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AGILE LEADERSHIP PRACTICES IN THE DIGITAL TRANSFORMATION OF HEIS

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Purpose: One of the strategic challenges of many higher education institutions is digital transformation. The success of this process depends not only on the technologies and IT systems being introduced but also on the actions of leaders in the field of digitalisation. This article aims to examine the relationship between agile leadership practices found in HEIs and the level of the progress of digital transformation.
Design/methodology/approach: The article presents the results of quantitative research conducted in 2023 among 515 teaching and administrative staff members in 20 Polish HEIs.
Findings: The results of the study confirm the relationship between the level of progress of an HEI's digital transformation and the selected leadership practices, in particular flexibility, encouraging staff to frequently test, experiment, and seek innovative solutions. At the same time, these practices were less frequent in the surveyed HEIs than the practices with less impact on the progress of digital transformation.
Research limitations/implications: The results of the study may be applicable to the broader HEI population, but caution should be exercised in their generalisation due to certain limitations of the sample. In the course of further investigations, it would be worthwhile to supplement the research approach with mixed methods that provide opportunities for deeper analysis of the described phenomenon.
Practical implications: The results of the study can provide valuable information for higher education institutions regarding the implementation of new digital leadership strategies. They can inform the design of academic leadership development programmes focused on developing an agile approach to management in educational institutions.
Social implications: Implementing effective leadership strategies can lead to increasing innovation within HEIs, optimising educational processes, and improving the quality of education.
Originality/value: Literature review shows research gap in digital academic leadership's role in HEI's digital maturity. The results of the study provide important insights and contribute to developing knowledge on the relationship between agile leadership practices and an HEI's digital transformation process. They provide a basis for further research and development of digitalisation strategies tailored to the specificities of higher education.

Category of the paper: Research paper.

Keywords: Academic Digital Leadership, Agility in Higher Education, HEIs.

1. Introduction

Today's educational landscape, continually shaped by accelerating technological advances, is encouraging higher education institutions (HEIs) to reflect on their own transformation strategies. The digital age is the source of much turbulence and challenges in the environment of organisations (Korzyński, 2018; Romanowska, 2011; Zakrzewska-Bielawska, 2013), including educational ones.

The Covid-19 pandemic was certainly a catalyst for digital transformation in higher education. Many authors highlight its impact on accelerating the digitalisation of higher education institutions and initiating arguably profound and lasting changes (Jorge-Vázquez et al., 2021; Marinoni et al., 2020; Rodríguez-Abitia et al., 2021). The uncertainty caused by the pandemic, the development of distance learning and resulting increased competition from foreign HEIs, and the need to operate using social networks and advanced information technologies required new competencies from academic leaders. On the other hand, changes regarding digitalisation are forced by the expectations of university candidates, especially the youngest generations, often referred to as digital', who are used to acquiring information not only through traditional channels, e.g., physically in the classroom. For this generation, the teacher is not the only source of reliable knowledge. Present-day students use the open resources of so-called MOOCs, learn from online sources and social networks and, increasingly, use artificial intelligence-based solutions, e.g., ChatGPT.

The modern university is changing under the influence of digital technologies that transform the teaching and learning model and increase access to data and allow it to be collected and analysed, effectively influencing management decisions (McCluskey, Winter, 2012). As Mazurek (2019) argues, the digital transformation of higher education is more than just the implementation of technological tools in HEIs. It is a systemic change that includes changing the organisational culture from hierarchical to networked, to decision-making based on centralised, standardised data, developing the digital competencies of all HEI employees, implementing tools that develop teaching innovations, and building relationships with stakeholders through social media (Mazurek, 2019).

As Gudergan et al. (2019) point out, digital transformation is more about people than about digital technology itself. It requires organisational change that is supported by leadership and critical challenges to organisational culture. The authors divide organisations undergoing digital transformation into two categories: digitally developing and digitally mature, each managed differently. It is the differences between leaders that distinguish digitally mature organisations from those that are just developing in this area (Abbu et al., 2022).

Many researchers argue that organisational agility positively influences the course of digital transformation (Li et al., 2020; Porfirio et al., 2021; AlNuaimi, 2022) and that leaders play a key role in building organisational agility (Menon, Suresh, 2020, 2022) and in guiding

organisations through digital transformation (Porfirio et al., 2021; Al-Nuaimi, 2022; Hansen et al., 2011).

The aim of this article is to broaden the understanding of the role that HEI leaders play in the digital transformation process. The posed research question is: Is there a relationship between the agile management practices employed by academic leaders and the level of digital transformation and the degree to which universities use digital technology?

2. Literature review

2.1. Digital maturity in higher education institutions

Digital transformation is a gradual process that ultimately leads to the creation of new business models, more advanced and efficient management practices and business operations, improved service delivery (Morakanyane et al., 2017), the creation of a culture of innovation through the use of advanced technology to act quickly and focus on problem-solving, generate innovative ideas, and meet market needs (Tanniru et al., 2018; Dimitrov, 2018). In the literature relating to the issue of digital transformation, there are attempts to create digital maturity models for organisations (Proença et al., 2016; Remane, 2017; Carvalho, 2019). Digital maturity defines the state of digital transformation of an organisation (Chanias, Hess, 2016). One example of a digital maturity model is the Digital Transformation Toolkit Guide, developed by the South Australian Government in collaboration with KPMG to support organisations in developing digital strategies and help assess their level of digital maturity. The model assumes 5 stages, from minimal to transformed, and is described at the level of 5 spheres: governance and leadership structure, people and culture, capacity and capability, innovation, and technology. Each of these spheres is characterised according to the level of digital maturity. In addition, in each of the mentioned areas, there are actions on different levels: from the reactive through the experimental to the full level — the organisation-wide level, in which digitalisation is part of the organisation's strategy, and mission and vision, and digital technologies are used to increase the efficiency of the organisation's operations, redefine processes and methods of providing services, and even create new products and services based on tools and digital technologies.

There are several digital maturity models developed for educational institutions, although their number is still limited. Rodríguez-Abitia et al. (2020) proposed a framework for assessing the degree of digital maturity of an HEI based on its ability to provide adequate IT infrastructure, to use technology in the teaching and learning process, and to manage the work of teams and the coordination of processes. Two other models can be used as examples: the KPMG and Google models. KPMG calls its model 'a blueprint for digital transformation in

universities'. The blueprint comprises six elements: customers, channels, enterprise strategy, core businesses practices, advanced data and analytics, and enabling business practices. Google has classified seven elements of digital transformation, namely: vision, learning, culture, technology, professional development, funding and sustainability, and community engagement. These two models do not describe the stages in the process of becoming digitally mature, but only show the areas in which this maturity manifests itself.

2.2.Digital leadership in higher education

Digital leadership in higher education is increasingly the focus of academic research, representing an area of great research potential. Many authors believe that digital leadership is an under-researched practice in higher education (Cifuentes-Álvarez, Vanderlinde, 2015; Masrur, 2021). One of the definitions of digital leadership was developed by Ebler & Drews (2021, p. 226): *digital leadership is a complex construct aiming for a customer-centred, digitally enabled, leading-edge business model by (1) transforming the role, skills, and style of the digital leader, (2) realizing a digital organization, including governance, vision, values, structure, culture, and decision processes, and (3) adjusting people management, virtual teams, knowledge, and communication and collaboration on the individual level.*

The notion of digital leadership, particularly in relation to educational institutions, is not well-established. Other terms describing digital leadership appear in the literature: ICT leadership (Cifuentes-Álvarez, Vanderlinde, 2015), e-leadership (Avolio et al., 2001), technology leadership (Yuting et al., 2022), and leadership 4.0 (Mihardjo et al., 2019).

Some of the research focuses on the characteristics of effective digital leaders. Many authors identify similar leadership behaviours, among them readiness for change (Rodríguez-Abitia et al., 2020; Rodríguez-Abitia, Bribiesca-Correa, 2021), the ability to manage change so-called 'transformational leadership' (Antonopoulou et al., 2019, 2020, 2021), team orientation, the ability to involve all stakeholder groups and to delegate leadership — so-called 'distributed leadership' (Laufer et al., 2021; Garrison, Vaughon, 2013; Cifuentes-Álvarez, Vanderlinde, 2015; Avidov-Ungara et al., 2022), the ability to combine management with technology and digital skills (Kotula et al., 2021; Antonopoulou et al., 2020), and an awareness of the need to develop the digital competencies of the HEI's staff (Binh, Le, 2015; Newland, Handley, 2016).

The period of the Covid-19 pandemic encouraged researchers to explore the subject of digital transformation in HEIs and the issue of agility as a characteristic of an HEI that adapts better to operating in a turbulent environment (Dima et al., 2021; Memon, Suresh, 2020, 2022) however, there is still little exploration of this topic.

2.3. Agile leadership and digital transformation

Higher education institutions, like other organisations, operate in an extremely uncertain, dynamically changing environment. In order for them to compete successfully not only in the local but also in the global education market, they must be ready to adapt and redesign their processes quickly, which characterises so-called organisational agility (Menon, Suresh, 2022; Kerrum et al., 2020; Shewchuk, 1998). In the literature, in the context of responding to change, one can find, in addition to the term 'agile organisations', other synonyms such as 'flexible organisations' or 'adaptive organisations' (Sherehiy, 2007; Loiro et al., 2019). The agile project management model, particularly popular in the IT industry, has also emerged among project management methodologies (Hoda et al., 2008). At the same time, agile management is becoming one of the key challenges facing organisations on the road to mature digital transformation (Wiechmann et al., 2022).

In the literature, one can find examples of studies looking for a link between an organisation's leadership style and successful digital transformation. Researchers' interests are particularly focused on the styles that refer to the effective management of organisational change and to adapting to a changing and uncertain environment, which is characteristic of the agile approach. Research by AlNuaimi et al. (2022) has proven that transformational leadership and organisational agility have a positive impact on digital transformation. At the same time, they confirmed a positive relationship between transformational leadership and organisational flexibility. According to the aforementioned researchers, transformational leaders promote organisational agility through the way in which they build relationships with subordinates and encourage them to innovate, take rational risks, and see opportunities in the environment (Wanasida et al., 2020). Porfirio et al. (2021) reached similar conclusions: in their research, they confirmed that more agile and democratic decision-making processes, associated with more democratic leadership styles, constitute characteristics that foster the development of digital transformation in organisations. Furthermore, leaders' openness to innovation may be related to the effectiveness of strategic management processes and the company's ability to maintain a competitive advantage resulting from digital sophistication. As part of their research, Büyükbeşe et al. (2022) created a tool to measure digital leadership (Digital Leadership Scale, DLS), which indicates the strongest relationship between the successful digitalisation of an organisation and two dimensions of leadership: innovation and supporting subordinates, in addition to agility, developing digital skills, and being a so-called 'digital role model'.

Digital transformation is a process that requires leaders to lead an organisation through a series of changes. The Covid-19 pandemic mentioned earlier was certainly a situation that required HEIs to quickly adapt to new conditions — introducing remote learning models, remote or hybrid work models, implementing new IT systems to support learning and the day-to-day running of the HEI, ensuring the health of staff and students, and, at the same time, it became an excellent opportunity to begin or advance the level of digitalisation of the HEI.

Research on the relationship between HEI leadership styles and the digital transformation process is limited; in particular, quantitative and mixed-method research is lacking. Many studies show a positive relationship between agile, flexible and more adaptive management styles and successful digital transformation. A study by Dima et al. (2021), conducted among leaders of 23 European HEIs, found that leadership styles should evolve after the Covid-19 pandemic. New digital and transformational leadership styles may gain an advantage as they are more adaptive and agile. Other researchers also point to the transformational style as more agile and better suited to operating in a changing and dynamic environment. Transformational leaders are better equipped to manage organisational change, especially in a digital environment (Hingins et al., 2018; Santatiagar et al., 2017, Antonopoulou et al., 2019, 2020, 2021).

2. Research methodology

The subject of this study was to examine how the degree of utilisation of digital technologies and the level of progress of a higher education institution's digital transformation relates to the management practices found in the institution and those used by direct supervisors. The study was exploratory in nature; in addition to satisfying the need for a more thorough understanding of the investigated issue, the main idea behind it was to identify the rationale for undertaking broader exploration and to develop methods that will allow further research to be carried out (Sułkowski et al., 2021).

The study posed the following research question:

Is there a link between agile management practices and an HEI's level of digital transformation and the extent to which it utilises digital technology?

The following hypothesis was formed:

Agile management practices found in an HEI correlate to its level of digital transformation and the degree to which it utilises digital technology.

In order to investigate the relationship between leadership practices found in HEIs and the level of their digital transformation, a quantitative study was conducted among 515 teaching and administrative staff members representing 20 Polish HEIs. The sample included 15 public and 5 non-public HEIs. The institutions' authorities did not give permission to publish the names of the HEIs participating in the study. The survey was conducted in May-June 2023 using an anonymous, original online questionnaire, which included questions on the degree to which the HEI is using digital technologies, the level of digital transformation in the HEI, the management practices in the HEI, and the practices of the immediate supervisor in the context of HEI digitalisation.

The main variables used in the survey were expressed in the form of synthetic measures based on specific indicators determined on the basis of theoretical considerations and literature analysis (Sułkowski, 2020). The level of digitalisation was created based on the analysis of the models described in the theoretical part of the article, including the Digital Transformation Toolkit Guide (https://www.dpc.sa.gov.au/) The respondents' level of digital transformation was assessed based on the availability of digital technologies, the degree of digitalisation of processes, and the integration of technology in the daily operations of the HEI. Measures of agile leadership at the HEI level were described by 12 statements, which included an assessment of practices such as flexibility, encouraging staff to experiment and innovate, use of agile project management methodologies, and frequent exploration of the needs of representatives of different stakeholder groups. The Cronbach's Alpha reliability coefficient for this index had a value of 0.943, a result indicative of the high reliability of the tool. The behaviour of the direct supervisor was assessed by the respondents using 9 statements describing the supervisor's practices in the area of digitalisation and consisting of, among other things, the inclusion of subordinates in the decision-making process, supporting them in the process of acquiring digital competencies and assisting them when they encounter difficulties in the area of digitalisation. Once again, satisfactory Cronbach's Alpha coefficient values (0.965) were achieved, demonstrating the high reliability of the index created.

The data collected underwent statistical analysis using the IBM SPSS Statistics software, applying appropriate tools such as correlation analysis and statistical tests. The results of the analysis enabled the identification of relationships between digital academic leadership practices and the degree of digital transformation in an HEI.

3. Research results

The majority of the respondents were women (62.5%). With regard to the age of respondents, the largest group was between 36 and 45 years old (35.1%) and the smallest group was under 25 years old (2.1%). The largest portion of respondents worked in the administration departments of the HEIs (45%); by function, the majority of respondents were categorised as administration and leaders (61.6%). Nearly half of the respondents had been employed at their HEI for more than 10 years (48.2%). A detailed profile of respondents is presented

Table 1.
Respondent characteristics

Respondent profile		**Quantities**	**Percentage (%)**
Gender	woman	322	62.5
	man	193	37.5
Age	below 25 years old	11	2.1
	25-35 years old	79	15.3
	36-45 years old	181	35.1
	46-55 years old	151	29.3
	above 55 years old	93	18.1
Employment category	administration worker	232	45.0
	research and teaching manager	85	16.5
	research and teaching worker	198	38.4
Function	administration and leaders	317	61.6
	teachers	198	38.4
Duration of employment*	less than 2 years	77	15.0
	2-5 years	108	21.0
	5-10 years	80	15.5
	more than 10 years	248	48.2
Total:		**515**	**100.0**

n = 515; * — data not available (2 respondents did not provide duration of employment).

Source: Own survey.

The level of digital technology use in the HEI was rated by the respondents on a scale from 1 to 6, where 1 meant not at all/to a negligible extent and 6 meant to a great extent/fully. Most responses indicated level 5 (46.02); the average level for all HEIs surveyed was 4.61. However, it is worth noting that the level of digital technology use by individual HEIs varied considerably, which was confirmed by the result of the chi-square test. Detailed data is presented in Table 2.

Table 2.
Level of use of digital technologies according to respondent statements

Level of use of digital technologies in their processes by HEIs (scale 1-6)						**M**	**Statistical significance**
1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)		$\chi2 = 118.993$*; V = 0.215
0.58	2.33	7.96	28.16	46.02	14.95	4.61	

n = 515; % — percentage; p — statistical significance; * — $p < 0.05$; $\chi2$ — chi-square test; V — Cramer's V coefficient.

Source: Own survey.

The level of progress of digital transformation in the HEI was assessed by the respondents using a scale from 0 to 4, each level being described as follows:

Table 3.
Description of the levels of progress of digital transformation in the HEI

Level 0	**Digital transformation has not yet begun.**
1 — low level	My institution is at the beginning of its journey in the use of digital technology; we are gaining our first experiences in this area.
2 — medium level	My institution is beginning to experiment with digital technologies that are not yet fully integrated into educational, administrative, and research processes. High level
3 — very high level	My university is beginning to integrate digital technologies into administrative, educational, and research processes in line with its digitalisation strategy.
4 — very high level	My institution is creating new business models and products using digital technologies.

Source: own work.

Table 4 shows the percentage of responses indicating the level of digital transformation at their HEI. Almost half of the respondents (49.51%) rated the level as very high; the average level of progress of the transformation in the surveyed HEIs was 2.61. It is worth noting that the level of digitalisation declared by the respondents depended on the HEI, which was confirmed by statistical analyses (chi-square test). This means that both the level of digitalisation and the level of use of digital technologies among the surveyed HEIs varied greatly; the group of surveyed HEIs included both those that distinguished themselves by their sophistication in the studied area and those characterised by a low level of digital transformation.

Table 4.
Level of progress of digital transformation in the HEI according to respondent statements

Level of progress of digital transformation in the HEI (%)						**Statistical significance**
0	1	2	3	4	M	$\chi2 = 121.795$*; V = 0.243
0.39	6.99	33.20	49.51	9.90	2.61	

n = 515; % — percentage; p — statistical significance; * — $p < 0.05$; $\chi2$ — chi-square test; V — Cramer's V coefficient.

Source: Own survey.

From the perspective of the purpose of the study and the set hypothesis, it was important to test the relationship between the level of digital technology use by HEIs and the level of digitalisation on the one hand, and the leadership practices found in the HEIs and the behaviour of the immediate supervisor on the other. Leadership practices refer to situations that describe a leadership culture, including flexibility as a value, practices occurring not only at a team level but promoted throughout the organisation, e.g., the creation of interdisciplinary teams and the attitude of university authorities towards digitalisation. Supervisor's behaviour only refers to the supervisor's practices within the individual respondent's team. In both the first and second cases, all the statements described refer to an agile approach and are set in the context of digitalisation.

Table 5 shows the results of the Spearman rank correlation coefficient for a summary of the evaluation of agile management practices implemented in an HEI and the level of digital technology use and the level of progress of digital transformation. The results confirmed a statistically significant ($p < 0.05$) correlation in all analysed cases. The strongest relationship (average correlation strength) was observed between the level of digital technology use and the level of progress of digital transformation in an HEI and the practice of supervisors encouraging employees to innovate and seek innovative solutions. Moreover, the level of progress of an HEI's digital transformation correlates positively with the practices of encouraging frequent testing and experimentation by staff, quick decision-making by management, the university authorities' emphasis on the importance of digitalisation and digital transformation in building a competitive advantage in the education market and flexibility as an important organisational value.

Table 5.
Agile management practices and degree of digital technology use and level of digital transformation progress according to respondent statements

Leadership practices	Relationship between the level of digital technology use and the evaluation of management practices	Relationship between the level of progress of an HEI's digital transformation and the evaluation of management practices	M
Staff is encouraged by their superiors to innovate and seek innovative solutions.	**r_s=0.465038;** p=0.000000*	**r_s=0.485343**; p=0.000000*	3.23
Staff is encouraged to test and experiment frequently.	r_s=0.426532; p=0.000000*	**r_s=0.458902**; p=0.000000*	3.02
Failure is treated as a lesson; we believe that creating innovation requires making mistakes.	r_s=0.256795; p=0.000000*	r_s=0.287113; p=0.000000*	3.17
We often form project teams consisting of representatives from different departments of the institution.	r_s=0.277807; p=0.000000*	r_s=0.349024; p=0.000000*	3.13
We are encouraged to work effectively with external stakeholders (partners).	r_s=0.271933; p=0.000000*	r_s=0.340864; p=0.000000*	3.49
We often survey the expectations of our customers, e.g., students, in order to improve the services offered.	r_s=0.250134; p=0.000000*	r_s=0.32798; p=0.000000*	3.46
We create prototypes of our services, which we test/consult with clients/students or other employees.	r_s=0.307913; p=0.000000*	r_s=0.36754; p=0.000000*	3.07
We create new ideas, services, offers, actively collaborating with students (customers), external partners, suppliers, and other stakeholder representatives.	r_s=0.277894; p=0.000000*	r_s=0.344094; p=0.000000*	3.36

Cont. Table 5.

We use agile project management methodologies such as Scrum, Kanban, Agile or others.	r_s=0.307986; p=0.000000*	r_s=0.33079; p=0.000000*	2.82
Decisions are made quickly by managers in my institution.	r_s=0.357525; p=0.000000*	**r_s=0.424853; p=0.000000***	3.13
Flexibility is a valued asset in my institution.	r_s=0.397726; p=0.000000*	**r_s=0.415676; p=0.000000***	3.35
Institution authorities emphasise the importance of digitalisation and digital transformation in building competitive advantage in the education market.	r_s=0.385334; p=0.000000*	**r_s=0.438519; p=0.000000***	3.57

n = 515; M — mean; r_s — Spearman's rank correlation coefficient; p — statistical significance; * — $p < 0.05$.

Source: Own survey.

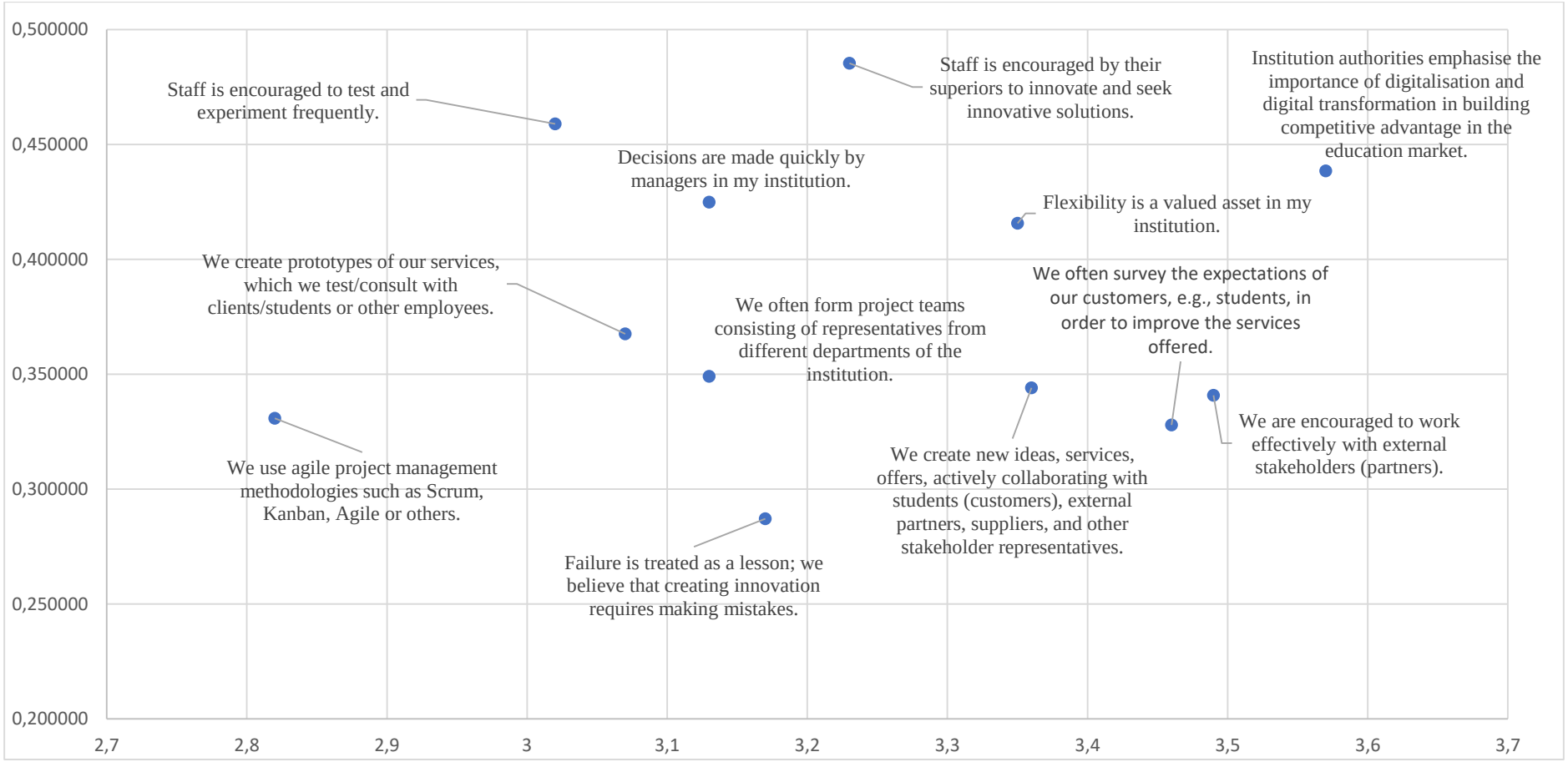
Figure 1 shows the correlation values of the different agile management practices used in HEIs with the level of digital technology use in an HEI. Agile project management methodologies (2.82) and service prototyping (3.07) are used least often in HEIs. Two other practices are also relatively rare: superiors encouraging subordinates to innovate and seek innovative solutions (3.23) and encouraging frequent experimentation and testing (3.02). Both of these practices correlate (at an average level, the highest achieved in this study) with both the respondents' declared level of digital transformation and the level of use of information technology in the HEI (Figure 1 and Figure 2).

Figure 2 visually presents the correlation values of each agile management practice with the level of digital transformation progress. It is worth comparing the management practices that correlate highest with an HEI's level of digital transformation progress to the frequency of their occurrence in HEIs. The data collected shows that respondents are least likely to be encouraged to test frequently (3.02); at the same time, this is a practice that correlates with the level of progress of digital transformation. Analysing the data presented in Tables 4-5 and Figures 1-2, it is worth noting that none of the surveyed management practices achieved a higher frequency score than 3.49 on a scale of 1 to 5, indicating that agile management practices are implemented in HEIs at an average level.

n = 515.

Figure 1. Agile management practices and the level of use of digital technologies according to respondent statements.

Source: Own survey.



n = 515.

Figure 2. Agile management practices and level of progress of digital transformation according to respondent statements.

Source: Own survey.

In the case of the relationship between the level of use of digital technologies and the level of progress of digital transformation and the management practices of direct supervisors in an HEI, the Spearman's rank coefficient results indicated a statistically significant correlation between each of the variables analysed ($p < 0.05$). The three strongest correlations found were between the supervisor's active involvement in the digital transformation process in the institution and the level of digital transformation (average strength), the supervisor's encouragement of digital competence and the level of digital transformation (average strength), and between the supervisor's active involvement in the digital transformation process and the level of digital technology use (average strength) (Table 6).

Table 6.
Management practices of direct supervisors in the HEI vs. the degree of digital technology use and the level of progress of the HEI's digital transformation

Behaviours of direct supervisors	**Relationship between the level of digital technology use and the behaviours of the direct supervisor**	**Relationship between the level of progress of an HEI's digital transformation and the behaviours of the direct supervisor**	**M**
Has an innovative vision, sees value in digitalisation and opportunity for the institution to grow.	r_s=0.292597; p=0.000000*	r_s=0.348408; p=0.000000*	3.72
Has the ability to quickly build and coordinate interdisciplinary teams organised around the implementation of digital solutions in the HEI.	r_s=0.308918; p=0.000000*	r_s=0.341858; p=0.000000*	3.54
Has up-to-date knowledge and skills in digital technologies and their use in our area of operation (e.g., teaching, administration or research).	r_s=0.305053; p=0.000000*	r_s=0.361016; p=0.000000*	3.58
Is actively involved in the digital transformation process in the institution.	**r_s=0.379671; p=0.000000***	**r_s=0.414303; p=0.000000***	3.49
Supports employees when they encounter difficulties in the area of digitalisation, e.g., when implementing new IT solutions and developing their competencies.	r_s=0.333953; p=0.000000*	r_s=0.369379; p=0.000000*	3.53
Invests in the development of their digital competencies; is willing to test them themselves; is a model in this area.	r_s=0.307714; p=0.000000*	r_s=0.360196; p=0.000000*	3.48
Encourages me to develop my digital competencies, e.g., by attending internal or external training courses.	r_s=0.315673; p=0.000000*	r_s=0.380947; p=0.000000*****	3.58
Involves me and other employees in decisions that affect our work and my digital working environment.	r_s=0.319774; p=0.000000*	r_s=0.352736; p=0.000000*	3.47
Encourages employees to make greater use of different types of IT solutions.	r_s=0.311134; p=0.000000*	r_s=0.366268; p=0.000000*	3.57

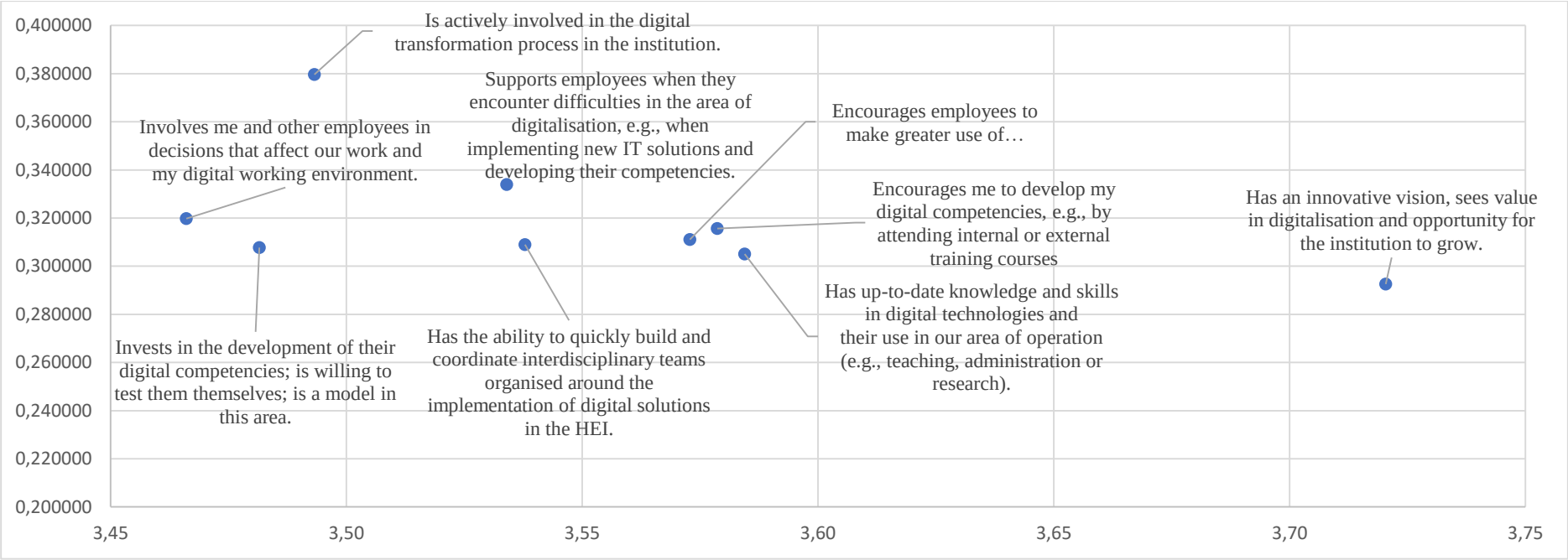
n = 515.

M — mean; r_s — Spearman's rank correlation coefficient; p — statistical significance; * — $p < 0.05$.

Source: Own survey.

Both the data presented in Table 6 and in Figures 3 and 4 show that the activity of the direct supervisor in the area of digitalisation plays a key role in the area of digitalisation development in HEIs; at the same time, it is relatively rare in the surveyed HEIs (3.49) — certainly less frequent than other behaviours assessed in this question. Considering the fact that the frequency of specific behaviours of the supervisor was rated by the respondents on a scale of 1 to 5, it can be said that it is also rare at the surveyed HEIs for the direct supervisor to involve their subordinates in decisions affecting the digital working environment (3.47) and to invest in the development of their digital competencies, and to be a model in this area (3.48).

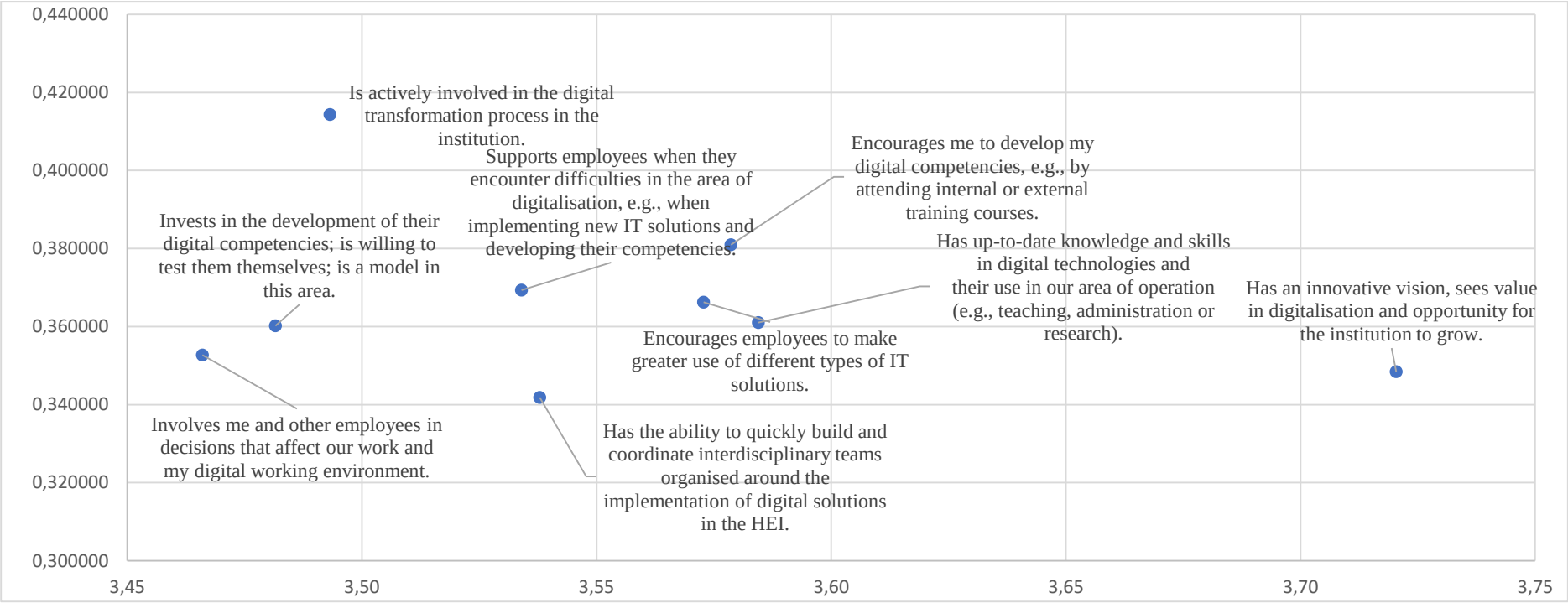
Figures 3 and 4 clearly show that the average frequency of most of the assessed practices of the immediate supervisor assumed values between 3.48 and 3.58. Most common among the assessed practices is the creation of an innovative vision, the supervisor seeing value in digitalisation and the opportunity for growth in the institution.



n = 515.

Figure 3. Management practices of the direct supervisor vs. the level of use of digital technologies according to respondent statements

Source: Own survey.



n = 515.

Figure 4. Management practices of the immediate supervisor and the level of digital transformation of the institution according to respondent statements

Source: Own survey.

Discussion

Digital transformation in higher education institutions is increasingly becoming a subject of interest for researchers. Undoubtedly, the pandemic has been a major catalyst for change in HEIs in this area and has revealed the challenges HEIs have faced, not only in the organisational dimension or in the dimension of infrastructural resources but also in the area of managing the transformation process and the digitalisation of the institution.

The aim of this article was to present the results of a study investigating the relationship between management practices used in the institution and presented by direct supervisors and the level of progress of digital transformation in HEIs. The hypothesis was that there is a relationship between the progress of digital transformation and agile management practices. A survey of 515 employees at 20 Polish HEIs confirmed the link between the level of progress of digital transformation in an institution and its level of use of digital technology and the agile management practices used in the institution and by the direct supervisor. The strongest correlations identified were observed between the declared level of digitalisation of the institution and the management practices of supervisors encouraging their subordinates to innovate and seek innovative solutions and encouraging frequent testing and experimentation. This type of behaviour is characteristic of so-called transformational leaders, who, according to research (Wanasida et al., 2020; Porfirio et al., 2021; Büyükbeşe et al., 2022) encourage innovation and support subordinates and thus promote agility in the organisation, which fosters digital transformation in the organisation.

Correlations were also shown between the level of digital transformation of an HEI and the institution's authorities' emphasis on the importance of digitalisation and digital transformation in building a competitive advantage in the education market, as well as the leader's active efforts towards digital transformation. A positive correlation was also observed between the level of digital transformation of HEIs and the active operation of leaders in the area of digitalisation, which confirms the observations of other researchers. The leader plays a key role in the process of digital transformation (Abbu et al., 2022; Antonopoulou et al., 2021), sets the digital direction (Masrur, 2021; Cifuentes-Álvarez, Vanderlinde, 2015), and should be involved in the digitalisation strategy (Holth, Boe, 2019).

Today, developing the competencies of digital leaders in HEIs is a strategic challenge for the academic world (Sułkowski, 2022; Ehlers, 2020), especially because many institutions are still culturally, mentally, and organisationally in a post-Humboldtian stage (Sułkowski, 2022). Management structures are based on a traditional hierarchical model, the level of academic entrepreneurship is still relatively low, and decisions are more often made centrally rather than according to a participatory model. Higher education institutions lag behind other businesses

and industries in terms of digital progress levels. Due to market pressures, other industries have likely been forced to start the transformation faster than HEIs (Rodríguez-Abitia, Bribiesca-Correa, 2021).

Conclusions

This study expands on previous research on digital leadership, in particular academic digital leadership, which is still under-explored. The literature review indicates a research gap in the area of digital academic leadership and its role in building the digital maturity of an HEI. The results of the study provide important insights and contribute to developing knowledge on the relationship between agile leadership practices and an HEI's digital transformation process. They provide a basis for further research and development of digitalisation strategies tailored to the specificities of higher education.

The results of the study may be applicable to the broader HEI population, but caution should be exercised in their generalisation due to certain limitations of the sample. The HEIs that took part in the survey were not a representative sample of Polish higher education and the population surveyed was also not representative of the institution in question. The typical limitation of a quantitative survey — the subjectivity of respondents' self-assessments — must also be taken into account.

The research certainly needs to be continued. In the course of further exploration, it would be worthwhile to supplement the research approach with mixed methods that offer opportunities for deeper analysis of the described phenomenon, e.g., document analysis or observation and interviews with university representatives, including leaders and people responsible for digitalisation in the institution. For this reason, there are plans to continue the research with a broader and more precisely selected sample and to utilise triangulation of quantitative methods and in-depth qualitative analysis.

The results of the study can provide valuable information for higher education institutions regarding the implementation of new digital leadership strategies. They can inform the design of academic leadership development programmes focused on developing an agile approach to management in educational institutions.

Implementation of effective leadership strategies can lead to increased innovation in higher education institutions, optimisation of educational processes, more effective use and implementation of information technologies and improvement of the quality of education, as well as increasing the competitiveness of Polish higher education in the global education market.

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