

Model for managing an electronic curriculum at a university 4.0**Modelo para la gestión de un curriculum electrónico en una universidad 4.0**

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Abstract

With the fourth industrial revolution, the paradigm of the intelligent university was born. An innovative pillar is, in the teaching function, the intelligent curriculum. This curriculum is student-centered and requires continuous labor market screening. This paper proposes a model for intelligent management in a university 4.0 This model is based on the standard IT4IT and the Electronic institution development environment framework in multiagent systems, the model meets the stated objectives.

Smart University, University 4.0, Smart Curriculum

Resumen

Con la cuarta revolución industrial se generó el paradigma de la universidad inteligente. Un pilar innovador es, en la función docencia, el curriculum inteligente. Este curriculum está centrado en el estudiante y requiere una detección continua del mercado laboral. En este trabajo se propone un modelo para la gestión inteligente en una universidad 4.0 este modelo se basa en el estándar IT4IT y en el marco de trabajo Electronic institution development environment framework en sistemas multiagente, el modelo cumple con los objetivos marcados.

Universidad Inteligente, Universidad 4.0, Curriculum inteligente

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Introduction

Antecedents

In the sixties of the last century, the Third Industrial Revolution began. This was caused by the incorporation of computer systems into organizations [1]. Beginning in the 1990s of the 20th century, with the arrival of a disruptive technology, known as the Internet, the interactions between the organizations move from a local environment to a global one. This type of organization is known as digital organizations.

The Smart Organization

In 1999, Choo published his book “The Smart Organization” [2]. This document states that an organization continuously perceives information from its processes, generates knowledge, and modifies its procedures. This knowledge is based on the experiences of your inner environment. Since the fourth industrial revolution [3] the concept of intelligent organization was expanded. Now the perception is also to their external environment. That means generating knowledge about future trends in your area of competence, the latter means that smart organization must have a strong component of disruptive innovation. These types of organizations are now known as smart organizations.

Section II will study the concept of a smart university or university 4.0. Section III will study the IT4IT regulations and the EIDE framework based on multiagent systems for the development of a smart organization. Section IV will develop the model for the management of a smart curriculum for a University 4.0.

The Smart University

The University is an organization that forms the human resources that society demands and generates knowledge for the development of new technologies, so the role is fundamental to the Third Industrial Revolution. It is known as Digital University, from the Internet, it makes use of social technologies (So), Mobile (Mo) and in the cloud (Clo) [4]. This changed the structures of teaching and the way in which research activities are carried out in a global environment.

With the advent of smart organization, digital university is becoming a smart university. This smart university will revolutionize the three substantive functions of a university: Teaching, research and extension. Only the management of the smart curriculum will be presented in this paper [5]. A model will be proposed for the management of the smart curriculum that allows the perception of information from the external environment and the generation of knowledge for strategic decision-making in the university.

The smart university is being characterized by being student-centered. The main pillars are: Flexible curricula that meet the needs of the student according to the outdoor environment. This will involve new degrees. Each student will have his or her academic training in a personalized manner. The tool that will enable the management of such a teaching system is distributed artificial intelligence (multiagent system).

Standardization and framework

The IT4IT Standard

The Open Group consortium published, in 2016, the IT4IT Reference Architecture standard, Version 2.1 Technical Standard [6], is a standard for managing business models with information technology. This standard is based on the Porter value chain, four stages are defined in the primary activities. The IT value chain is grouped into two main categories of activities:

- Primary activities, which deal with the production or supply of goods or services for which a business function, such as IT, is directly responsible.
- Activities, which facilitate the efficiency and effectiveness of primary support activities.

IT value chain content details the series of activities that each IT department performs that add value to a business service or IT service.

The functional components in the IT value chain are grouped into four IT value streams and five supporting activities, as follows.

The primary value streams for the IT value chain are:

- Strategy to Portfolio, S2P.
- Requirement to Deploy, R2D.
- Request to Fulfill, R2F.
- Detect to Correct, D2C.

Core activities are at the heart of the IT function and play a vital role in helping to comprehensively execute the entire lifecycle. These are usually organized within it.

The activities in support of the IT value chain are:

- Governance Risk and Compliance.
- Sourcing and Vendor.
- Reporting.
- Finance and Assets.
- Resource and Project.

This standard defines the value streams, functional components, and associated data objects that are critical to the service lifecycle.

The primary value streams in this standard are as follows:

Portfolio Strategy

This flow of value establishes the strategy of the services required by the organization, both for internal users and external users. The product of this value flows The conceptual plan of the organization.

Requirement to Deploy

This value flow corresponds to the tactical part, defines the logical services to meet the organization's objectives. The product of this value flow is the Logical Plan for Services.

Request to Comply

This value stream consists of the operational part. This value stream refers to the implementation of the infrastructure for logical services interoperability. The product of this value stream is the Operational Plan of the organization's infrastructure.

Detection for Correction

This flow of value consists in the detection of the operation and the detection to generate knowledge and contribute to decision-making by the strategic part. Figure 1 shows the outline of this standard with the four value flows.

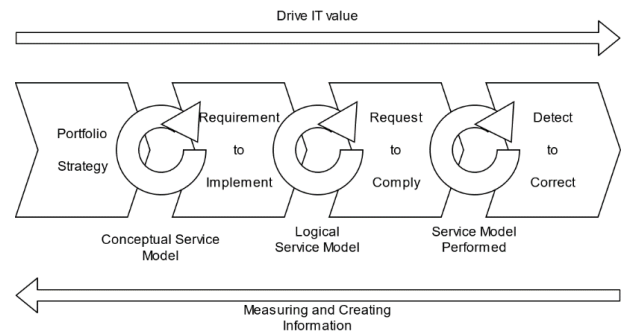


Figure 1 Description of the IT4IT standard

Electronic institution development environment framework

Distributed artificial intelligence consists basically of multi-agent systems, an agent is software with properties of being autonomous, proactive, reactive and social. A multi-agent system consists of a collection of agents that behave like a human organization. This in a multi-agent system requires learning, negotiation, and communication processes between agents to achieve the goal of the multi-agent system. Another feature of multi-agent systems is the inclusion of standards of conduct to regulate the overall behavior of the multi-agent system.

High-level work frameworks exist for the design, implementation and simulation of a multi-agent system, i.e. they have user-friendly graphical interfaces. The proposed Electronic Institution Development Environment Framework (EIDE) [7] consists of four programs: ISLANDER, aBUILDER, AMELI and SIMDEI. The EIDE is composed of:

- ISLANDER. A graphical tool that supports the specification of rules and protocols in an electronic institution.
- SIMDEI. Simulation tool to analyze and verify the specifications developed in ISLANDER.
- AGENT BUILDER. Agent development tool.

- AMELI. Software platform to run e-institutions.

Figure 2 marks the relationships between these four components.

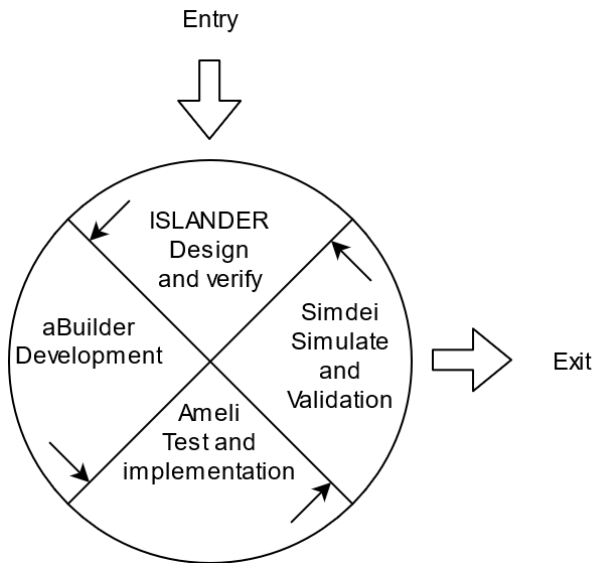


Figure 2 Understanding the EIDE Framework

Development of a model for the management of an intelligent curriculum

As mentioned above, with the Third Industrial Revolution the traditional university underwent a transformation giving way to the concept of an intelligent university. This type of university was possible with the emergence of innovative technology such as the Internet [8]. Later, the incorporation of disruptive technologies such as social media, mobile device communication over the Internet, and cloud computing. These technologies impacted teaching-learning processes. This led to distance education. On the other hand, traditional degrees remain with a rigid curriculum with little student participation. Figure 3 shows a model based on the value chain for the teaching function.

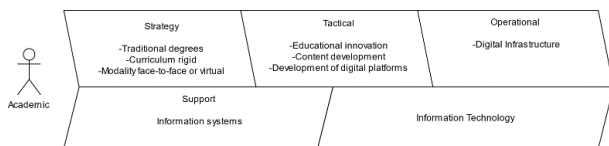


Figure 3 Teaching model for a Digital University

It can be said that this teaching model the curriculum is fixed and established in most cases by university academics without considering the external environment. Nor are the student's competencies and skills considered, school control is simple, since it is the same for a given degree, giving rise to the electronic school record for each student.

With the Fourth Industrial Revolution the concept of digital university became the concept of smart university. This new paradigm is at a turning point on the path to the universities of the future, innovation now plays a key role in all university tasks such as teaching, research and extension. Figure 4 shows a case model for the intelligent transformation of a 4.0 university.

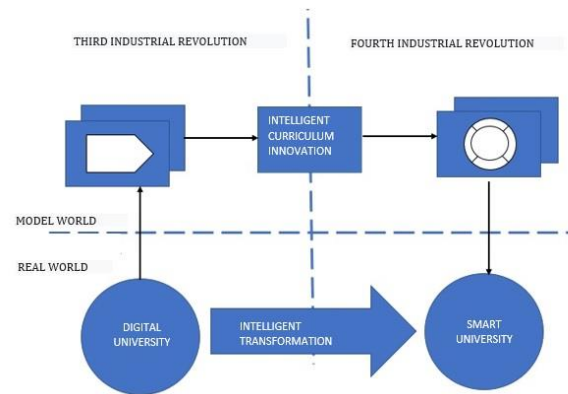


Figure 4 Transformation to the university 4.0.

A disruptive innovation in teaching function is what has been called intelligent curriculum. This curriculum is focused on the student and the outside environment. That is, in the competencies and skills of the student that allow a free choice over his/her content path in the curriculum. this type of curriculum must also maintain a permanent detection of changes in labor markets. As a result, the electronic school record is unique to each student which requires efficient management for the administration of his or her school record.

Innovation is also carried out at the level of teaching/learning processes for the offer of courses in the distance modality in an efficient way.

A proposed model for the management of the intelligent curriculum for a university 4.0 starts from the following considerations:

1. The student-centered model.
2. Developing a smart curriculum (each university will determine the type of curriculum).
3. The management of the electronic school record individually for each student.
4. Consideration of an information technology standard.

5. The development of the model will be with a framework for distributed artificial intelligence.

The model based on the IT4IT standard of The Open Group mentioned above and the Electronic Institution Development Environment described in a previous paragraph is shown below.

Figure 5 shows the complete model.

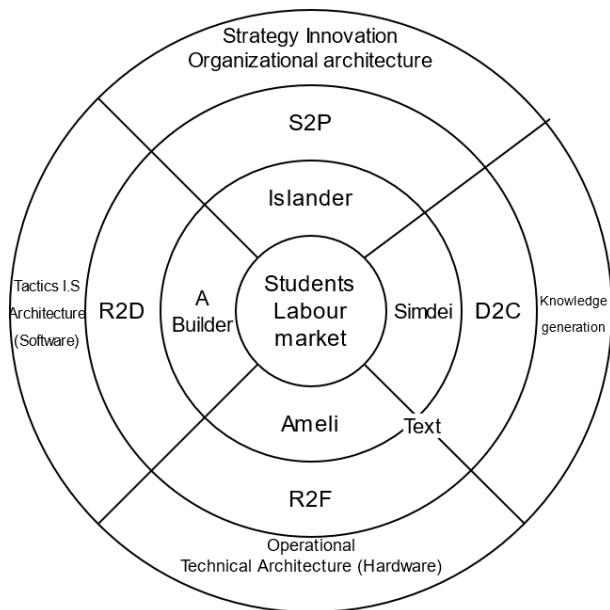


Figure 5 Complete model of a university 4.0

This model is student-centered, allowing you to make the most of your skills and competencies. As the figure shows, this model is now a circle of value, allowing a permanent perception of the external environment (labor market).

This model uses the tool of distributed artificial intelligence to achieve curriculum management by collaborating with all the processes involved.

Conclusions

The general objective of this work was to propose a model for the management of a smart curriculum in a 4.0 university under the IT4IT standard and a working environment based on multi-agent systems. This work met the goal set completely. As a future work, this model is being implemented with the framework already mentioned to achieve verification and validation of it.

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