

# Digital Transformation in Higher Education Institutions: A Systematic Literature Review

## Group 9

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# **This paper are structured as follows:**

- **Introduction** section makes out the current SLR related to the DT in HEIs, defining the objectives and the research questions.
- **Methodology** section, the authors state the protocol followed, the process for extracting the relevant data, and describe results of the data extracted process.
- **The Discussion** section offers a debate in order to answer the research questions.
- **The Risk and Validity** section presents the risks intrinsic in the SLR.
- **Finally, in Conclusions** section, inferences are described.

(21B6028)

# Introduction

Digital transformation (DT) has become a priority for higher education institutions (HEIs) in this second decade of the 21st century, and this is a natural and necessary process for organizations that claim to be leaders of change and be highly competitive in their domain. If HEIs want to persist in time as a key element of this transformation, and not disappear from the stage, it is necessary that they evolve integrally.

**Remarkably, HEIs face a disruptive scenario that is established in the new business models, ostensibly transforming the way they evolved over time, actively linking internal and external clients, and increasing their commitment and strengthening their experience in the organization**

**Nevertheless, many universities are developing specific digital strategies in reaction to the massive shift towards using new technology, yet lack the vision, capability, or commitment to implement them effectively**

**It was used PICO criteria (population, intervention, comparison, outcomes) to identify keywords and defined search strings from research questions.**

**Population: HEIs.**

**Intervention: DT processes at HEIs.**

**Comparison: In this study no comparison intervention has been projected.**

**Outcomes: Distinctive characteristics of the DT implementation process that have taken place in the HEIs.**

# Methodology

## Data Sources:

The search was carried out through the electronic databases Web of Science (WoS), and Scopus, as they are the most relevant scientific information platforms that access the scientific databases and the most significant publications of the different areas of knowledge.

# Search Strategy

One of the most subtle, but relevant moments of an SLR is the structured search strategy, because it must allow filtering the information available in the databases, so that the selected articles will respond to the questions raised in the investigation, and consequently the stated objective will be fulfilled. The search strategy must allow the completeness of the search to be assessed [8]. In response to this requisite, the words contained in the search strategy, the keywords considered in the PICO model,



# Study Selection Process

Studies were selected according to the criteria outlined below: Sensors 2020, 20, 3291 4 of 22 Study designs: We included studies where it could be identified which dimensions of HEIs have been permeated by digital transformation, who has intervened in these processes, their methodology, technologies adopted, among others. Taking into account the suggestion given by [7] using PICO criteria, to identify keywords and defined search strings from the research question:

**Population:** HEIs.

**Intervention:** DT processes at HEIs.

**Comparison:** In this study no comparison intervention was projected.

**Outcomes:** Distinctive characteristics of DT implementation processes that took place in the HEIs.

**Timing:** Between 1980 and April 2019 was selected for inclusion, because the year 1983 is considered as a starting point recognizing the birth of the Internet as one of the foundations of DT.

**Setting:** Restrictions by document type, articles and conference proceedings were analyzed.

**Language:** Articles reported in English in order to avoid bias, by recognizing this language as the universal language.



## 2.4 Study Quality Assessment

Study selection criteria:

- ⬡ Eligibility Criteria
- ⬡ Inclusion/Exclusion Criteria

# Eligibility Criteria

- First, article included in its title the “digital transformation” sequence words AND, and second, articles included in its abstract the “digital transformation” sequence words AND, either HEIs or university.
- It was marked with number 1, if the word appeared, and marked with number 0, if it did not.

# Inclusion/Exclusion Criteria

Questions define the inclusion/exclusion of articles for reading and analysis. The questions have been classified in the following categories:

1. Study design. Articles that the objective and the process of the DT that was carried out inside the HEI.

- ⬡ Are all research questions answered adequately?

- ⬡ Are the main goals of the DT at HEIs stated?

2. System design. Articles that show the dimensions, participants, and/or their relationships in processes of DT of HEIs.

- ⬡ Does the proposed DT apply to the whole HEI?

- ⬡ Were all model construction methods to apply DT in HEIs fully defined?

## 2.5 DATA EXTRACTION



The diagram features a blue background with a network of white lines and hexagonal nodes. Two red arrows point from the main title to two sub-topics. The sub-topics are enclosed in white boxes with black borders. The background also includes several small grey speech bubbles containing binary code (011, 010, 001, 100).

**Design of Data  
Extraction Forms**

**Data Extraction  
Procedures**

**(21B6021)**

## 2.5.1 Design of Data Extraction Forms

- ❖ Mendeley and Microsoft Excel were the software used to manage data , analyze articles and the reference manager.



# Uses of Mendeley

- ❖ Manage the articles from the search in the databases
- ❖ Eliminate duplicate references
- ❖ Classify the information from each article by underlining with different color according to the category

# Uses of Excel

To document and manage  
data from the following  
protocol.

## 2.5.2 Data Extraction Procedures

3 Stages :

1. Information analysis
2. Classification of Information
3. Information Extraction

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# Information analysis

- For further detailed analysis and classification are done by, the text fragments that are highlighted with different colors using the Mendeley tool.

# Classification of Information

- ◈ Label codes to assign meaning to the highlighted information, synchronously with the Information Analysis stage

# Information Extraction

- ⬡ The text fragments that were highlighted from the first stage were classified according to the codes established in the Classification stage. This requires spreadsheet to manage the result of this stage.



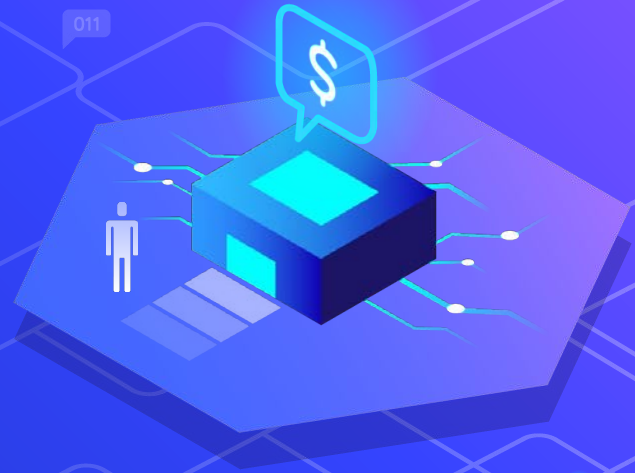
## 2.6 Data Synthesis

The data is tabulated and displayed to represent :

- ⬡ Different DT in HEIs definitions is presented in the articles
- ⬡ Dimensions within a HEI that have established the DT or have been forced to intervene in DT process

# 3. Results

(21B6011)



# Results

- ⬡ Included and Excluded studies.
- ⬡ How has the DT of HEIs been addressed
- ⬡ Interrelationships inside DT of HEIs
- ⬡ DT of HEIs Addressed by Actors

**Table 3.** Records obtained.

Criteria	Filters	Scopus	Web of Science (WoS)
Restriction	Topic (title, abstract, author keywords)	129	31
Period	2001–2019. The first article published in WoS was in 2001 1980–2019 Scopus	128	30
Document type	Articles and conference proceedings	107	30
Language	English	100	19
Total		119	

Scopus: A bibliography database containing abstracts and citation for academic journal articles

Bibliography: A list of the books of a specific author or publisher or on a specific subject

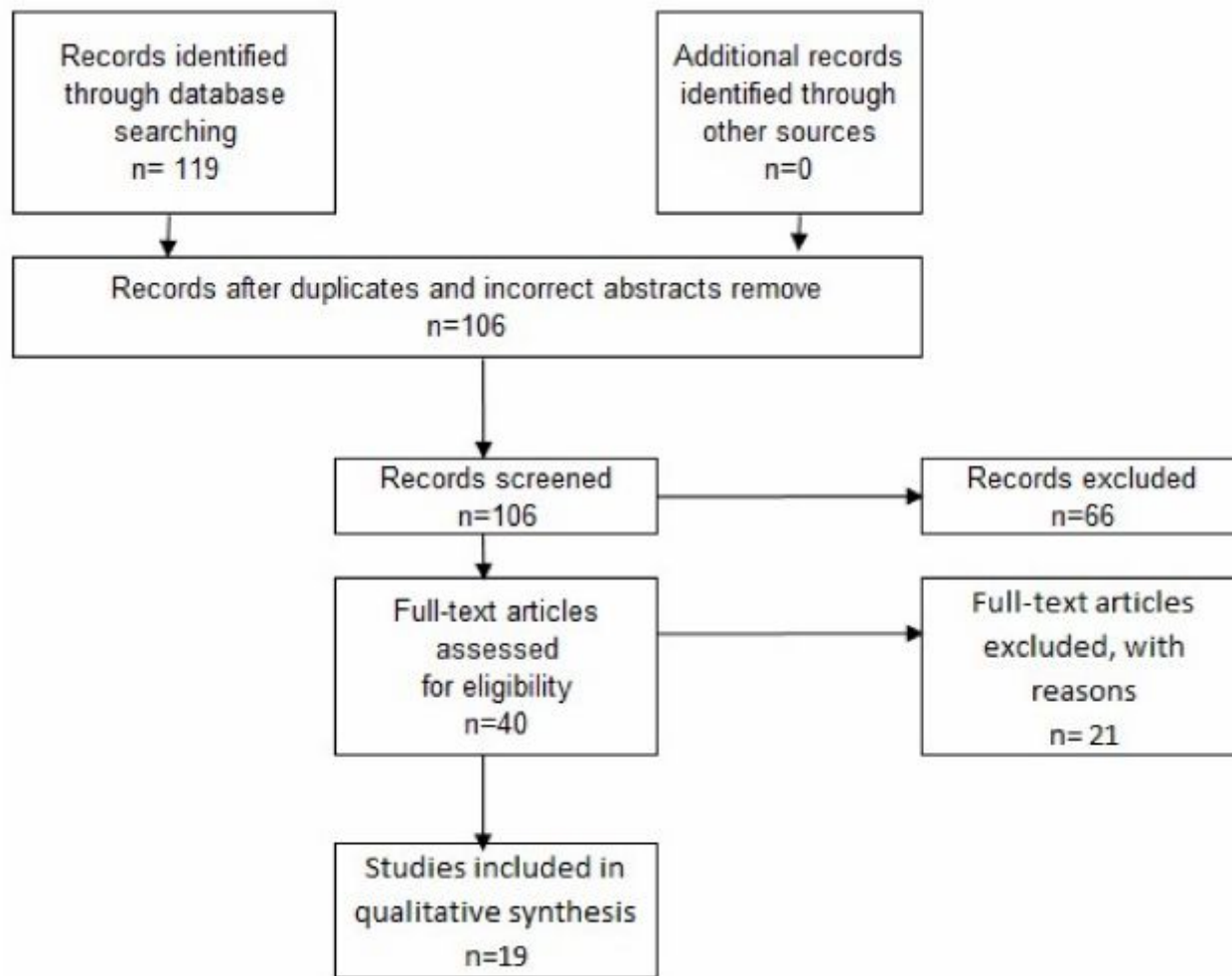
WoS: A website that provide subscription-based access to multiple database that provide comprehensive citation data for many academic disciplines

**Table 4.** Number of elected papers.

Criteria	Papers
Articles Elected	40
Excluded articles	21

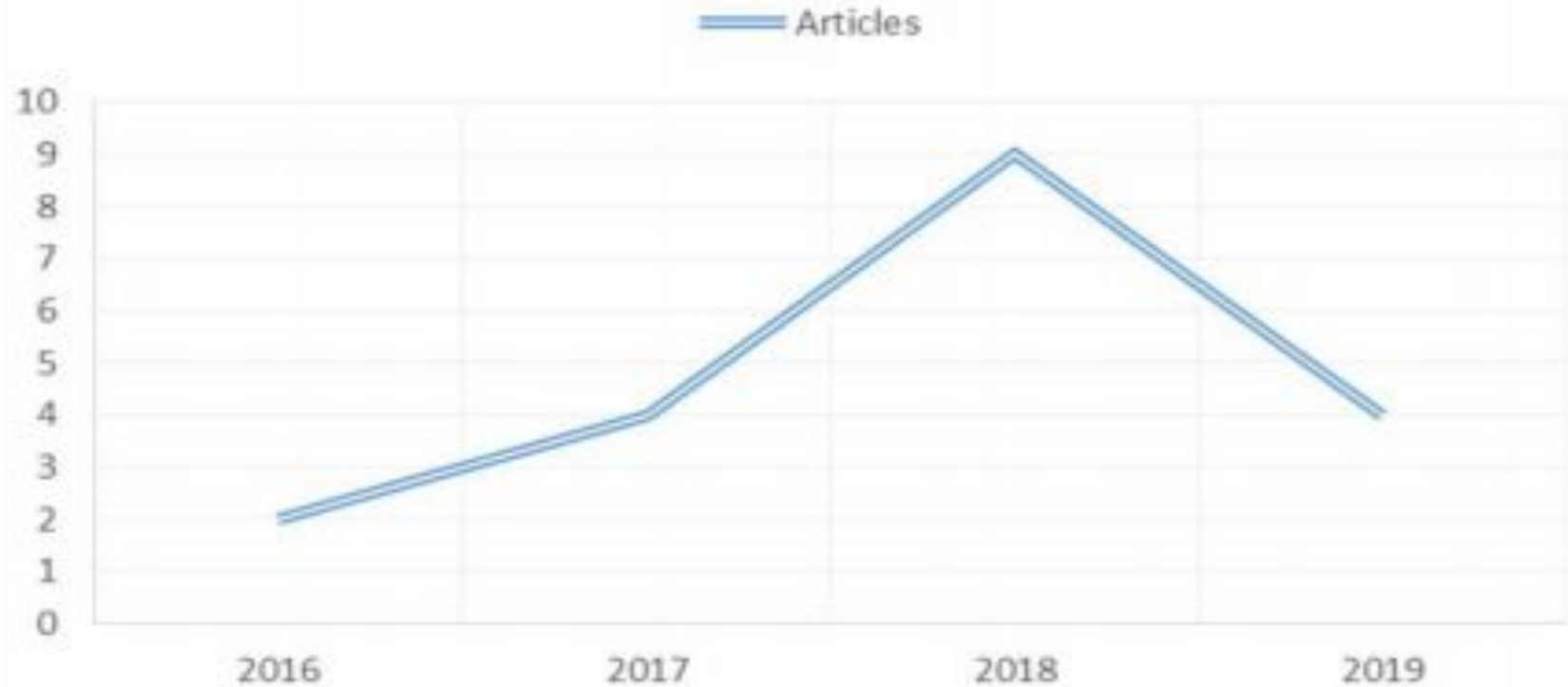
**Table 5.** Full reading papers included.

Criteria	Papers
Full reading papers	19
Excluded articles	21





## PUBLICATIONS DISTRIBUTION



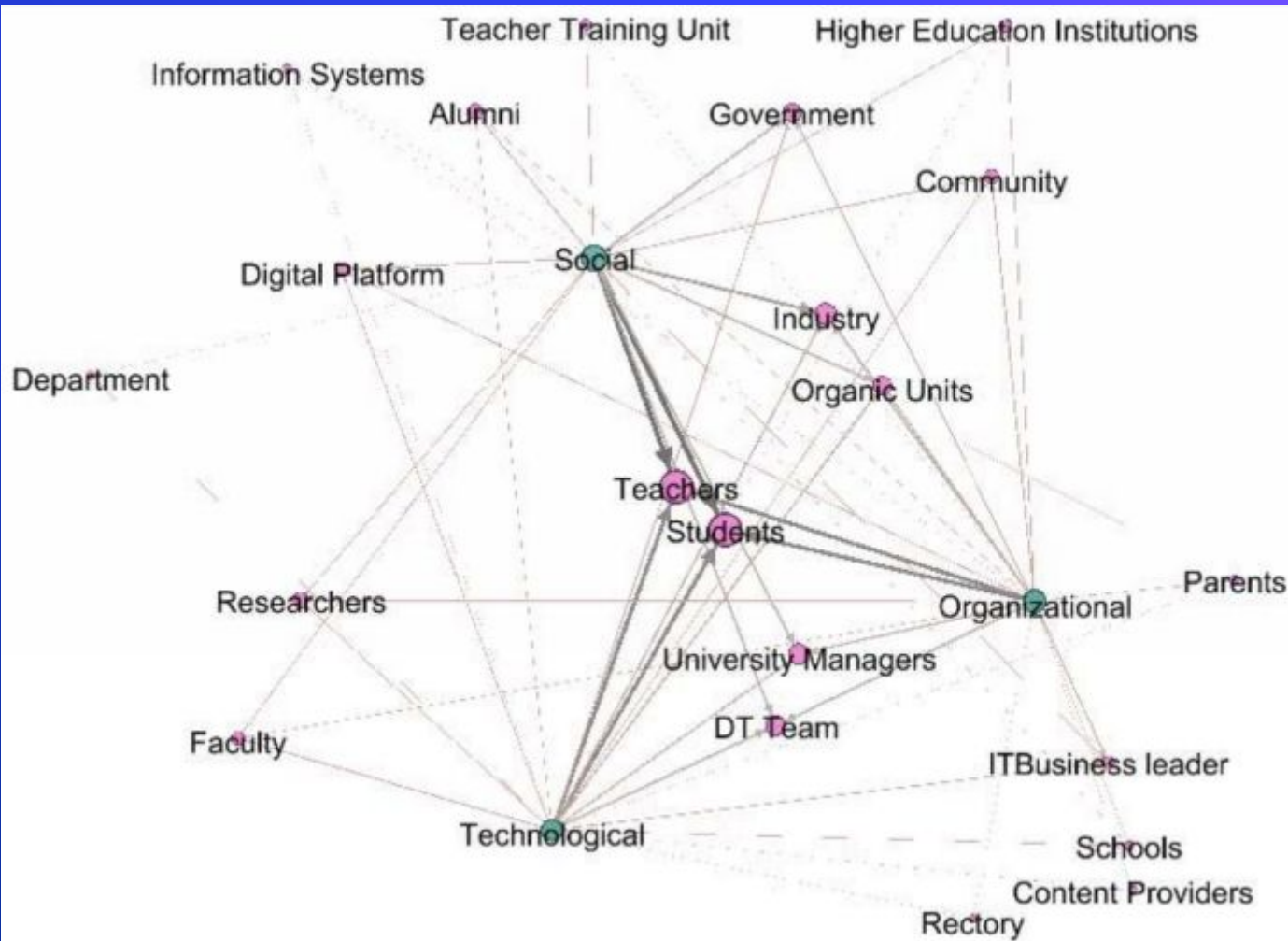
## RESEARCH IN DIGITAL TRANSFORMATION IN HEI



## DT Dimensions

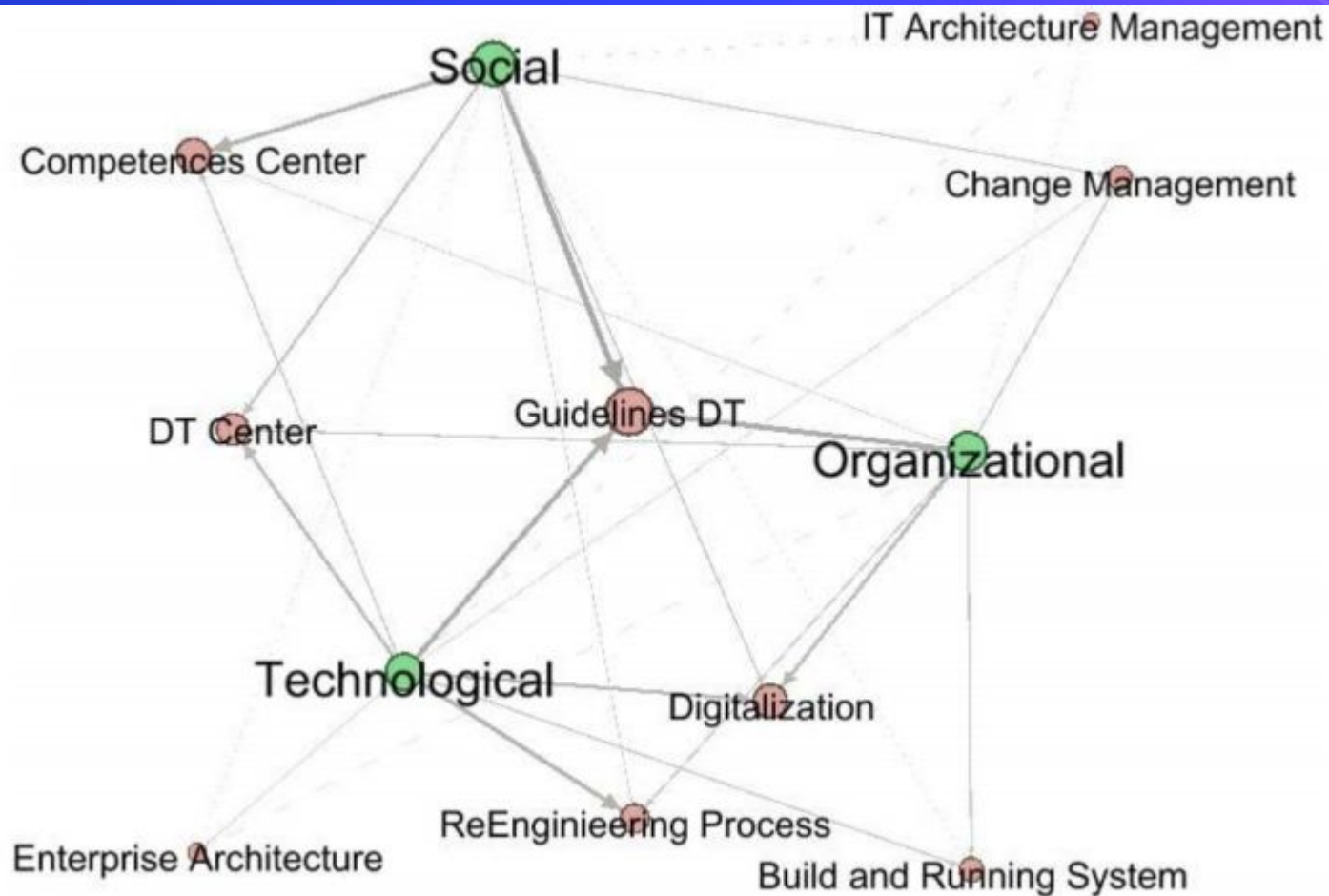


## Interrelationships inside DT of HEIs



## Relevancy of actors.

Actors: A participant or party in an action or process



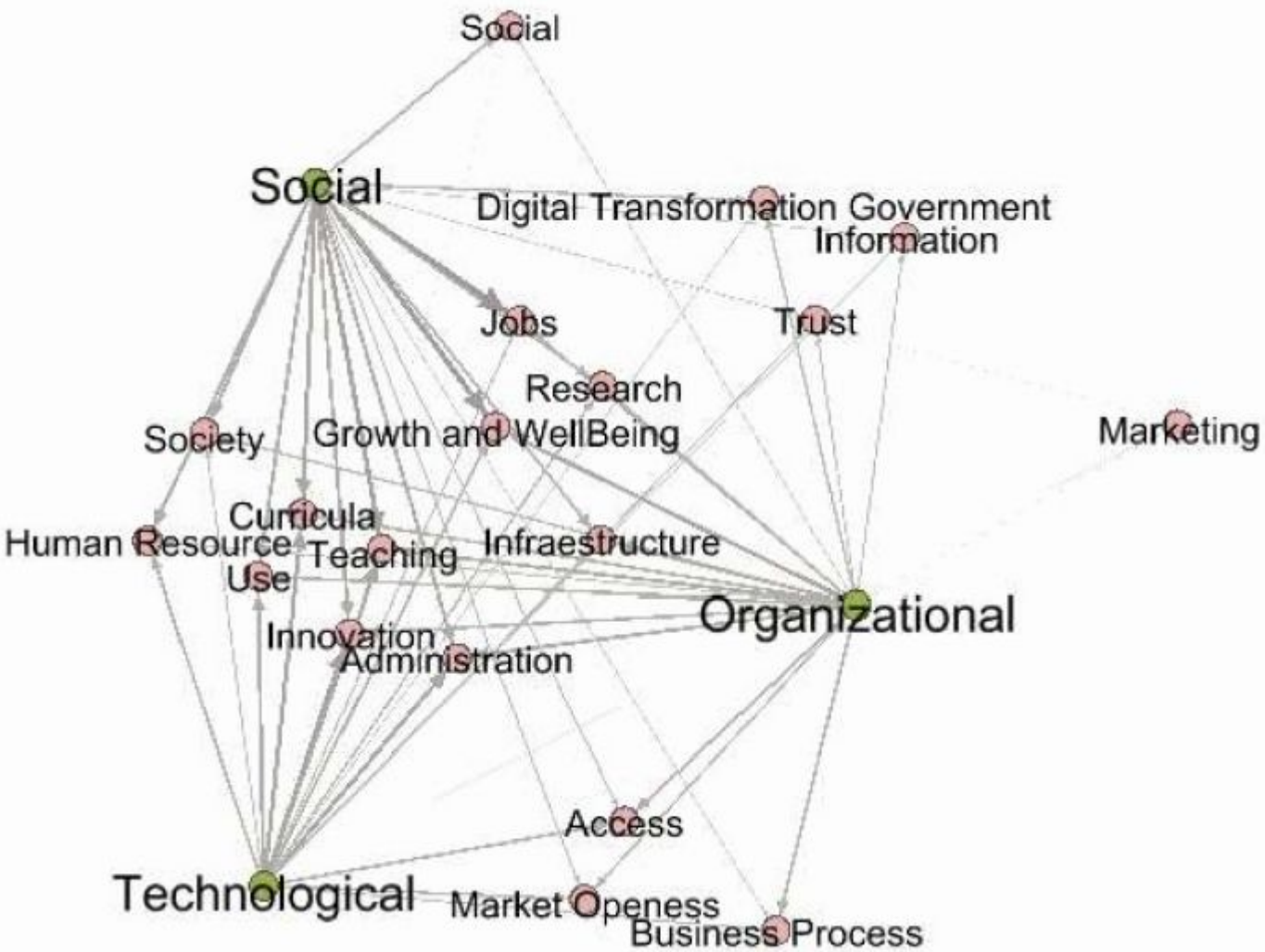
DT guidelines

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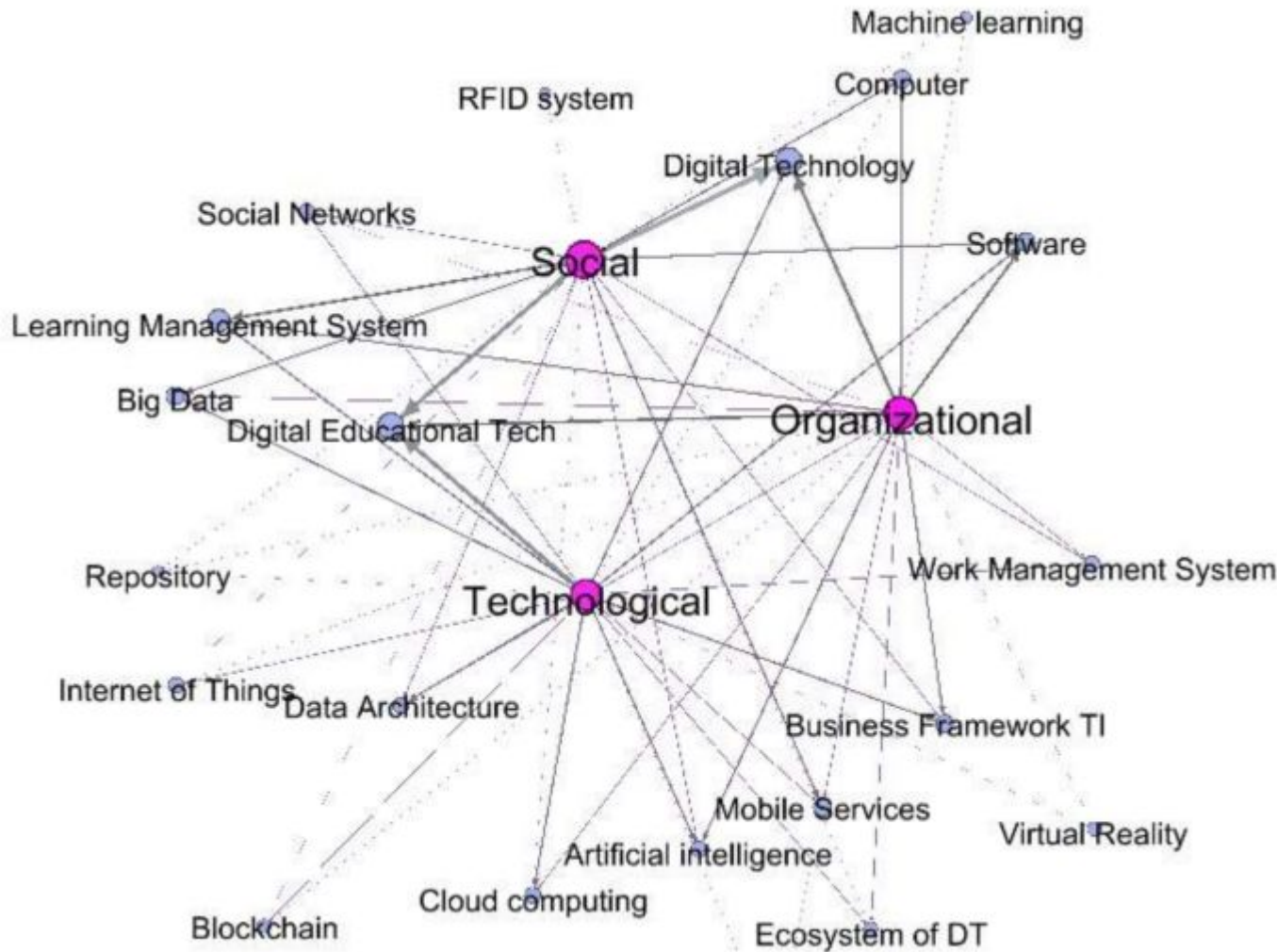


## Goals of DT in HEIs

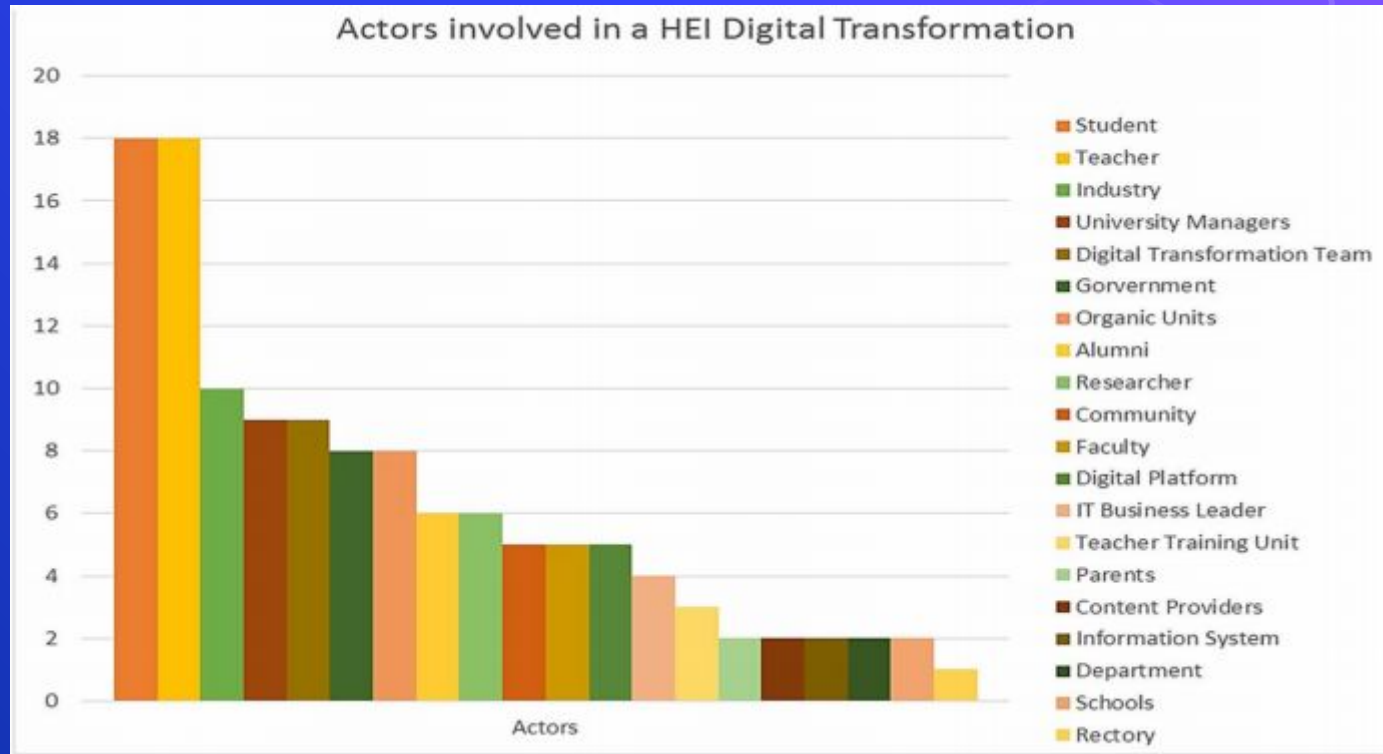
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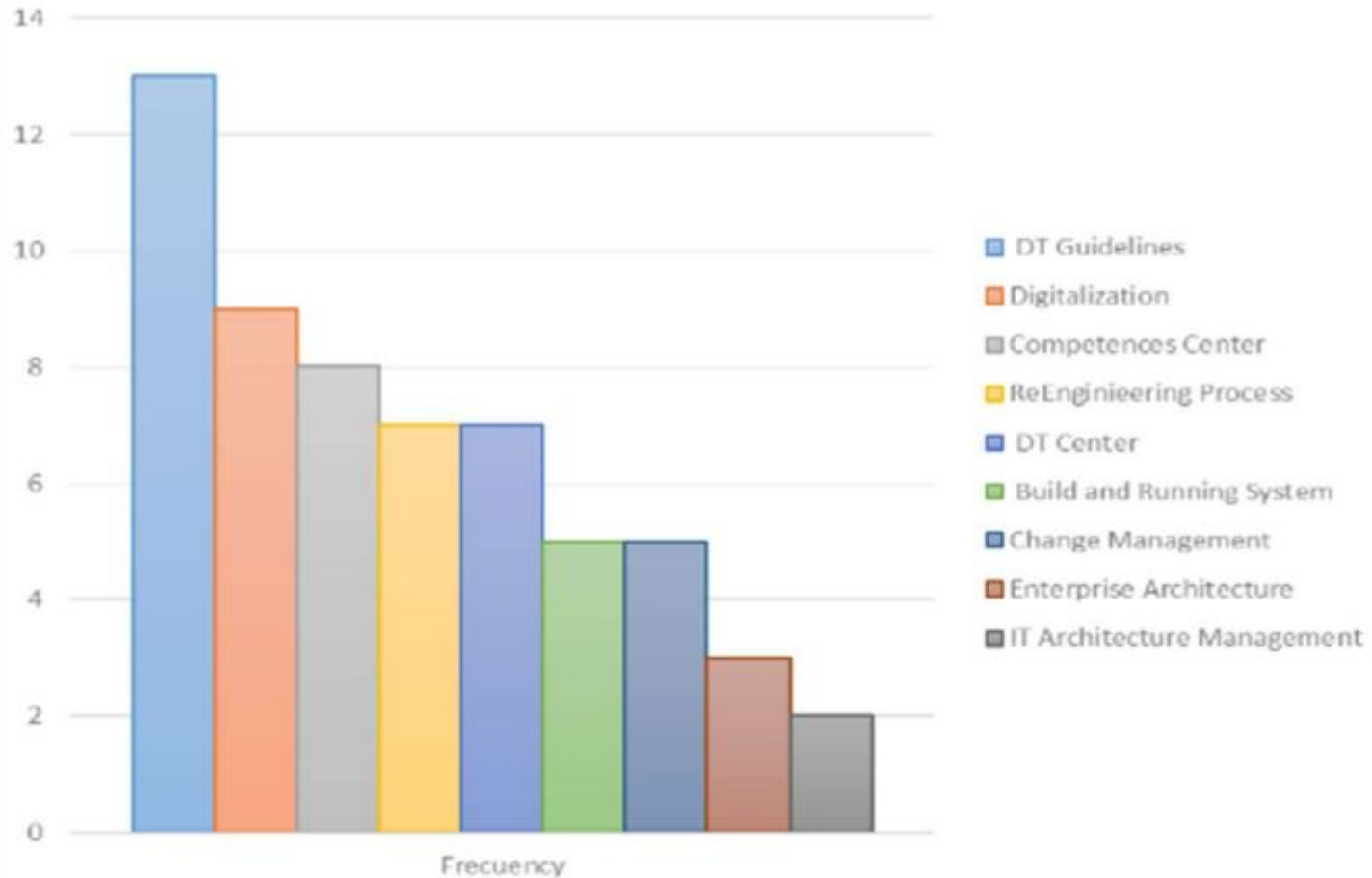
## Technologies used in DT of HEIs



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## DT Implementing Methods



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# 4. Discussion

## Main Distinctive Characteristic

- \*Digital Transformation's definition & consensus in HEIs not reached.
- \*DT as an disruptor, fundamentally changing industries.
- \*Both technology and social perspective required for successful transformation.
- \*DT integrated in teaching, learning and organizational practices.

\*Implementations of DT in HEIs differs depending on interest.

\*Order of categories most affected by DT in HEI:

1. **Education**
2. **Infrastructure**
3. **Curriculum**
4. **Business administration**

## 4.2 DT in HEIs Dimensions

- \***Digital platforms and contents for teaching and learning.** – Meet current educational standards.
- \***Digital infrastructure for teaching**
- \***Digital literacy and digital skills** – New workforce.
- \***Data and security infrastructure** – Cybersecurity improvements.
- \***Software infrastructure for HEIs** – A greater challenge on the level security, data protection & regulation.
- \***Curriculum modernization** – Adaptive & flexible platform.
- \***Digital curriculum** – Improvised educational standards
- \***Information dimension** – Educational materials
- \***Business process dimension** – Digital services.

## Remarkable Relationships of DT of HEIs

Notable relationships includes the actors involved, goals that guides DT processes, employed methods and the technologies.

Actors, goals, methods and technologies differs slightly depending on the approach.

# Actors

Social Perspective	Organizational Perspective	Technological Perspective
Students	Students	Students
Teachers	Teachers	Teachers
Industry	Organic units	University managers
Organic units	University managers	DT team
Digital platforms	Business leader	Faculty
Government	Content providers	Researchers
Teacher training unit	Rectory	
Information systems	Schools	
Community		



# Goals

(Guiding the HEIs processes)

**Social Perspective:** Positively impact society, develop job skills, contribute to the growth and wellbeing of actors, improve HEIs credibility, afford the digital transformation of government, remove time and space barriers, and promote access to education, which positions the human resources as a vital element to achieve DT, and to adapt to make curricula more flexible.

**Organizational Perspective:** Improving infrastructure, business process, administration, teaching, curricula, job, access, market openness, research, and digital marketing, as being novel aspects to consider.

**Technological Perspective:** Provide technology to support human resource, teaching, innovation, administration, access, market openness, building process, society, and research.

# Technologies

(Advancing the DT at HEIs)

**Social Perspective:** Digital technology, social networks, learning management systems, big data, digital education tech, software, machine learning, computers, and RFID systems.

**Organizational Perspective:** Work management systems, business frameworks, digital technology, computers, and software.

**Technological Perspective:** Digital educational tech, internet of things, data architecture, cloud computing , blockchain, mobile services, ecosystem of DT, virtual reality, business framework, and work management systems.

## 4.2.2 Addressing of the DT in HEIs by Different Actors

Students & teachers are the main actors in DT processes in HEIs.

**Students:** Opportunity to study without barrier of space and time. HEIs providing flexible curricula, digital learning and digital educational content.

**Teacher:** Innovate teaching, research, working process, and management experience. Impart digital services offered at a university level.

**University managers:** Opportunity to optimize process management within organic units and the university. Improve data and information usage in all the decision support processes.

**DT Team:** Need of a specialized team with strong leadership that is capable to explain and implement the DT in HEIs.

**Content providers:** Boost the quality and accessibility of contents provided by a university education.

**Faculty:** Improve productivity in teaching and provide new innovative digital experiences.

**Academic department:** Provides for curriculum modernization, and administration processes.

## 4.2.3 Route Established by HEIs to Carry Out Their DT

### **Guidelines DT in HEIs**

- \*Requires well planned digital technology
- \*Necessary resources

### **Re-engineering process**

- \*Requires an extensive re-engineering of all supporting processes.
- \*Innovative approach to succeed.

### **Build and running system**

- \*Goes hand in hand with building a system that supports the HEI business processes. (2 Stages were identified)
  - Platform should dematerialize the full range of business processes of the University in a relatively short time.
  - The WMS was expected to promote the harmonization, consolidation, and optimization of the working procedures.

### **DT Center**

\*Implementations of DT in university business process system requires the creation of a directory of administrative service for the training process, internal research, personnel management, and infrastructure management.

### **Competence Center**

\*A strategic resource supporting the development of human resources of the HEI.

\*Digital capabilities includes someone who is living, learning and working in a digital society and are key enablers of the university DT processes.

### **Change Management**

\*To successfully execute of a project of the characteristics immersed in a DT in the HEI, it's of importance to lessen the potential negative effects of digital disruption.

# Discussion

## 4.3 Risks To Validity

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# Discussion

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## 4.3 Risks To Validity



Not all the papers submitted  
will be accepted



Due to different uses of  
scientific databases



The search string did not  
contain papers that specifically  
addressed the DT in HEIs



Complexity of the DT in HEIs



# To minimize this risk,



authors followed the checklist  
mentioned in the quality  
assurance checklist.

# 5.0 Conclusion

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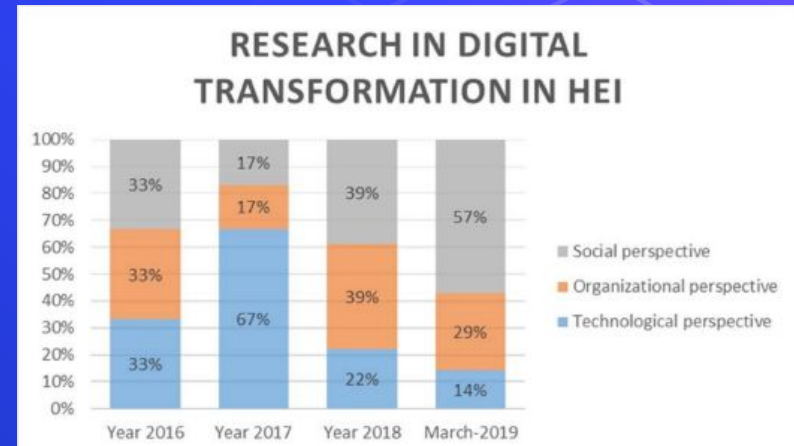
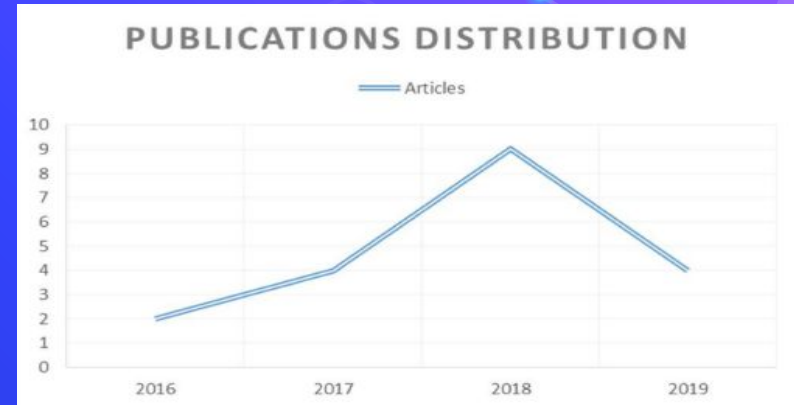


# Conclusion

The social, organizational, and technological aspects of DT in HEIs have all been considered.

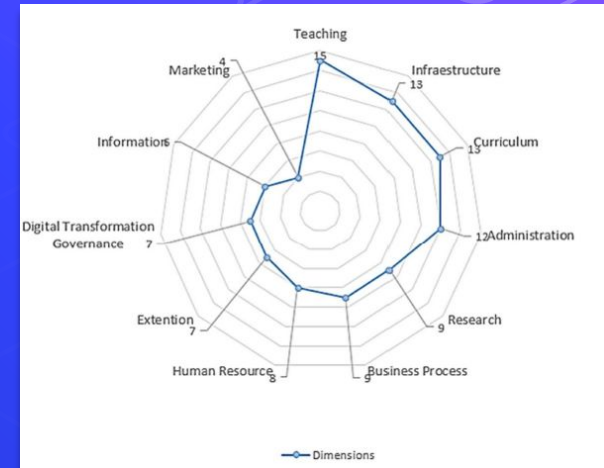
- ⬡ The rise in the number of articles published in recent years demonstrates HEIs' desire to achieve their DT (*Figure 2*).
- ⬡ Furthermore, we discovered that the tendency has a defined social importance, implying that researchers are aware of the importance of human resource skills and capacities in completing DT projects successfully (*Figure 3*).

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# Conclusion

- According to the article, the following components within a HEI have been affected by DT processes:
  - teaching, infrastructure, curriculum, administration, research, business process, human resource, extension, digital transformation governance, information, and marketing (**Figure 4**).
- The previous measures the DT process's complexity, and no article has addressed every one of them.



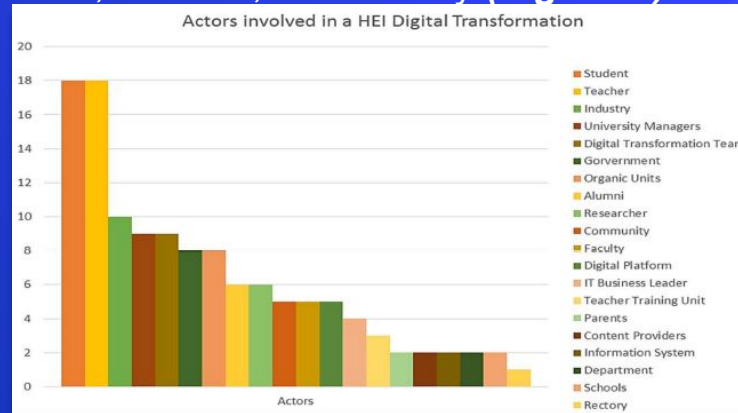
**Figure 4**

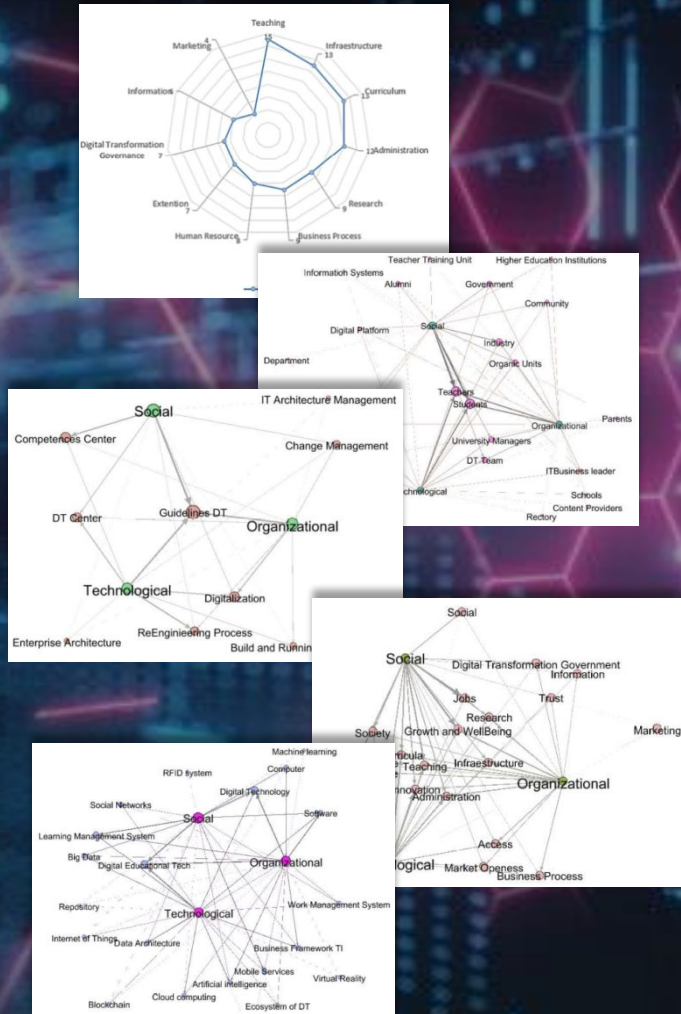
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# Conclusion

○ The following actors have been recognized for being involved in the DT processes at HEIs, either as leaders or as beneficiaries:

□ students, teachers, industry, university managers, digital transformation team, government, organic units, alumni, researchers, community faculty, digital platforms, IT business leaders, teacher training units, parents, content providers, information systems, departments, schools, and rector (Figure 9).





**The role that these actors play is determined by**

**the dimension and perspective addressed in the DT process (Figures 4–8).**

**(21B6009)**



# Conclusion



Each of the articles examined highlighted the variety of methods in which DT has been addressed in HEIs.



Needs rethinking, restructuring, and reinventing due to its multi-purpose, multi-processes, multi-disciplinary, multi-state, and multi-actorial nature.



It is a collaborative effort

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# Conclusion

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Imply both technological advances and more transcendental.



Handling papers piece by piece, demonstrates the lack of adoption techniques for these types of initiatives at the holistic level.



Considerations need to be taken; internal digital capabilities, as well as its own prospective outlook.



Research on the idea and strategies for implementing DT in HEIs should be improved.





# THANK YOU!

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