Maturity model for digital teacher transformation based on digital and organizational competencies in higher education

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Abstract. The mastery of the computer tools by teachers and the application of technological solutions to digitalize the academic and administrative activities of higher education have led to the creation of these institutions with strategic objectives that allow a digital transformation. To solve this problem, a maturity model was developed for the digital teaching transformation that measures 2 aspects: the digital culture and the organizational culture, both aspects were integrated to create a model in which the teacher was classified into four profiles: anonymous teacher, Alpha teacher, beta teacher and gold teacher, this will allow us to know what kind of teachers we have and what strategies are necessary to obtain gold teachers and achieve the necessary digital transformation for educational institutions. To validate our model, it was applied to a public university where the level of maturity of the teachers was evidenced and strategies were established that allowed us to lead to gold-type teachers.

Keywords: Digital transformation, higher education, digital culture, organizational culture

1 Introduction

Teachers today are aware that they need to master technological tools that support both their work as trainers (teaching - learning process) and their work as researchers (knowledge generators), both important aspects to achieve digital transformation in universities

But we observe that a large percentage of university teachers do not dominate, nor are they updated in the use of technological tools that allow new ways of doing things for the benefit of students and the professional development of the teachers themselves. In addition, in public universities we find a lack of institutional identification, political

interests that do not allow us to be part of the change, even becoming an obstacle to change.

It is clear that the digital transformation depends on people, so it is required as indicated by Roca and Salvatella [1] "insert the digital chip in the organization's DNA", Llorens F. [2] He states that "numerous studies show that the main obstacle is the resistance to change of people working in organizations. You have to prepare and train to assume the change to the extent that is beneficial and that brings value to universities".

The purpose of this study is to provide a maturity model for digital teacher transformation in university higher education in order to generate the commitment of teachers, where it is not only necessary to have digital skills for digital transformation but have the attitude and willingness to collaborate and be committed to the institution.

2   State of the Art

The accelerated increase in emerging technologies revolutionizes the way in which we manipulate digital resources and information moves to a virtualization plane, which is why in this 21st century we live in a world of information digitalization, even as mentioned Trujillo J. [3] It is to move from the information society to the knowledge society, and higher education is not far from being integrated into this digital transformation that allows it to take on new challenges. As Barquín J. [4] mentions, most teachers are aware of this change and believe that the future is through the use of electronic media, but the way to manage knowledge instruct and educate in and with the media is yet to be written, and the most complicated of all is that it needs to be adapted and "adopted" by teachers

We also assume what they mention Cela-Ranilla, J. *et al.* [5] that digital competencies have numerous definitions, indicating that it must consist of four basic components: basic digital skills that are expressed successively, didactic competence with ICT, learning strategies and digital training or training.

According to Levano-Francia, L. *et al*. [6] the universities must urgently make transformations of an academic, organizational, humanistic and scientific nature, which allows them to face the new digital landscape that flourishes daily.

In addition, this together with the organizational competences based on institutional identification, soft skills and the organizational climate, allow us to focus on proposing a Maturity Model that integrates both aspects evaluated.

3   Proposal

Universities like all types of organizations are not oblivious to digital change and technological innovations, which is why our proposal focuses on defining the characteristics of one of the important actors of the university such as the teacher; whose work as agent of change it is vital to achieve digital transformation.
The proposal is seen under two approaches: digital culture and organizational culture, which allows a significant change in the way in which teachers carry out their academic

activities, as well as in their behavior and in the way they interact with others inside and outside. From the university, with the purpose of moving towards a digital university.

According to a study conducted by Boston Consulting Group [7] In 2018, approximately 40 digital transformations were evaluated, it was obtained that the proportion of companies that reported strong financial performance was five times higher (90%) among those that focused on culture than among those who neglected culture (17%), that is why digital culture is considered as a fundamental part of our proposal.

On the other hand, Capgemini Digital Transformation Institute [8], in The Digital Culture Journey: All On Board !, made a study where the urgency of systematically promoting the transformation of the organization's culture to align it to its business model with digital vision is evident, so we also integrate the culture organizational in our proposal. See Figure 1.
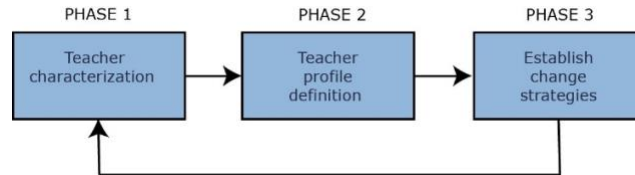

Fig. 1. Methodology

Phase 1: Teacher characterization

It is based on the degree of mastery of information technologies (digital culture) and its commitment to the institution (organizational culture) for which the maturity levels are proposed, which will allow us to classify them later into 4 profiles. Regarding the organizational culture, the levels of: indifferent, interested, involved and committed are described, described in Table 1. The maturity model of organizational culture takes into account 3 dimensions: Institutional Identification, Soft Skills and Organizational Climate.

Table 1: Description of the level of maturity of the organizational culture

Level of maturity of the organizational culture	Description
Indifferent	Doesn't know the vision and mission of the university Doesn't know the statute and regulations of the university Doesn't identify with your institution Doesn't maintain permanent communication with the members and authorities of its institution Doesn't handle soft skills Resists change
Interested	Knows the mission and vision of the university Knows in a basic way the Statute and Regulations of the university Participates only in some of the meetings or events scheduled at the university

		Communicates occasionally with the members and authorities of the Institution Handle some soft skills
	Involved	Knows the mission and vision of the university Knows the Statute and Regulations of the university Participates only in some of the meetings or events scheduled at the university Communicates regularly with the members and authorities of the Institution Manages soft skills at the elementary level
	Committed	Knows and internalize the mission, vision of the university Knows and internalize the statute and regulations of the university. Identifies with the Institution Communicates permanently with the members and authorities of the institution Participates in scheduled meetings and events Master the relevant soft skills Is willing to change

The score that determines the level of teacher maturity in terms of organizational culture is explained in Table 2, defined based on the 15-item instrument with a score per item of 0 to 4 points.

Table 2: Maturity level score of the organizational culture

Maturity level of organizational culture	Score Model
Indifferent	From 0 to 15
Interested	From 16 to 29
Involved	From 30 to 44
Committed	From 45 to 60

Regarding the digital culture, the levels are defined: primitive, basic, intermediate and advanced, based on the 3 dimensions: Use of Technology, Digital Competence and Communication and Internet, as described in Table 3, and in Table 4 the score set to determine the level of maturity is defined considering the 17-item instrument, where each item has a rating of 0 to 4 points.

Table 3: Description of the level of maturity of the digital culture

Level of maturity of the digital culture	Description
Primitive	Influenced to acquire technology Prefers printed information Doesn't handle office tools Doesn't use internet Doesn't use mobile devices Communicates opt for traditional means such as telephone
Basic	Frequent use of internet Office Domain Use the internet as a source of information Use of mobile applications Frequent use of social networks

Intermediate	Cares about digital security Makes payment for services online Makes transactions online Digital self-taught Has a YouTube channel
Advanced	Browse more safely without being a victim of digital crimes Protect your identity and information They are fully digital and mobile, multitasking and multiscreen The mobile phone is the center of your communication and information They have become, without intending to, influencers of their environment and their family Permanent Internet connection Little verbal communication

Table 4: Maturity level score of the digital culture

Maturity level of digital culture	Score Model
Primitive	From 0 to 17
Basic	From 18 to 34
Intermediate	From 35 to 51
Advanced	From 52 to 68

To determine the level of maturity both digital and organizational, the following formulas are applied:

- For the calculation of the Score in each Dimension:

$$Score_{Dimension} = \frac{\sum_{i=1}^{n} Score_{criteria}}{n} \qquad (1)$$

- For the calculation of the Model Score (both digital and organizational):

$$Score_{Model} = \frac{\sum_{j=1}^{nd} Score_{Dimension}}{nd} \qquad (2)$$

$$n = number\ of\ criteria\ of\ dimension$$
$$nd = number\ of\ dimensions$$

Phase 2: Definition of the Teaching Profile

Our model integrates the organizational culture and the digital culture, considering that a teacher not only has the mastery of technology but also is committed to the strategic institutional objectives to achieve the true digital transformation of the university.

This model determines 4 profiles: the anonymous teacher, the beta teacher, the alpha teacher and the gold teacher, as shown in Figure 2 and whose characteristics are described in Table 5.
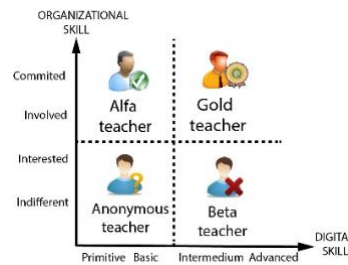

Fig. 2. Teaching digital transformation model

Table 5: University teacher maturity level

Type of teacher	Description
Anonymous	This teacher has low knowledge in the use of technology so their digital skills are basic or nil, also the internet communication applied to educational management is incipient. Regarding the organizational culture, it has no institutional identification, it does not show soft skills, and so it is indifferent in improving the work environment.
Beta	This teacher has a great capacity in the use of technologies, showing digital competences and great communication through interconnected devices, but little institutional identification, not showing soft skills and little participation in the organizational environment.
Alpha	This teacher has almost no capacity for technology management, low digital skills and little use of digital media for teaching - learning and content generation. Regarding its organizational culture, it presents a great institutional identification, active participation in activities to achieve strategic objectives.
Gold	This type of teacher is essential in the institution, shows a management of information and communications technologies, showing great digital competences, also, is deeply rooted with its institution and has an active participation in improving the quality of the work environment.

Table 6 identifies for each type of teacher what characteristics must comply, based on the dimensions that make up the digital and organizational culture.

Table 6: Identification of characteristics by type of university teacher

TEACHER	DIGITAL CULTURE			ORGANIZATIONAL CULTURE		
	Use of technology	Digital skills	Communication and internet	Institutional Identification	Soft skills	Organizational climate
Anonymous	X	X	X	X	X	X
Alpha	X	X	X	✔	✔	✔
Beta	✔	✔	✔	X	X	X
Gold	✔	✔	✔	✔	✔	✔

Phase 3: Establish change strategies

As part of the model, strategies have been established to change the level of teacher maturity as shown in Figure 3.
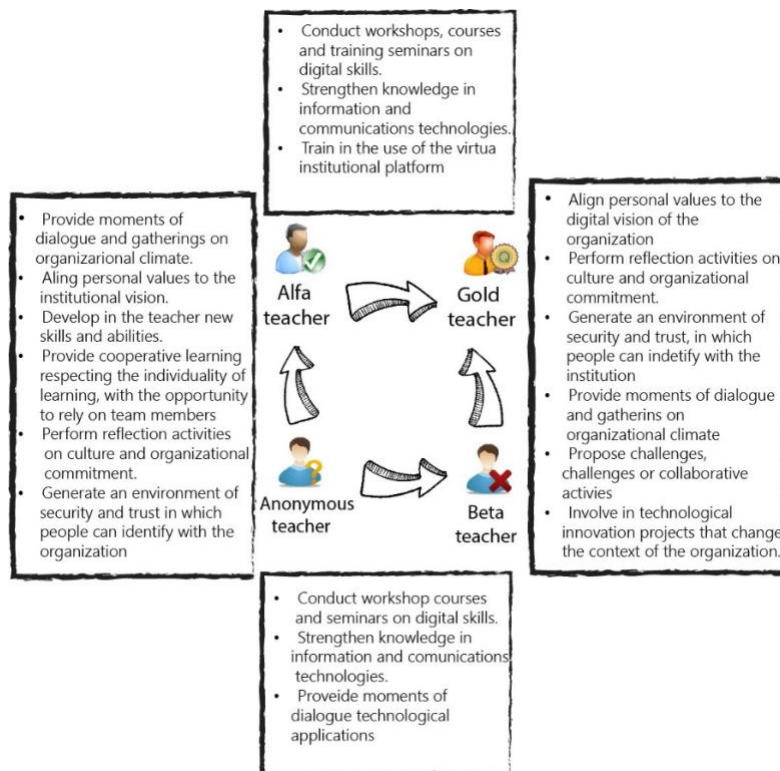
Fig. 3. Digital and organizational change strategies

4 Validation

The present investigation takes as a case study the teachers of a faculty in a Peruvian public university, where two surveys were applied, structured in two aspects to determine the level of maturity of the organizational culture and the digital culture.

In both cases the numerical measurement scale was used, considering the current level of organization (1 = never, 2 = almost never, 3 = occasionally, 4 = almost always, 5 = always).

The instruments used were validated by experts. In both cases, statistical analyzes and appropriate tests were carried out that allowed us to obtain validity and reliability results of the two instruments (Cronbach's Digital Culture Alpha = 0.800 and Cronbach's Organizational Culture Alpha = 0.812) concluding that they are reliable instruments.

The statistical treatment of the data obtained through the survey was carried out with the statistical program SPSS v24.0.

Phase 1: Teacher characterization

Regarding the organizational culture, the instrument consists of 15 questions divided into three dimensions: 5 of Institutional Identification, 6 of Soft Skills and 4 of Organizational Climate.

It was applied to 131 teachers of different age, sex and professional school, both before and after applying the digital and organizational change strategies defined in our proposal.

Table 7: Maturity level results based on organizational culture

Maturity level of organizational culture	BEFORE		AFTER	
	N° of interviewed people	Percentage (%)	N° of interviewed people	Percentage (%)
Indifferent	5	3.82%	0	0.0%
Interested	76	58.02%	38	29.01%
Involved	38	29.01%	67	51.15%
Committed	12	9.16%	26	19.85%
TOTAL	**131**	**100.00%**	**131**	**100.00%**

It is evident in Table 7, that initially 58.02% have a level of organizational maturity **interested** and after applying the strategies of organizational change 51.15% of the respondents are **involved** organizationally, but being our goal to achieve in the short term that they are committed, since this will allow us to achieve the digital teaching transformation.

Regarding the digital culture, it was structured in 17 questions divided into three dimensions as follows: 5 of Use Technology, 7 of Digital Competencies and 5 of Communication and Internet, obtaining the following results:

Table 8: Maturity level results based on digital culture

Maturity level of digital culture	BEFORE		AFTER	
	N° of interviewed people	Percentage (%)	N° of interviewed people	Percentage (%)
Primitive	6	4.58%	2	1.53%
Basic	63	48.09%	14	10.69%
Intermediate	41	31.30%	88	67.18%
Advanced	21	16.03%	27	20.61%
TOTAL	**131**	**100.00%**	**131**	**100.00%**

It is observed that as regards the digital culture in the faculty 48.09% of the teachers have a Basic digital maturity level and after the application of the digital change strategies it was evidenced that 67.18% of the teachers managed to reach a level of **Intermediate** maturity.

Phase 2: Definition of the Teaching Profile
In the integral model it is visualized that 61% of teachers are anonymous (See Figure 4), that is, in digital their level is mainly basic and in the organizational they are only

interested and only 8% are gold teachers, so that after applying the strategies of digital and organizational change, proposed in phase 3, a significant change is evidenced by reaching 15% of gold teachers and reducing anonymous teachers to 32%.

Phase 3: Establish change strategies

The objective is that our teachers are located in the profile of gold teacher, so the strategies of digital and organizational change were applied, which must be carried out continuously, with a permanent follow-up and monitoring by the corresponding instances to achieve sustainability of the proposed model.
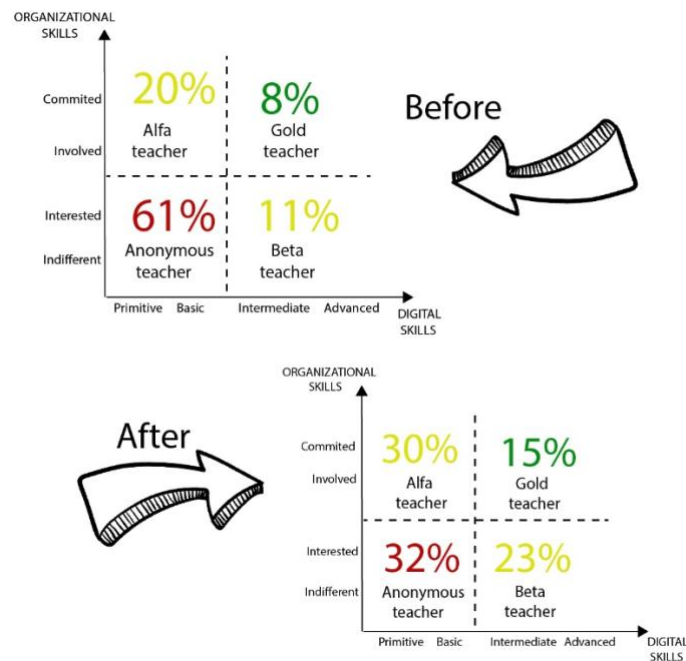

Fig. 4. Result of the application of the proposed model

5 Conclusions

- The instruments developed were useful to know the level of digital and organizational culture of the institution.
- The proposed maturity levels, both digitally and organizationally, served to classify teachers for a better analysis.
- The integration of the two dimensions allowed us to define types of teachers (anonymous, alpha, beta and gold) to establish continuous improvement strategies to achieve digital transformation.

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