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MANAGING VIRTUAL TEAMS – A NEW MODEL OF COMPETENCE

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Purpose: Model of competence describing the specifics of relationships in virtual organizational teams after 2020 (the research was conducted in 2024). The final model was obtained on the basis of our own research.
Methodology: The methodology of own research included in the following order: systematic literature review; construction of an original research tool (questionnaire based on the results of a literature review); surveys (virtual team managers and virtual team members).
Findings: On the basis of our own research, a completely new competency model was built to describe the behavior of virtual team leaders.
Research implications: The most interesting result in the obtained model of competence can be considered that among the 14 indicators of behavior confirmed in the research process, as many as 11 of them refer to aspects of people or relationships in the team. Therefore, although we are talking about virtual teams, paradoxically, aspects of functioning related to the characteristics and behaviors related to building and maintaining interpersonal relationships come to the fore.
Practical implications: The results of the research may be useful for virtual teams leaders, for people leading teams working remotely for part of the working days, and for superiors managing employees working from home (WFH). In addition, the results of the research may be useful for the daily practice of HR departments, and especially HR of partners involved in developing the competencies of future managers. We hope that the text of the articles contains a ready-made set of competencies along with behavioral indicators key to effective teamwork in the digital environment. Thus, they may have an impact on updating the shape of managerial competency programs and shaping evaluation systems relating to people in managerial positions.
Social implications: The dissemination of this competency model may change societal expectations of people leading virtual teams towards presenting more soft skills instead of prioritizing technical agility.
Originality/value: The model can bring new value to the area of research on organizational leadership, competencies and the functioning of virtual teams. The model also complements research in the field of individual differences describing the management of virtual teams.
Keywords: Virtual team management, virtual teams, competencies, competency models.
Category of the paper: Research paper.

1. Introduction

The rapid development of remote work after 2020 has shown the high importance of people in the organization. As Higgins and Bianzino (2020) state when describing organizations after 2020: "[...] People are not anonymous elements of many layers of a large organization. People are an organization – its most important and powerful resource. […] human ingenuity, resourcefulness and diversity of experience – combined with technological tools – can create solutions, ideas and business models for the future". Therefore, it can be said that in the current reality of organizations, it is the human being who is supported by technology in their functioning.

Analyzing the basic components of the digital transformation of enterprises, we see that digital transformation begins with people. Even if we talk a lot about data during the changes towards digitization and ultimately build a strongly data-oriented organization, it should be remembered that there are always people "at the end of the data" (Chamorro-Premuzic, 2021).

While remote work in teams was previously a feature of international virtual teams (the so-called Global Virtual Team - GVT) working in globally distributed locations, it became common after 2020: for example, in 2021, based on a Gartner report, we can estimate that 70% of relationships between supervisor and subordinate in 2021 were asynchronous or remote (Turner, 2022; Kropp et al., 2021).

Paradoxically, due to the universality of use and the loss of the "exclusivity" feature of remote group work, the limitations of this form of task implementation have been realized. In other words, remote work and hybrid forms of work have become commonplace, but only to a certain extent so effective previously provided by direct work. Extensive research, verifying and operationalizing the above statements, has shown a high potential for some jobs to perform them remotely. On the other hand, such tasks have been distinguished that are much more effective in person than remotely (Lund et al., 2020).

The universality of remote work and at the same time the awareness of its limitations leads, m.in, to the search for those elements in management and teamwork that allow to increase the effectiveness of joint work conducted in a virtual environment. This article summarizes and structures in the form of a competency model the results of own research in the field of behavior indicators that increase the effectiveness of a leader leading a virtual team.

The large number of virtual teams was not only an episode of the COVID-19 pandemic, but is a phenomenon that continues (Murphy, 2024). It is estimated that almost 50% of meetings are still held remotely, and employees spend an average of 23 hours in meetings per week (Aliman et al., 2024). Thus, about 1/4 of the weekly working time is taken up by working in teams through digital technologies.

Therefore, an important question becomes the question: What skills of the team leader to build and maintain to support the functioning of the team working virtually (Murphy, 2024). The matter is not easy, as we are also talking about basic (universal) competencies, but related to the efficiency of functioning in the digital environment and, consequently, to the effectiveness of the team (Heubeck et al., 2024).

Virtual teams are different from classic task-based teams working in face-to-face contact and hybrid teams (Grobelny, 2023). Hence, it seems, the way they are managed or the specifics of the leader's functioning may also emerge. However, the difference is not only in the scope of: classic – hybrid – virtual, but also in the area of virtual teams in the timeline. As in the case of virtual teams, when we talk about leadership in virtual teams, the pandemic caesura is a kind of marker. Of course, we have texts from before 2020 pointing to analyses of leadership carried out virtually (Avolio et al., 2014), but after 2020 we are dealing with both quantitative and qualitative change.

As we know, in 2020-21, working and leading virtual teams (the abbreviation often used in the scientific literature is: VT) has become a standard in many, diverse industries. Along with the quantitative change, a fundamental change in the narrative can be noted. Before 2020, online work was perceived, for example, in reports by the International Labour Organization (ILO) as one of the biggest dangers of the decade, disrupting the balance of work and leisure. On the other hand, the situation after 2020, with the mass emergence of VT, posed challenges for both traditional and virtual teams, organizations and their leaders (Bagga et al., 2022; Afrianty et al., 2022; Herath, Herath, 2020; Bekirogullari, Thambusamy, 2020). Currently, we are not focusing on difficulties and threats, as in publications before 2020, but on answers to the question of how to work in VT with greater efficiency. Texts published since 2020 change the narrative: they do not show risks, they talk about the challenges and benefits of working at VT and leadership at VT (Raffoni, 2020). Even if texts published after 2020 speak directly about the difficulties of working in virtual teams, they indicate the reasons for this and give suggestions for neutralizing negative phenomena (Mortensen, 2023). The reason for the change in narrative may be prosaic: Between 2018 and 2022, the results generated by team leaders working with digital tools differed significantly and were higher than those of leaders working with the same tools to a negligible extent (Lamarre et al., 2023). However, digital transformation is not only about increasing the results achieved, it also brings disappointments. One of them is the scale of the results achieved in relation to expectations. It is estimated that 89% of large companies around the world are undergoing transformation with the use of digitalization and artificial intelligence, they only get 31% of the expected revenue growth and 25% of the expected cost savings through effort (Lamarre et al., 2023).

Therefore, while digital transformation is a common phenomenon, the results achieved are discussed. Therefore, it is worth looking not only at the level of the entire economy or individual business models chosen by organizations (which was done in earlier chapters). Currently, when writing about organizations, we analyze processes that take place simultaneously at the

level of employee teams and individual people who make up the team and thus organizations (Preller et al., 2023; Hashemi et al., 2022).

2. Methods

From the perspective of the changes that have taken place in the implementation of work after 2020, it seemed reasonable to check whether working in virtual teams requires a specific set of competencies of the person leading such a team.

Therefore, the aim of the research was defined: to establish a set of competencies with behavioral indicators adequate for leading virtual teams.

The methodology of our own research included in the following order:

1. Systematic literature review.
2. Construction of an original research tool (questionnaire based on the results of a literature review),
3. Surveys (virtual team managers and virtual team members).

In the field of a systematic review of literature, a review of issues appearing in the literature on the subject over the years 1998-2024 was carried out, followed by a detailed review of the topics from 2020 – 24. On the basis of the two aforementioned analyses, the year 2020 was identified as the borderline moment of the change in the narrative in terms of describing the functioning of virtual teams and interpreting research topics differently (constantly present over the course of 35 years).

The aforementioned detailed analysis of the literature published after 2020 allowed to distinguish 3 narrative streams on the functioning of virtual teams:

1. renewing already represented approaches in leadership thinking relating to classic teams – in other words, looking for the "fit" of the current situation with pre-existing typologies,
2. a change in the perception of virtual teams and their role in organizations – in other words, attempts to place leadership thinking in VT on the timeline set by the “pandemic milestone”,
3. a change in thinking about leadership in HRM in order to restore the stability of the organization and ensure greater resilience to crises in the future - in other words, to try to define leadership in VT related to the context of the changing understanding of human functioning in the organization in order to increase the resilience of the organization.

In the next step, an original research tool was constructed. The results of a systematic literature review were used. Each of the three coexisting narratives in the post-2020 literature review was analyzed in terms of the descriptions contained in it:

- areas of work of the leader with the team,
- skills considered necessary in a leader,
- activities that a leader should take.

The extracted data were edited and piloted to make comparisons between the narratives. Editing and pilot studies included the following steps:

1. Separation and organization of elements describing work in a virtual team according to a given theory/approach.
2. Create aggregated descriptions that combine similar content within a given story and similar content between stories, if any.
3. Changing the form of aggregated descriptions: from statements to behavioral descriptions.
4. Construct an output pool of questions for a survey.
5. Expert consultations of the initial question pool.
6. Create a survey for pilot studies.
7. Pilot studies.
8. Editing of the pool of questions and the content of questions based on the results of pilot studies.

The activities in points 1-4 and 6-8 were performed by the authors of the publication. In the scope of points 1-4, the phases of individually editing the content of individual statements by both authors were alternately repeated, and then the content of individually developed solutions was agreed. The phases of individual work and content agreement were repeated 5 times. Next, the draft version of the tool (point 5 of the above list) was presented for review by both scientists – specialists in management sciences, and managers working in virtual teams. On the basis of the comments submitted by the experts (point 5), a pilot version of the test was developed by the authors (point 6). In this case (point 6), work was also carried out using the alternating use of the individual work phase and reconciliation, this process was repeated 3 times. After conducting pilot research, the authors made the final editing of the content of the set of 18 statements.

From a set of unified descriptions based on another analysis, covering the leader's areas of work and priority skills. indicators characteristic of each of the 3 narratives have been distinguished. For each of the narratives, 6 behavioural indicators were distinguished, which gives a total of 18 indicators.

Semantic analysis of the indicators in each narrative allowed us to determine a consistent motif for each of them. These were, respectively:

Narrative 1: The person of the leader and the qualities of this person.

Narrative 2: Skills in the use of individual tools or resources.

Narrative 3: Building relationships with your team.

The model of the research tool at this stage is presented in Table 1.

Table 1.
A model of statements that make up a research tool, content based on semantic analysis of data obtained as a result of a systematic review of the literature

Narration	Behavior indicators
Narrative No. 1: A person of a leader and the characteristics of that person	Mindfulness of the leader, which strengthens the commitment of team members.
	Creating trust-based relationships in the team by the leader.
	Ensuring that the leader and the team understand the goals in the same way.
	Building team interactions by the leader so that they support the group's co-creativity.
	The leader uses the diversity existing in the team (e.g. competence, cognitive, personality, etc.).
	Creating conditions for employees to cope with ambiguous tasks more easily by the leader.
Narrative No. 2: Application skills in scope of individual tools or resources	Providing access to appropriate infrastructure (e.g., devices, information tools, software, network connectivity, etc.).
	Encouraging the leader to use short text messages (e.g., chat, instant messaging, etc.) as a communication tool for the team.
	Ensuring that the leader communicates on an ongoing basis through team meetings.
	Encouraging team members to communicate the need for mutual assistance (e.g. substantive support, reduced workload) by the leader.
	Selecting the team in a way that ensures the coverage of competencies adequate to the tasks (e.g. by greater involvement of organizational experts in the work of the team).
	Setting clear divisions of tasks in the team by the leader.
Narrative No. 3: Build relationships with your team	Developing solutions (e.g. behavioural patterns for crisis situations) by management necessary for the time of crisis.
	Identification by management of possible crisis events that require a change in the way of working.
	Quick acceptance of responsibility by the leader for the challenges resulting from the crisis situation.
	Implementing patterns of behaviour (e.g. process or organisational changes) developed by management for crisis situations into the team's ongoing work.
	Ongoing support by the leader for changes in behaviour in the team's work based on the experience gained in the crisis.
	The leader uses the crisis to accelerate the development of employee independence.

Source: (own study).

As mentioned earlier, the third stage of the research, after a systematic review of the literature and the construction of the research tool, was to conduct a survey of the study. Based on the model presented in Table 1. An electronic questionnaire was constructed, in which 18 behavioural indicators were presented to the respondents in random order. The presentation of the indicator was accompanied by the same question each time:

"Based on your as a team leader (team member) who has transitioned to virtual work during the pandemic, determine how important this factor is for the transition to remote work".

Under the question, a statement was presented (one of eighteen). The screen also contained a description of the ends of the scale on which the person made the decision. For point 1, the description was presented: "It doesn't matter at all"; for point 10 it was the description: "It is essential". The task of the respondent was to decide on the meaning of a given statement (from 1 to 10) as an element relevant to the transition to remote work.

The authors assumed that the study is exploratory in nature and the entire model is tested, hence no research hypotheses relating to the tested model were formulated. Also, a review of the literature or the models existing until the research was conducted did not provide grounds

to conclude that, for example, 1 out of 3 narratives that make up the tested model will turn out to be stronger than the others.

The survey was conducted on a group of 264 employees of one of the international consulting companies, employing several thousand employees in Poland. The group invited to the study were people who switched to working in virtual teams in 2020 and continued (2024) to carry out at least part of their projects in such teams. Both team managers (in 2020 and 2024) and employees of such teams (2020 and 2024) were invited to the study. Therefore, managers and employees, at the time of the study, had at least 4 years of experience working in virtual task teams.

From such a selected group of people, the survey was finally completed by 138 managers of virtual teams and 126 employees of virtual teams working in locations throughout Poland.

The survey questions referred to working in virtual teams during the pandemic, but (as mentioned) the respondents continue to work in this way. Therefore, it can be considered that the question referred to a distinct trigger, but the individual responses in the survey were superimposed on 4 years of experience in the type of work asked about in the survey. In the end, the answers could refer not so much and not only to the situation from 4 years ago - here, due to the specificity of the functioning of long-term memory, the image could have been strongly "polluted" (Kahneman, 2022). It can be assumed that the answers refer rather to the accumulated experience of working as a manager or employee of a virtual team, over the years 2020-24.

3. Results

The collected results of the survey were subjected to statistical analyses in three stages:

1. In the first stage, the baseline model (obtained on the basis of literature review and subsequent edits) was analyzed in terms of the research data obtained.
2. In the second stage, the decision was made to re-specify the initial model and search for the optimal structural model.
3. In the third stage, the structural model selected in the 2nd stage was analyzed.

All stages and the actions taken at these stages are presented in Figure 1.

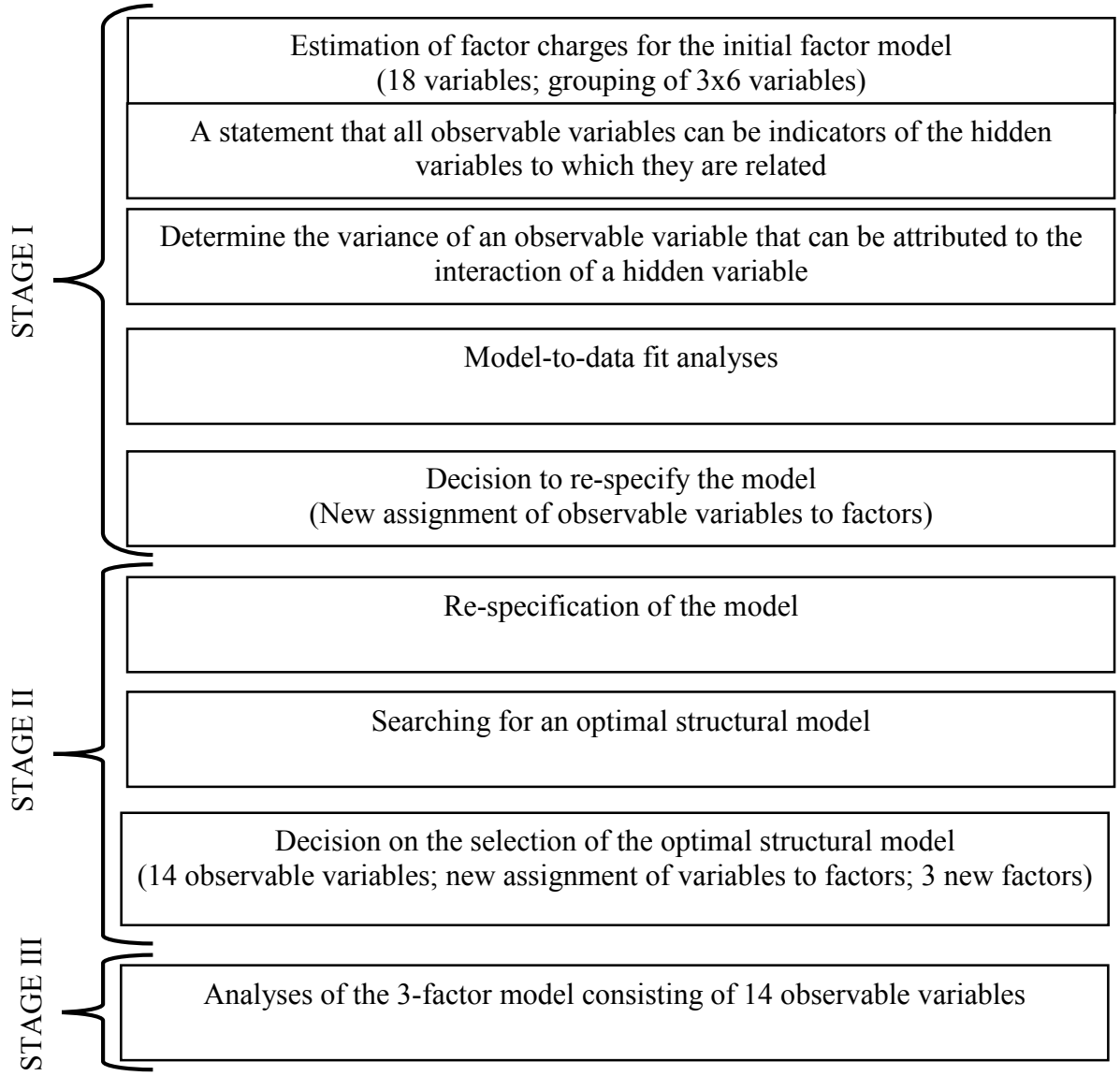

Figure 1. Stages of analysis of the obtained research data.

The first analysis of the factor model was carried out. For the purposes of this analysis, working names were given to hidden variables and observable variables. It was a necessary activity, from a technical point of view.

Starting from a survey based on 3 groups, 6 statements in each group, we had a picture of the structure before the research, as in Figure 2. The initial structural model was obtained on the basis of data from the literature review and subsequent revisions of the statements contained in the survey.

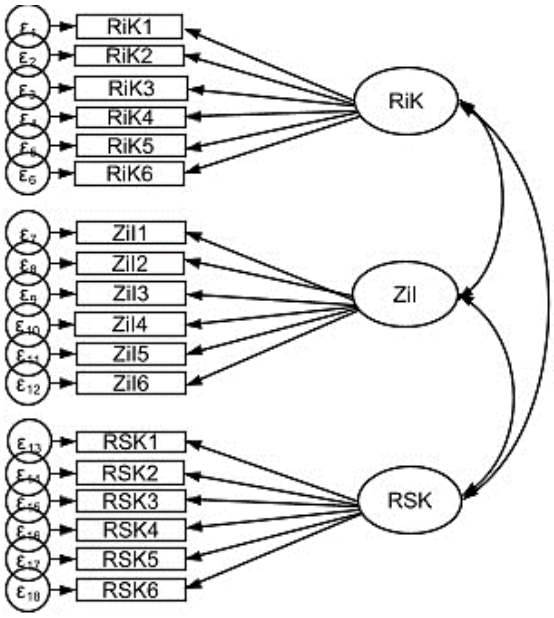

Figure 2. Initial structural model.

The first analysis was to estimate the factor charges for each of the 18 statements used in the survey. The results are shown in Figure 3 (factor charges only).

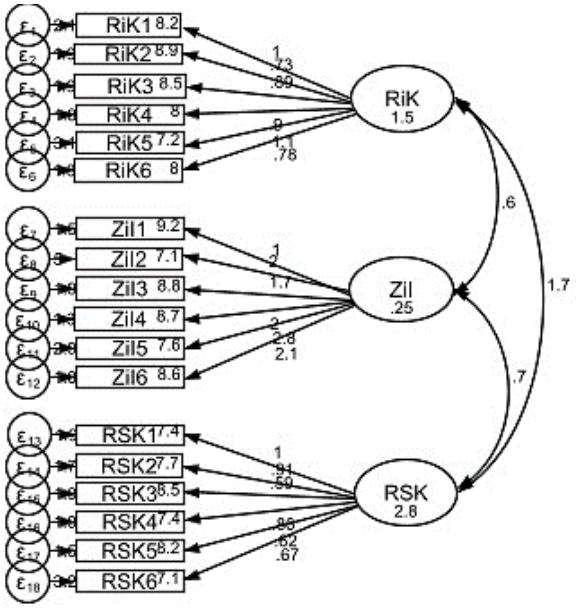

Figure 3. Factor charges obtained in studies for the initial structural model.

The data presented in Figure 3. indicated that all factor charges for the 18 survey statements were statistically significant at < 0.05. In such a case, we may be dealing with the phenomenon that:

1. All observable variables can be treated – to a greater or lesser extent – as indicators of the hidden variables to which they are related.
2. The result obtained may also be a consequence of the sample size (with a larger sample, it might not occur).

For further analyses, the first assumptions were made (all observable variables can be indicators of hidden variables to which they are related) and further analyses were performed for the collected data.

In the light of the presented data, an answer to a more basic question was also sought: Does our model reflect the data structure well and is it really the one we have theoretically adopted? Therefore, the analysis of the model's fit with the data was carried out, using a central analysis in structural equation modeling, which consisted of the following tests: Likelihood Ratio Test (*LR*), RMSEA Test (*Root Mean Square Error of Approximation*), PCLOSE Test (*Test of Close Fit*), CFI (*Comparative Fit Index*), TLI (*Tucker-Lewis Index*), SRMR (*Standardized Root Mean Square Residual*). The combined analysis of the above indicators of model match-to-data indicated that the original model (3 factors of 6 indicators each) is at the limit of acceptability or shows poor match with the data. This kind of has become a recommendation for re-specifying the model.

The first step in the re-specification of the model was to answer the question of whether the collected data allow for inferences in their order in a factor structure. For this purpose, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (Kaiser-Meyer-Olkin Measure of Sampling Adequacy; KMO) to be able to assess the usefulness of the data you have for factor analysis. Obtaining KMO = 0.914 allowed us to conclude that the correlation matrix between observable variables gives grounds for inferring a factor structure. Then, with the help of scree plot and parallel analysis, the optimal amount of factors for the new model was searched for. Since no unambiguous picture of the number of factors was obtained, but only an indication of the legitimacy of generating models from 1 to 4 factors, the next step of the analysis was carried out to analyze four potential solutions, i.e. the 1-, 2-, 3-, 4-factor model, respectively. Since there is no solution in this regard (1 to 4 factors) where:

- the data structure gives an unambiguous picture,
- the analysed indicators are linked to each other in a consistent manner,
- the factors are not well separated (separable).

This is a significant element for the final decision and the criterion for the substantive (qualitative) evaluation of the results.

After qualitative analysis, a 3-factor model was selected, which is shown in Figure 4.

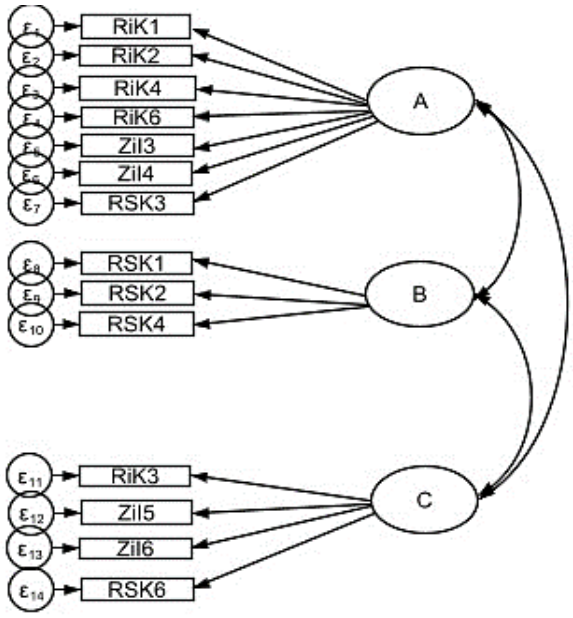

Figure 4. Structural model for a new system of factors.

The last stage of the analyses (stage III – see Fig. 1) was to subject the new structural model (14 indicators, 3 new factors) to the same analyses as the initial model in stage I (see Fig. 1). Therefore, the analysis of the model's fit with the data was carried out again, using a central analysis in structural equation modeling. Analyses of the model fit (Fig. 4) to the data showed that the new model after re-specification (14 indicators, 3 new factors) is at least acceptable, with a tendency to fit the data very well. At the same time, the result of the analyses of the model-to-data fit is different from the analyses carried out for the initial model in stage I (Fig. 2), where we were dealing with a model at the limit of acceptability with poor matching to the data and a recommendation to re-specify the model.

Final result – a model describing relevant behavioural indicators for leading virtual teams

Thus, the final model, describing the elements important for managing virtual teams, became a 3-action model, containing 14 indicators (Fig. 4). Details of the model – i.e. individual factors and indicators included in them – are presented in Table 2.

Table 2.
The final version of the model, the factors and the observable variables that comprise them

Factor	Observable variable label
Individual perspective	Mindfulness of the leader, strengthening the commitment of team members.
	Creating trust-based relationships in the team by the leader.
	Building team interactions by the leader so that they support the group's co-creativity.
	Creating conditions for employees to cope with ambiguous tasks more easily by the leader.
	Ensuring that the leader communicates on an ongoing basis through team meetings.
	Encouraging team members to communicate the need for mutual assistance (e.g. substantive support, reduced workload) by the leader.
	Quick acceptance of responsibility by the leader for the challenges resulting from the crisis situation.

Organizational perspective	Developing solutions (e.g. behavioral patterns for crisis situations) by management necessary for the time of crisis.
	Identification by management of possible crisis events that require a change in the way of working.
	Implementing patterns of behavior (e.g. process or organizational changes) developed by management for crisis situations into the team's ongoing work.
Team perspective	Ensuring that the leader and the team understand the goals in the same way.
	Selecting the team in a way that ensures the coverage of competencies adequate to the tasks (e.g. by greater involvement of organizational experts in the work of the team).
	Setting clear divisions of tasks in the team by the leader.
	The leader uses the crisis to accelerate the development of employee independence.

Expanding on the names presented in Table 2, the 3 factors that make up the current model can be understood as below:

1. Individual perspective – means focusing on the description of the behavior of the individual, which is the team leader; It is also the perspective of seeing the leader as a person with specific social competencies and focused on individual employees forming a team.
2. Organizational perspective – means focusing on the actions that should be taken by the organization; In the described model, the organization's actions are identified with the activity of the management staff of the nature of "system preparation", and not with ongoing work with the team.
3. Team perspective – means focusing on the team leader's activities aimed at the whole team as an individual; This means that a leader in his behavior, even if he refers to a single employee, the perspective of making decisions and choosing actions is the well-being and effective functioning of the entire group.

However, the final model is not completely new, as in the literature review preceding the construction of the model for research, there were 3 main narratives related to the management of the virtual team. In the perspective of the literature review, these were: the person of the leader and the qualities of this person; skills in the use of individual tools or resources; building relationships with the team. Thus, the elements from the literature review can be related to the final model obtained as a result of the research. The similarities that appear at the stage of literature review and in the final model are presented in Table 3.

Table 3.
Factors identified in the literature review and obtained as a result of the research

Factor	
In the literature review	**In the model obtained as a result of the research**
Leader person and characteristics of this person	Individual perspective
Skills in the use of individual tools or resources	Organizational perspective
Build relationships with your team	Team perspective

Similar divisions into: the characteristics of a leader, the area of activity of the organization and the relationship between the leader and the team appear in contemporary publications on management in the digital age – these results will be discussed in more detail in the section devoted to the discussion of the results obtained.

4. Discussion

Discussion: Chosen path of interpretation as too focused on people instead of technology

In the final model, we note 3 factors and 14 observable variables. Valuable information, although at the same time it may arouse discussions, is the fact that 3 out of 14 variables refer to the perspective of the organization, and 11 out of 14 variables refer to the characteristics of a person or the way of building relationships in a task team. Looking at the final model, it can also be said that it emphasizes social competences of a universal nature (50% of all observable variables included in the model refer to this range). **Isn't this perspective too focused on people instead of technology and benefits for organizations?**

To indicate that the tendency to emphasize social factors also takes place in other models created after 2022, a model by D. Ellström et al. (2022) will be presented, this model, on the one hand, contains indications regarding organizational support (see narrative 2 out of 3 in the original model – compare Table 1), on the other hand, it contains numerous references to relational aspects. Therefore, it is difficult to assign the model of D. Ellström et al. (2022) unambiguously to 1 of the 3 initial narratives obtained on the basis of literature analyses (compare Table 1). Rather, it presents a comprehensive attempt to describe the situation.

It is worth referring to the point of view that D. Ellström et al. (2022). They notice in a radical way that **digitization has no value in itself. What is important is how digitization will change the ways of working, the habits of employees and whether it will support the achievement of the company's goals** (Ellström et al., 2022).

Importantly, the final statement results from the analysis of the construction and analysis of the model of organizational support for digital transformation in a given company (see Figure 5).

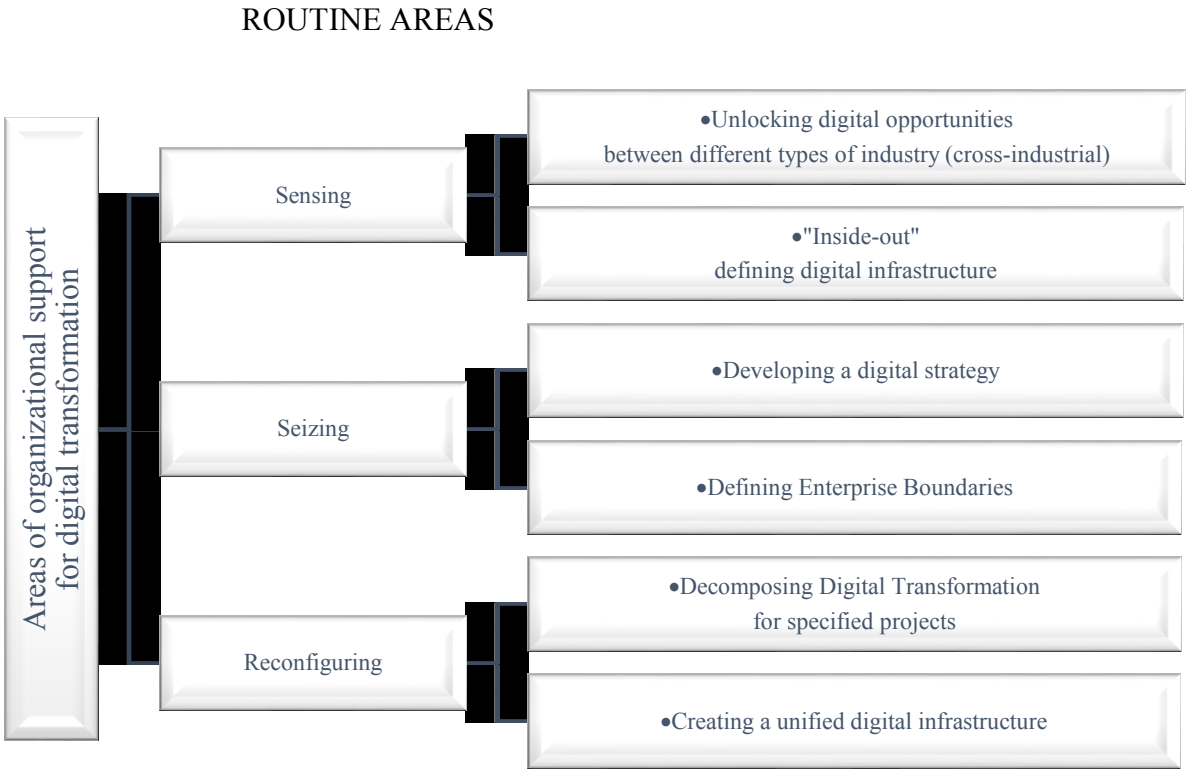

Figure 5. Areas of organizational support for digital transformation and key routines for each of the areas.

Source: (own study based on: Ellström, Holtström, Ber, Josefsson, 2022).

Although the model is oriented towards the areas of organizational support, the **6 routines for the designated 3 areas referred to not only to technological and organizational aspects, but also to areas of competence and attitudes of employees.**

The analysis of the descriptions (referred to in this study as: "idea in the background") for each 6 routines indicates a significant reference to social aspects in the model of organizational support.

In the area: *Seizing, both routines:* Digital strategy development and Defining company boundaries refer to people working in the company. The authors of the model directly draw attention to the need to build awareness among employees in the field of priorities and strategies for digital development. At the same time, they emphasize that this is crucial for the success of the entire digital transformation (routine: Digital strategy development – "Idea in the background").

In the second routine (routine: Defining the boundaries of the company – "Idea in the background") we have the decision to depend on the level of competence of employees and indicate the development of competences as an optimal state.

In the Reconfiguration area*, we have references:*

- *to the limited resources of people involved in projects* (routine: Decomposition of digital transformation into specified projects – "Idea in the background"),
- *employees' concerns about collecting digital data in one place and sharing it* (routine: Creating a unified digital infrastructure – frequently mentioned risks).

Thus, in the model relating to the organizational aspects of technological development, one of the three areas [*Seizing*] directly focuses on people, the other of the three [Reconfiguring] refers to the human aspects as significant for the success of the entire process. Therefore, it should not be surprising that in the model describing the leadership of virtual teams, we are dealing with the predominance of references to people and relationships.

A discussion of the model of D. Ellström et al. (2022) from Figure 6 is presented below, as a source material for the above reasoning.

1. Sensing

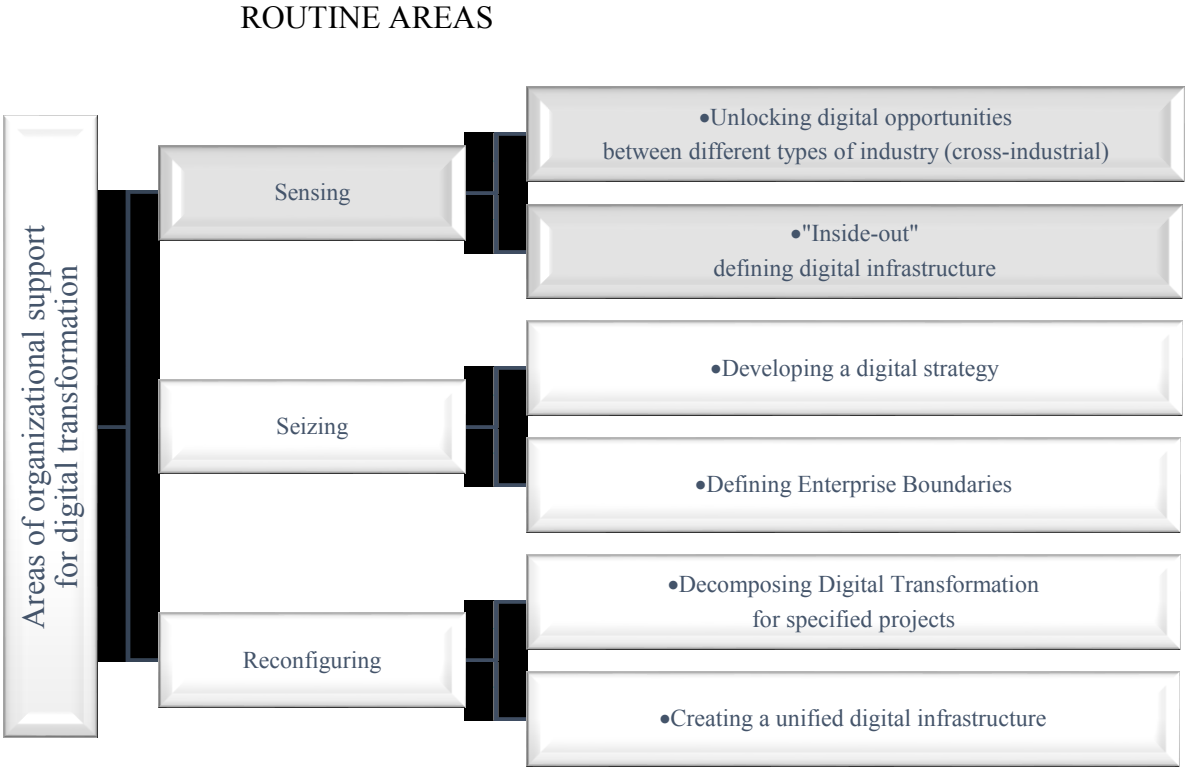

Figure 6. Areas of organizational support for digital transformation and key routines for each of the areas - highlighted area Detection.

Source: (own study based on: Ellström, Holtström, Berg, Josefsson, 2022).

- Detecting digital opportunities between different types of industry (cross-industrial):
  - Identifying new digital opportunities, also outside the network of existing partner companies.
  - **„Idea in the background":** digital innovations do not have to be revolutionary and do not have to be pioneering; You can just as well copy something that was done elsewhere or use something old in a new way. This approach reduces the pressure to create a pioneering solution, and thus reduces the risk of implementing unproven solutions.
- "Inside-out" definition of digital infrastructure:
  - Procedures for assessing the demand for digital infrastructure and searching for new solutions.
  - **"Idea in the background":** In the development of digital infrastructure, the starting point is the specificity of the functioning and needs of the company, not what is technically feasible. We start by checking what systems are currently in place in the company. We gain an understanding of how they meet the needs of the company and how they can be better utilized. We are trying to understand how current digital solutions implement the company's routines and how they bring added value to the company. So, in the first step, we try to understand the company's routines and the related demand of the organization for digital technologies. We then describe the future requirements of the company and the necessary functions of the digital system. We immediately apply a layer on top of this, describing whether and how infrastructure changes will bring added value to the company. By comparing both states of infrastructure and meeting the company's needs, comparing it with the necessary resources (e.g. time, budget, people), we get an answer as to whether the change in infrastructure is justified, and if so - to what extent. Thanks to this approach, it may turn out that, for example, a system used in one department can be implemented in other departments or it is possible to use the existing system in a new way.
  - A frequently raised risk is wasting the potential of digital transformation. This means implementing a costly technological change that does not change the way employees work and habits and/or does not support the achievement of the company's goals.
- Creating a unified digital infrastructure.

2. Seizing

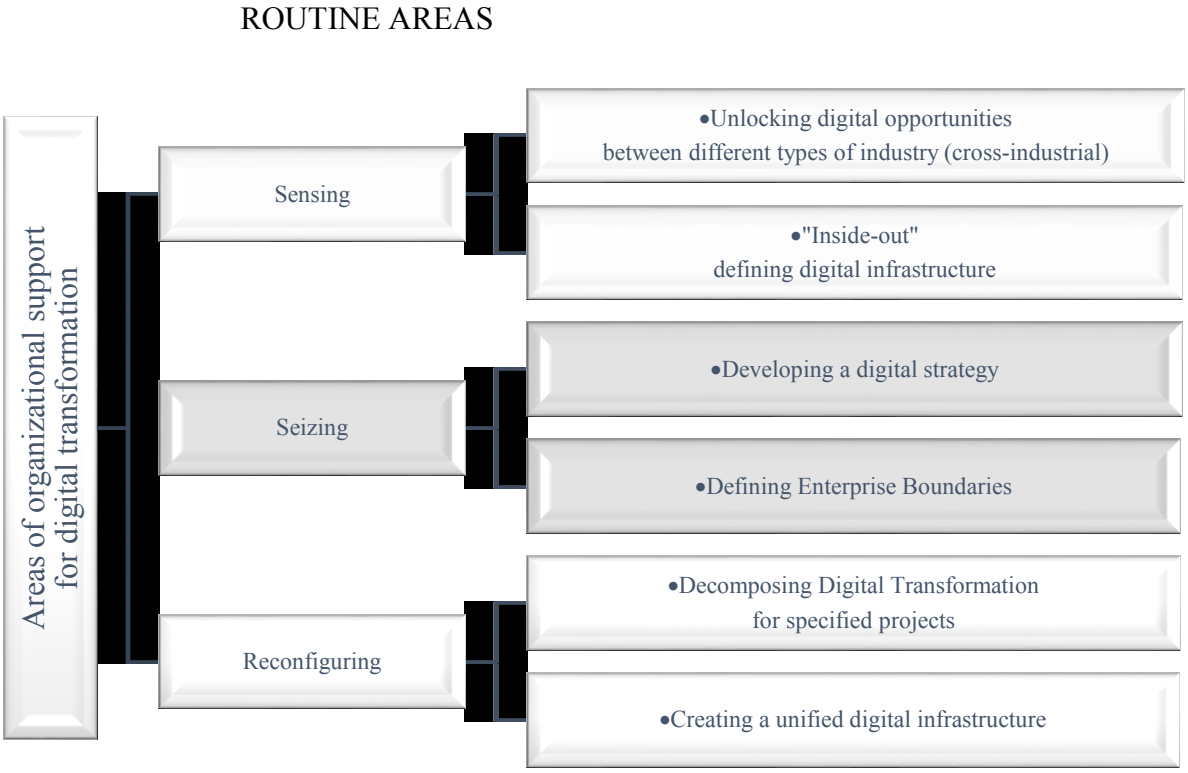

Figure 7. Areas of organizational support for digital transformation and key routines for each of the areas - the distinguished area of Acquisition.

Source: (own study based on: Ellström, Holtström, Berg, Josefsson, 2022).

- Development of a digital strategy:
  - Semi-continuous adaptation of an increasingly digitized strategy, adapted to the (changing) environment and (flexible) overall business goals.
  - **"Idea in the background":** For a digital transformation to be successful, it must be clear to all employees what the company's digital development strategy or priorities are and what the goal of the next digital transformation is. Without a clear digital development strategy/priorities, there will be confusion within the organization about what competencies need to be developed so that teams can take advantage of new digital opportunities. Lack of employee awareness of the company's overall digital strategy and business transformation goals is one of the most common obstacles to digitalization.

    Only another aspect of developing a digital strategy is balancing the predictability of the strategy and specific business goals in a situation where the environment of digital transformation and its environmental conditions may change rapidly. Therefore, in addition to the sustainability and readability of strategies and goals, flexibility and adaptation to new opportunities become a requirement. A skillful solution to this dilemma (constancy – flexibility) becomes important for employee engagement.

One solution is to add a dimension of time and create alternating phases in the development of the company. Exploration phases, where flexibility is a priority, and exploitation phases, where we pursue a fixed strategy. Another solution is to add a dimension that describes the responsibilities of employees and describes permanent duties and such duties that may change.

- A frequently raised risk is the resistance or inertia of employees to change.

- Defining the boundaries of the enterprise:
  - Procedures for determining what should be done in-house and what should be carried out as part of outsourcing; These procedures are based on an understanding of the current competencies in the company and the competencies necessary for the implementation of the digital strategy.
  - **"Idea in the background"** As part of the implementation of digital transformation, we determine which routines to implement internally and which to outsource. It should be remembered that outsourcing is not always the best solution:
    - In a situation where there is no competence to implement routine in the company, it may be more beneficial to develop the necessary competencies within the company than to outsource routine.
    - In the case of competence shortages, outsourcing can be used at the initial stages of transformation, before the company has developed the necessary competencies.
    - Outsourcing tasks that are critical to a company's digital strategy can create high uncertainty in the company.

3. Reconfiguring

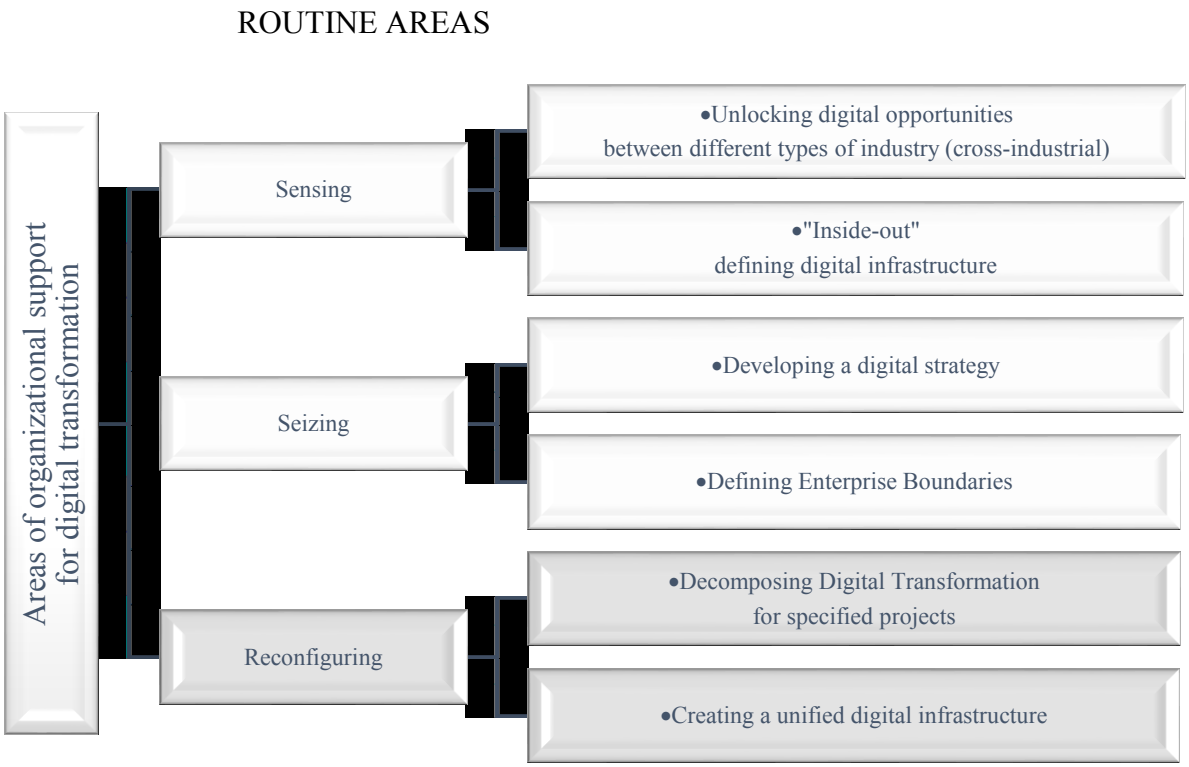

Figure 8. Areas of organizational support for digital transformation and key routines for each of the areas - the distinguished area of Acquisition.

Source: (own study based on: Ellström, Holtström, Berg, Josefsson, 2022).

- Decomposition of digital transformation into specified projects:
  - Prioritization of digitalization projects based on a digital strategy and assessment of resources (technical and human).
  - **"Idea in the background":** Separating sets of short-term and long-term projects to ensure sufficient resources for long-term digital transformation endeavors. It is important to limit smaller projects to the exploration phase and disband project teams if the evaluation of a given project phase shows a lack of results. Thanks to such activities, we receive resources for further projects.
- Creating a unified digital infrastructure:
  - Integrate digital solutions into a unified digital infrastructure and make it available to the entire organization.
  - "Background idea": Deciding which company-wide information is collected in one place and made available to all employees (e.g., device manuals, document templates) so that they can find and, if necessary, relevant information collected in the same place.
  - A frequently raised risk is that digital systems provide data security requirements. This aspect cannot be limited to one-off actions during the implementation of the change, but it is important that the security aspects have been continuously developed and regularly evaluated.

Conclusion

Presentation of an extensive model of implementing digital transformation in the organization: (Ellström D. et al., 2022) indicates that in each of the routines of this type of implementation, we refer to aspects describing the functioning of employees in the organization. From a specific point of view, the functioning of employees can be described as crucial for the timely implementation of digital transformation in the assumed scope.

Therefore, it seems that the model presented in this text – the effect of our own research – indicating that 11 out of 14 variables refer to the characteristics of a person or the way of building relationships in a task team as important, is not a model "excessively" focusing on relational aspects and omitting technological aspects of digital transformations in organizations.

Discussion: Results obtained for individual variables – missing differences

The most important difference between variables is the lack of differences in response between team leaders and team members. It can be considered that the lack of difference between employees and managers indicates that both groups are equally assessed by individual components. Therefore, another conclusion may be that the behavioral indicators that make up the individual factors of the test are universal – they are equally important for managers and employees. This lack of difference seems to be crucial due to the future independent use of the tool, as well as to the comparison with other tools used to assess the functioning of task forces in organizations.

The above-mentioned universal nature of the indicators may also be emphasized by the lack of differences in answers occurring for individual geographical locations of respondents) and the lack of differences due to the department in which the respondents worked.

The universality of the model can support the result obtained at the same time, as in the studies presented above. Interestingly, a similar result was obtained despite the use of a slightly different research procedure. According to F.B. Tigre et al. (2025), digital leadership has two main aspects:

- The first aspect is business-related and is focused: on strategy and execution.
- The second is related to the person of the leader and refers to: personal characteristics and orientation towards interpersonal relationships.

Therefore, we have two basic dimensions of a leader's functioning in the digital environment (the way the business is carried out and personal qualities). Each of these dimensions has 2 areas. This means that ultimately the model has 4 areas: 2 related to business and 2 related to the leader. The four areas captured by this model are presented in Figure 9.

Figure 9. Conceptual Model: Digital Leadership Capabilities.

Source: (own study based on: Tigre, Henriques, Curado, 2025).

The four areas mentioned above are similar to those obtained as a result of our own research (3-factor model, 14 indicators). The similarities of the model from our own research and the model of F.B. Tigre et al (2025) are compared in Table 4., below is also a detailed description of the inference leading to the final shown in this Table 4.

Table 4.

Factors identified in own research and factors identified in the study by F.B. Tigre et al. (2025)

Factor	
In the model obtained as a result of our own research	**In the model obtained by F.B. Tigre et al (2025)**
Individual perspective	Orientation towards interpersonal relationships Personal attributes
Organizational perspective	Focus on strategy
Team perspective	Relationship with implementation

Source: (own study).

The area "Orientation to interpersonal relationships" refers to social interactions between leaders and subordinates such as establishing relationships, communicating, being trustworthy, coaching, inspiring, empowering and engaging people.

In turn, the area: "Personal attributes" informs about how leaders manage themselves and their emotional reactions to situations; It consists of constructs concerning the characteristics of leaders in the area of the so-called individual differences: curiosity, initiative, autonomy and self-awareness (Tigre et al., 2025). The first and second areas correspond to the factor described in the final model (Table 2): Leader person and qualities. This factor refers to similar aspects as the areas from the F.B Tigre et al. (2025) model and others.

The third area from the F.B. Tigre et al. (2025) model: "Focus on strategy" defines how leaders formulate and implement strategic decisions towards the future goals of the organization. In other words, this area refers to leadership skills that affect the organization's long-term goal and response to change. This area is similar to the "Organizational Perspective" factor from the final model obtained in our own research (Table 2), as it refers to long-term activities at the organizational level related to the response to organizational change. It must be admitted that despite the similarity of the scope of this area, we have differently distributed accents and a different level of their detail. In the model of F.B. Tigre et al. (see Figure 9), we have general formulations relating to whole issues, such as: Calculated risks. Change Management, Innovation, Diversity, Knowledge Sharing, Vision/Direction. On the other hand, the same area in the model derived from our own research is described by terms at the level of performance of activities (see Figure 9), such as: Development by management of solutions necessary for the time of crisis; Identification by management of possible crisis events requiring a change in the way of working; Implementing the behaviour patterns developed by the management for crisis situations into the team's ongoing work.

The fourth area from the F.B. Tigre et al. model: "Relationship with Execution" refers to the leadership ability to manage the team towards the desired outcome. This area is similar to the "Team Perspective" factor, as it refers to the actions taken by the leader in relation to the team. In other words, the areas "Relationship with implementation" and "Team perspective" refer to the leader's actions towards the team, and not to the individual characteristics of the leader and possibly resulting from this style of communication. The areas "Relationship with implementation" and "Team perspective" refer to expert knowledge in the field of team management, writing down the actions that a leader should take towards colleagues who make up the team. As in the case of the "Focus on strategy" area and the "Organizational perspective" factor, we are dealing with differently distributed accents and with a different level of their detail (see Table 2).

Conclusions

The occurrence of similar aspects in models obtained with the help of different research procedures and by different authors seems to confirm the universality of the model obtained in our own research (see Table 2).

5. Summary

Conclusion

The finally obtained model of the behavior of the virtual team leader, containing 3 factors consisting of 14 observable variables, seems to be a model of a universal nature. This can be evidenced not only by the lack of differentiation due to location, role in the organization or department of the company. Also, the results of other research on leadership in the age of digitalization show similar areas as the 3 essential factors of the model. This is despite the use of other research procedures and other tools.

For the model finally obtained, an important characteristic is the focus on social skills (*soft skills*). This is a paradox, because we are talking about leading teams in which the use of advanced digital technologies is significant. However, it seems that this is a direction consistent with the way of understanding the relationship between man and technology defined in Industry 5.0.

The differences shown for the gender of people leading virtual teams are significant and developmental. This diversity seems to be a possible contribution to changes in the virtual labor market.

Limitations

The size of the group of people tested should certainly be included among the limitations, there is a risk that the current findings may not be confirmed when examining a larger number of people. The size of the group results from its specificity (people managing virtual teams and employees of the same teams), but it is also worth taking into account the observable variables rejected in the current study in subsequent studies. It is possible to return or delete individual observable variables from the 14 currently forming the model.

While the limitation may apply to individual observable variables, it seems that in the scope of 3 factors describing the management of virtual teams, we are dealing with a model of a universal nature. The universality of the model in terms of 3 factors is confirmed by other studies and seems to indicate that we can have an unchanging picture as far as the general findings (3 factors) are concerned.

The second limitation is the fact that working in virtual teams has been forced by the COVID-19 pandemic. Hence, the themes relating to work in virtual teams overlap with motifs referring to work in a situation of organizational change or task-based activity in a crisis situation.

However, the organization where the research was conducted maintained remote work even after the pandemic and the respondents were asked for their opinion in 2024, so with experience of working in virtual teams after the pandemic ended. Hence, it can be assumed that they

responded on the basis of (not so much) experiences related to change, but on the basis of experience from current work in virtual teams, which has become a standard in this company.

Practical recommendations

The model of leadership in virtual teams obtained in the research emphasizes social competences of a universal nature (50% of all observable variables captured by the model refer to this range). Next, we have the behaviour of the manager related to the management of the task force and the areas relating to the activities undertaken by the organisation represented by the senior management. As you can see, although the model describes functioning in an environment with a high degree of digitization, it does not refer to specialist competences related to the use of digital tools. So, in terms of recommendations for management, we have:

1. Focusing the organization's resources on the diagnosis and development of social competencies of people managing virtual teams. At the same time, a reduction in the development focus on digital competences (perhaps they are sufficiently well developed) could be considered. The freed up time and financial resources can be allocated to the development of competencies related to building leader-team relationships.

This recommendation results not only from the obtained model, but also from the observation that the technology supporting virtual work is becoming more and more user-friendly, and expectations in terms of relational issues (trust, way of communication, presence of a leader in the team's work) remain unchanged or are intensifying.

Further recommendations result from the connection of the results obtained in own research (leadership model in virtual teams) with the model describing the areas of organizational support for digital transformation by Ellström et al. (2022). On the one hand, this model can complement the presented own research in the area of the model called: "Organizational perspective". On the other hand, the model itself by Ellström et al. (2022), as indicated earlier, is saturated with aspects related to people management (e.g. eliminating resistance, developing competencies, building awareness of strategies and priorities) referring to observable variables specified in own research in the final version of the model.

From the common part of both models [the final model from our own research and the model of Ellström et al. (2022)], useful (as it seems) managerial tips are created:

2. It is important to remember that digitization has no value in itself. What is important is how digitization will change the ways of working, the habits of employees and whether it will support the achievement of the company's goals (Ellström et al., 2022). Thus, paradoxically, in technology-focused transformations, the critical factor is the area related to people: the characteristics of the manager, the style of building relationships, the way of issuing and communicating management decisions (see the set of 14 indicators in the final model from our own research).

3. Digital transformation is a situation where major changes are introduced. In such cases, there is a high risk of resistance or inertia of employees before change (Ellström et al., 2022). It is worth taking into account that digital transformation requires the involvement of highly specialized employees, so it seems advisable to choose a participatory way of managing change and take into account the fears that arise in the team as a source of resistance to the individual stages of implementing organizational change. A separate issue is the selection of appropriate means.
4. A frequently raised aspect of digital transformation is the provision of data security requirements by digital systems (Ellström et al., 2022). On the one hand, digitization makes work easier, as it involves digitizing physically existing information resources and at the same time facilitating access to them. On the other hand, we have concerns about the security of our own work products and personal data. Hence, it is necessary to build a system "in the default configuration of excessively secure" and at the same time communicate in a way that is readable to an individual employee the way in which access to data will be secured.

References

1. Afrianty, T.W., Artatanaya, I.G., Burgess, J. (2022). Working from home effectiveness during Covid-19: Evidence from university staff in Indonesia. *Asia Pacific Management Review, 27(1),* 50-57. https://doi.org/10.1016/j.apmrv.2021.05.002
2. Aliman, D.N., Hennig-Thurau, T., Henke, A. (2024). Navigating the enterprise metaverse: How virtual reality affects business agility and meeting outcomes, *Business Horizons*, ISSN 0007-6813, https://doi.org/10.1016/j.bushor.2024.05.007
3. Avolio, B.J., Sosik, J.J., Kahai, S.S., Baker, B. (2014). E-leadership: Re-examining transformations in leadership source and transmission. *The Leadership Quarterly*, *Vol. 25, Iss. 1*, pp. 105-131, ISSN 1048-9843, https://doi.org/10.1016/j.leaqua.2013.11.003
4. Bagga, S.K., Gera, S., Haque, S.N. (2022). The mediating role of organizational culture: Transformational leadership and change management in virtual teams. *Asia Pacific Management Review*, ISSN 1029-3132, https://doi.org/10.1016/j.apmrv.2022.07.003
5. Bekirogullari, Z., Thambusamy, R.X. (2020) Virtual Leadership in Small Businesses during the COVID-19 Pandemic: Challenges and Possibilities. *The European Journal of Social & Behavioural Sciences, 29(3),* 3214-3224 DOI: 10.15405/ejsbs.281
6. Chamorro-Premuzic, T. (2021). The Essential Components of Digital Transformation. *Harvard Business Review*, *November 23.*

7. Ellström, D., Holtström, J., Berg, E., Josefsson, C. (2022). Dynamic capabilities for digital transformation. *Journal of Strategy and Management, Vol. 15, No. 2*, pp. 272-286, Emerald Publishing Limited, ISSN: 1755-425X, https://doi.org/10.1108/JSMA-04-2021-0089
8. Grobelny, J. (2023). Factors Driving the Workplace Well-Being of Individuals from Co-Located, Hybrid, and Virtual Teams: The Role of Team Type as an Environmental Factor in the Job Demand–Resources Model. *International Journal of Environmental Research and Public Health*, *20(4),* 3685. https://doi.org/10.3390/ijerph2004368
9. Hashemi, H., Rajabi, R., Brashear-Alejandro, T.G. (2022). COVID-19 research in management: An updated bibliometric analysis. *Journal of Business Research, Vol. 149,* pp. 795-810, ISSN 0148-2963, https://doi.org/10.1016/j.jbusres.2022.05.082
10. Herath, T., Herath, H.S.B. (2020). Coping with the new normal imposed by the COVID-19 pandemic: Lessons for technology management and governance. *Information Systems Management, 37(4),* 277-283. https://doi.org/10.1080/10580530.2020.1818902
11. Heubeck, T., Storz, A.S., Meckl, R. (2024). Success factors of global virtual teamwork: A social capital perspective. *Digital Business, Vol. 4, Iss. 2*, 100081, ISSN 2666-9544, https://doi.org/10.1016/j.digbus.2024.100081
12. Higgins, D., Bianzino, N.M. (2020). Tech Should Enable Change, Not Drive It. *Harvard Business Review. October 12.*
13. Kahneman, D. (2022). *Pułapki myślenia. O myśleniu szybkim i wolnym.* Poznań: Media Rodzina.
14. Kropp, B., Cambon, A., Clark, S. (2021). What Does It Mean to Be a Manager Today? *Harvard Business Review, April 15.*
15. Lamarre, E., Chheda, S., Riba, M., Genest, V., Nizam, A. (2023). The Value of Digital Transformation. *Harvard Business Review, vol. July-August, July 31.*
16. Lund, S., Madgavkar, A., Manyika, J., Smit, S. (2020). Hybrid models of remote work are likely to persist in the wake of the pandemic, mostly for a highly educated, well-paid minority of the workforce. *McKinsey Global Institute*, *November 23*.
17. Mortensen, M. (2023). Why Hybrid Work Can Become Toxic. *Harvard Business Review, vol. July-August, July 28*.
18. Murphy, L. (2024). Wellbeing in the age of virtual teams and workplace automation – a systematic review and future research agenda. *International Journal of Organizational Analysis*, *Vol. 33, Iss. 5*, pp. 1039-1065, ISSN 1934-8835, https://doi.org/10.1108/IJOA-08-2023-3938
19. Tigre, F.B., Henriques, P.L., Curado, C. (2025). The digital leadership emerging construct: a multi-method approach. *Manag. Rev. Q., 75*, 789-836. https://doi.org/10.1007/s11301-023-00395-9
20. Turner, J. (2022). *These are the top 5 strategic initiatives HR leaders are prioritizing heading into 2023,* 4 October 2022. Retrieved from: https://www.gartner.com/en/articles/what-will-hr-focus-on-in-2023, 15.04.2023.