Mapping the Platforms in Higher Education – A Systematic Literature Review

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Abstract— **Platforms have determined the interaction and actions of many players for years. They have established themselves as leading business models in both the business-to-business and business-to-customer sectors. But not only companies use platforms. Increasingly, universities are also using platform models to generate value. This article uses a systematic literature review to examine 1289 publications in this area and classifies them in a concept matrix of the use of platforms in higher education to date. It shows that some areas of universities use platforms and platform ecosystems. The area of teaching benefits greatly from Massive Open Online Courses, which are provided on well-known platforms. Other areas, such as transfer or research, are underrepresented.**

Keywords— higher education, literature review, multi-sided markets, platform, universities

I. Introduction

Many of the world's most successful companies use platforms to generate value. But platforms, and related business models such as multi-sided markets, are increasingly being used in other areas as well [1]–[2]. It is becoming increasingly apparent that universities and other higher education institutions (HEI) are also establishing platforms in various areas [3]. For example, alliances of universities often establish their own platforms in the field of education in order to be able to offer Massive Open Online Courses (MOOC).

In the context of sustainable and future-proof development, universities play a major role, including in the transformation of cities into smart cities, as they operate there on several levels. They have the necessary know-how and are a place for basic research as well as applied research. Startups often emerge from the research results. Furthermore, they are the interface to the governmental institutions and are responsible for the education and training of the future generation.

Platforms and the network effects that occur with them accelerate the process, often creating "the winner takes it all" dynamics [4] which can have societal and economic consequences. Therefore, this article conducts a comprehensive systematic literature review to examine the current situation of the usage of platforms in higher education and provide a scientific analysis of this topic.

Therefore, the following research question arise:

RQ1: In which areas do higher education institutions rely on known platform concepts and / or multi-sides markets or establish them themselves in order to connect until now independent stakeholders?

RQ2: Which types of articles and studies have been used for this purpose so far?

Industrial economists use the term 'platform' to describe a specific characteristic in business model alignment. Therefore, platforms characterize products, services, companies or institutions that mediate between two or more groups [5]. Gawer describes that the value of the platform for one stakeholder group is only as large as the size of the other group, which leads to a chicken-and-egg problem. This problem is often solved by subsidizing one of the two sides to increase the number of customers on that side [4].

However, the topic of platforms is already being discussed in many areas and many definitions exist in different domains [6]–[10]. Pauli and Lin [11] as well as Pauli and Marx [12] examine platforms in the Industrial Internet of Things [11]–[12], Zarnescu and Dunzer [13] inspect the platform ecosystem ontology, whereas Lusch and Nambisan [14] investigate from different perspectives how value is created within these ecosystems. Baldwin and Woodard [15] as well as Tilson et al. [16] examine more technical perspectives but de Reuver et al. [17] consider more socio-technical perspectives. The market-based perspective of digital platforms described at the beginning of this paper goes back to Rochet and Tirole [5].

There is an extension of this platform concept to platform ecosystems, which according to Gawer and Cusumano are defined by three criteria: (i) there is a modular and scalable technological platform architecture, (ii) value is created by managing and governing the independent partners within the ecosystem, and (iii) direct or indirect network effects exist [10].

The phenomenon of platforms in higher education is described by many authors, but almost always with the focus of education within higher education. Belleflamme and Jacqmin describe MOOC-platforms as multi-sided platforms [18]. Rochet and Tirole emphasize that regardless of the domain, the existence of a platform means that all interactions between the different sites and customers, as well as within these groups, must be very carefully considered [5]. Schwab points out that these special characteristics, combined with network effects, mean that these platforms also dominate the e-learing sector, because the cost-benefit relationships are best here [19].

II. Research Methodology

This literature review follows accepted concepts for conducting systematic literature reviews. It follows a concept-oriented notation according to Webster and Watson [20]. Thereby, the sources are organized in a concept matrix and presented based on the concepts they contain. In contrast, literature searches are often mistakenly conducted in an author-centric manner, which often results in not synthesizing the entire literature. The aim of this article is to examine the status quo of the use of platform concepts by higher education institutions. The focus is on examining which concepts have

been developed, applied, or studied in this regard. Therefore, this article is a 'scoping review' according to Paré [21].

The procedure is based on the four phases of Okoli [22]:

Planning Phase: First, Cooper's [23] table was applied, see Table I, to determine the nature and structure of the review. The focus of the review is to examine research outcomes or theories that fall within the scope of platforms and are applied by universities or HEI. The goal here is to investigate the current state of the art and highlight previous research. The organization of the article is concept-centrist, as required by Webster and Watson [20]. The audience are specialized scholars and the coverage is exhaustive.

TABLE I. FOCUS AND SCOPE OF THE LITERATURE REVIEW

focus	research outcomes	research methods	theories	applications
goal	investigation		criticism	central issues
organisation	historical		conceptual	methological
perspective	neutral representation			esposal of position
audience	specialised scholars	general scholars	practioners / politicans	general public
coverage	exhaustive	exhaustive and selective	representative	central pivotal

In order to form a relevant search string, a keyword search according to Vom Brocke [24] was performed in several iterations and thus a keyword with an extension phrase was formed. The review focuses on the databases *Scopus*, *IEEE Xplore*, *Science Direct*, *ECONBIZ* and *Web of Science*. All databases were searched by title with no restrictions on specific years or individual journals. The search string is:

TITLE(„platform") AND („academi*" OR "university*" OR "higher education" OR "HEI")

Selection Phase: This phase will be in addition to the proposals of Okoli [22] extended by a multi-stage process of source selection. The search was conducted in December 2021 and a total of 1289 sources were found in the initial search, of which 32 were considered finally.

- Step 1: The search was initially performed with the mentioned search string, the results see Table II.

- Step 2: After removing duplicates, publications were reviewed by title and irrelevant publications were sorted out. Publications published more than once were also sorted out.

- Step 3: The remaining publications were then screened based on the abstract and irrelevant publications were sorted out.

- Step 4: All remaining publications were read, reviewed, and in the case of a positive evaluation, subjected to a forward and backward search as suggested by Webster and Watson [20].

- Step 5: Publications from important conferences in the field of the platform economy were searched to find additional sources.

TABLE II. NUMBER OF HITS PER SEARCH STRING AND DATABASE

initial search

	Scopus	IEEE Xplore	Science Direct	ECON BIZ	Web of Science
"university*" AND "platform"	569	122	30	20	64
"higher education" AND "platform"	149	25	7	4	12
"HEI" AND "platform"	1	0	0	0	0
"academi*" AND "platform"	221	33	23	8	1

without duplicates

Scopus	IEEE Xplore	Science Direct	ECONBIZ	Web of Science
569	4	9	12	22
124	1	1	3	11
1	0	0	0	0
208	4	3	3	14

after title

Scopus	IEEE Xplore	Science Direct	ECONBIZ	Web of Science
62	1	6	4	1
30	1	1	1	5
1	0	0	0	0
21	0	0	1	1

after abstract

Scopus	IEEE Xplore	Science Direct	ECONBIZ	Web of Science
11	1	1	1	0
11	1	0	1	1
1	0	0	0	0
4	0	0	0	0

Extraction Phase: Based on the research objective and the existing concepts in the platform economy literature from section 2, the publications assessed as relevant were classified into a concept matrix as proposed by Webster and Watson [20].

Execution Phase: The full-read publications that were classified into the concept matrix were then further examined and the findings were extracted and discussed.

III. RESULTS

The concept matrix, see Table III, was constructed according to the guidelines of Webster and Watson [20]. The authors are listed alphabetically in the first column. Then follow four columns with the areas of the universities, into which they can be divided. Universities are classified according to their legal areas, research, teaching and transfer, as well as an additional category 'other'. The type of research is divided into three groups, whereby an article can belong to several areas in a university as well as several types of research. However, the results are discussed concept-centristically.

Adrian [25] deals with the development as well as the investigation of the use of a new platform in e-learning. It is suggested that a transfer to other areas, for example the further education of employees of companies by universities, is conceivable. Ambros und Biberhofer [26], on the other hand, investigate the use of a knowledge platform for sustainability-

driven entrepreneurship. Dong et al. [27] present a platform for academic knowledge discovery.

Belleflamme and Jacqmin [18] examine MOOCs using various economic and pedagogical concepts to better understand MOOC specifications as well as shed light on the role of platforms in the process. Also Bezus et al. [28] deal with MOOCs, but apply less well-known platform theories or platform concepts compared to Belleflamme and Jacqmin. Out of this Costa et al. [29], Fernández et al. [30] as well as Florea et al. [31] or Ebner [32] examine e-learning platforms. Also Grams [33], Kulsehova et al [34], Langseth et al. [35], Liu [36], Liu et al. [37], Mafraq [38], Ma et al. [39], Peters [40], Valmeekanathan et al. [41], Wang et al. [42], Zhang [43] and Samim [44] conduct research in this area - always with different a research design but mostly very similar. In particular, Valmeerkanathan et al. connects different areas within higher education with a knowledge transfer platform.

Benson [45] examines the importance of social networking, Goshevski et al. [46] conducts a review on gamification paltforms in higher education. Koskinen et al. [47] highlight the role of platforms in the field of research, especially academic libraries. Tojo et al. [48] examine platforms for mediating employers and graduates of universities. Schubert [49] examines the context and dynamics of an academic collaboration platform in a very broad study using theories of sociotechnical change. Lee [50] investigates platforms in the business model context for university career services.

Chen et al. [51] are among a few of the authors examining platforms in the area of transfer. They explore how the economic performance of universities and companies could be improved through connecting platforms. He [52] investigates the platform construction for a new model of cooperation between universities and companies. Hansen [53] develop and investigate a new knowledge transfer model for the transfer sector. Ravi [54] explore different successful strategies and technology transfer models between industry and research. Hoeijmakers et al. [55] study the Academic Collaborative Centre Limburg in relation to cross-domain knowledge transfer.

TABLE III.   CONCEPT MATRIX OF THE LITERATURE RESEARCH

Authors	research	teaching	transfer	other	D	T	E
Adrian [25]		•	•		•		•
Ambros [26]		•					•
Belleflamme [18]		•				•	
Benson [45]	•		•			•	
Bezus [28]		•					•
Chen [51]			•				•
Costa [29]		•					•
Dong [27]	•						•
Ebner [32]		•			•		•
Fernández [30]		•				•	•
Florea [31]		•					•
Goshevski [46]		•					•
Grams [33]		•			•		•
Hansen [53]			•				•
He [52]			•		•		•

This table (Table III) continues at the top of the next column:

Authors	research	teaching	transfer	other	D	T	E
Hoeijmakers [55]	•		•	•			•
Koskinen [47]	•				•		•
Kuleshova [34]		•					•
Langseth [35]		•					•
Lee [50]			•		•		•
Liu, S. [36]		•			•		
Liu, Z.-Y. [37]		•					•
Ma [39]		•					•
Mafraq [38]		•			•		•
Peters [40]		•					
Ravi [54]			•				
Samim [44]		•					
Schubert [49]	•			•		•	•
Tojo [48]			•		•		•
Valmeekanathan [41]	•		•				•
Wang [42]		•					•
Zhang [43]		•			•		

a D: development or construction. T: application of theories and concepts. E: examination and discussion

IV. DISCUSSION

It can be seen that research related to platforms is also gradually entering the field of higher education without only highlighting e-learning platforms. Research in the areas of transfer, research and other areas in the context of higher education is also gaining increasing attention [26]–[27], [45]–[48], [51], [53]–[54].

Nevertheless, approaches and concepts that are often used result in multiple applications. Most approaches examine existing systems without using dedicated platform theory concepts. An exception here are Belleflamme and Jacqmin, Benson, Fernández and Schubert [18], [30], [45], [49].

Also, very few authors place emphasis on the area of transfer, which is becoming increasingly important. Without also examining other areas, only Chen, Hansen, Ravi, Wang and Zhang can be mentioned here. [42]–[43], [51], [53]–[54], with none of these authors using theories from the classic platform literature. The same applies to the field of research. Nevertheless, the interest of research is increasing.

V. CONCLUSION AND OUTLOOK

In this article, a systematic literature review of 1289 titles was conducted. In the process, important and accepted theories for conducting literature reviews in the field of information systems were used.

The literature review focused on locating publications that apply platforms and platform concepts in the field of higher education. The articles found were classified in a concept matrix and it was found that certain areas are overrepresented within higher education. Likewise, some types of research are preferred – as well as some combinations of research approaches (RQ1, RQ2).

It could be shown that most of the research in the intersection between higher education and platforms is in the area of teaching. Only a few authors deal with the other areas of HEI such as research or transfer (RQ1, RQ2).

Similarly, there is a lack of application of platform theory concepts in the field of higher education, especially in the less explored areas of research, transfer or other. These gaps in research should be closed as soon as possible in order to promote collaboration between universities and between universities and companies. The network effects of platforms in the area of higher education could also be used to exploit dynamics that also promote research.

For future work, we will therefore try to close these gaps by applying existing concepts and theories from the classical platform literature to so far little researched areas within the presented search framework, by examining existing platforms or by presenting our own proposals for the establishment and design of platforms in this area.

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