost and the necessary budget as soon as possible. will also be able to predict and anticipate the future, we can now begin to expand the digital culture of students and employees to be ready for anything unexpected.

3.4. Software Deployment Management

All software must produce data that will be put into the Data warehouse and, on the other hand, respect the hardware and infrastructure deployed. The objective is to ensure that existing software and those that will be deployed in the future respect all the constraints of the digitization project such as quality and budget.

Several possibilities are possible to be managed by this process: development via an internal team, outsourcing, renting or purchasing a solution.

This process will have to take into account the existing that is why in addition to the input data provided by the DTO, a general inventory and urbanization must be done in order to prepare the changes to be made in the form of Lots that can be spread over periods validated one by one (agility) and also a multi-criteria decision to prioritize software deployed or to replace .

3.5. Quality Learning Environment Management

It is a set of activities aimed at providing sufficient assurance that the digital services provided by the university meet the requirements and expectations. Any choices made in the first 3 processes must be approved by this process.

3.6. Managing Content Transformation Activities

Following the quality requirements, we go through this process to digitize the various traditional learning materials. This step will require the establishment of a team of key users/ key-users, people with the technical skills and the bare minimum of the learning ground, to help stakeholders during the digitization operation.

The role is very important because they will have an intermediate role between the IT teams and end users and will also take care of user training.

3.7. Managing Online Learning Processes

The objective is to define how we will ensure the adoption of new learning methods.

Technology is changing and learning methods too, so we have to make sure that the two remain in sync.
3.8. Help-DESK and Ramp-up

The aim is to restore services as quickly as possible without necessarily making them a perfect system. After restoring the service, root cause correction is performed by the Problem Management team during a sub-process called root cause analysis.

The primary priority of incident management is to ensure system restoration by overseeing and directing the university’s internal and external resources. Prompt restoration of a system as well as minimization of any impact to the user are priority on a long and intensive data collection for root cause investigation.

We anticipate facing cultural constraints and non-familiarization with digital in all actors. And those during and after the transfer, so it is necessary to have a helpdesk service in order to provide assistance and help with problem solving. And a crisis cell to prepare the degraded steps that will be used in the event of a service outage.

4. Conclusion and Discussion

The evolution of the telecommunications industry has played an important and key role in the digital transformation in the various fields and has enabled the trend towards 4.0. However, this change will not be possible overnight, it requires a strategic plan, which is spread over years, like that of the University of Geneva which was "initiated in 2015 and planned to finish 2025.

In order to help universities in their transitions, researchers like Aybek in 2017 and Ceren Cubukcu & Cemal Akturk in 2019 have already proposed models that despite their importance ,are not suitable for the Moroccan context where universities face various structural, budgetary or cultural constraints.

We noticed a lack of flexibility in these , which is why we proposed the adoption of the agile approach because it will allow to spend less, to adapt and to act more easily and quickly to the changes . Thus, we proposed in this work a new model that brings together a set of processes enabling the transfer to University 4.0, adapted to the context of H2C University, and applying an agile approach .

The limit of this work is that it does not count if the cultures of the universities are «ready» for such drastic changes as the Agile culture requires. Trust, flexibility, and uncertainty are variables that may be inconsistent with a university’s values. And yet it is these elements that make the success of Agile approaches. We were studying this problem in our future work.

It is clear that digital transformation in large part is the responsibility of universities that seek to transfer to 4.0 except that following the health situation due to COVID-19 we have noticed that this reality has limits when the main interlocutors do not have the means or the telecommunications infrastructure to track and adapt to the prerequisites of the digital age: connectivity is one of the indispensable components. So the question that arises and to which we have no answer is how can universities succeed in their transformation in such and such a condition? This question could also be a starting point for further research and work on the political and social issues of digitalization.

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