The Impact Of Remote Work On Organisational Climate Of Agile-Software Development Teams

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Abstract: Purpose: As a result of the changing labor market in a post-pandemic world, remote work in the IT sector is becoming almost a standard. It is known intuitively that the organisational climate changed compared to the stationary work, but it is difficult to determine how and what elements are going through the change. The aim of the article is to present the aspect of organisational climate in agile development teams working remotely compared to their stationary work. Methodology: The study was conducted using author own personally designed assessment questionnaire among ten programming teams using agile software development methodology. The number of members of the analysed teams varies from four to eight. This paper compares changes in each dimension of the organisational climate that have occurred in teams after switching to remote work. Using Cohen's d statistic, it determines the magnitude of the impact of these changes. Findings: The article is an attempt to answer which elements (dimensions) of the organisational climate, in what direction (positive vs negative) and to what extent (size effect) is remote work influencing in the context of agile software development teams. Value: Such knowledge will allow appropriate modeling of organisational climate factors, thus affecting performance and the well-being of team members. This is the first step to verify, whether the previous research about the impact of the organisational climate on agile development teams still applies to those teams working remotely.

Keywords: telework, remote work, organisational climate, agile software development, work organisation.

1. Introduction

The aim of the article is to present the aspect of organisational climate in agile development teams working remotely. It is known intuitively that it has changed compared to the stationary work of these teams, but it is difficult to determine how and what elements are going through the change.

Remote work (or telework) is not a new kind of work development, especially in the IT sector. However, undoubtedly it gained in importance and popularity as a result of the Covid-19 pandemic. Currently, teleworking has become a common form of work, especially in programming teams. It is conditioned by the development of technology and relationships that change in the market. It is highly desired by the technological community and in some form (also various hybrid variants), offered by employers. It is clear, that it brings several changes which are reflected in various elements of the team's work, such as: the way of communication, cooperation, teamwork collaboration, defining tasks, accounting for duties, or appreciating and rewarding. It all adds up to the organisational climate of these teams. Therefore, remote work influences and brings about changes in the organisational climate. In turn, its conscious and regular shaping allows it to influence important aspects, not only to the management, but also to the whole company, such as efficiency, motivation, job satisfaction or a sense of security and autonomy, which allows it to retain employees.

The article, based on the analysis of the literature, available research and the author's own research, is an attempt to answer which elements (dimensions) of the organisational climate, in what direction (positive vs negative) and to what extent (size effect) is remote work influencing in the context of agile software development teams. Such knowledge will allow the leaders and managers of these teams to determine, in appropriate manner, which of these factors of the organisational climate it requires in order to take better care of the team, its performance and the well-being of its members.

2. Remote work - a historical outline

As the Cambridge Dictionary (2021) says remote work (also known as working from home, distance work or telework) is “the practice of an employee working at their home, or in some other place that is not an organisation's usual place of business”. This term is of course not new but has grown in importance and popularity in 2020 due to the pandemic of Covid-19. The increase in the popularity of Google searches for this phrase (along with its varieties) amounted to over 450% in February 2020 and still remains at a relatively high level (data using Google Trends search).

The first examples of teleworking appeared in the 1960s in United States. The pace of life became astonishingly fast at one point - the USA was in a booming phase. This resulted in many office buildings and companies operating on a large scale. Remote work was a response to the pace of this development - working outside the

office, employees could avoid traffic jams and save hours commuting to work and returning home (Partner for entrepreneurship - blog, 2016).

The concept itself was first researched and described by Jack Nilles at the University of California in 1972 (JALA International, 2011). In his research, in 1979 five IBM employees were allowed to work from home as an experiment and then by 1983, the experiment was expanded to 2,000 people. They could reach each other thanks to the developing technology of organisational mainframes using personal computers, terminals using telephone lines as a network bridge and terminal emulators. He created the first definition of telework that is still used today: "a form of work organisation consisting in providing work outside the employer's organisational unit by means of electronic communication". Nilles created not only the general concept of telework, but also began to define the principles of working in this mode of work (Nilles, 1975).

In Europe, Great Britain was the first country to start hiring employees in the form of telework in the 1960s. Despite the passage of years, the United Kingdom continues to be a pioneer in employing teleworking employees (Owl Labs, 2021).

During the Information Age, many startups were founded in the houses of entrepreneurs who lacked financial resources, so remote work started to be used broadly. In 1996, the Home Work Convention and International Labour Organisation (ILO) Convention, were created to offer protection to workers who are employed in their own homes. Since the 1980s, the normalisation of remote work had been on a steady incline, also in legal aspects. By 1983 academics were beginning to experiment with online conferencing (Byrd, 2021) and in 1995 mottos like: “work is something you do, not something you travel to” or “work is what we do, not where we are” started to emerge (Woody, 1995).

In the 1990s and 2000s, remote work became facilitated by many developing information and communication technologies (ICT), such as collaborative software, virtual private networks, conference calling, videotelephony, internet access, cloud computing, voice over IP (VoIP) and mobile telecommunications technology, such as a Wi-Fi-equipped laptop or tablet computers. As well as smartphones and desktop computers, using software such as Zoom, Cisco Webex, Microsoft Teams, Google Meet, Slack, WhatsApp and many others.

Many researchers have written about the impact of remote work on various factors, including: well-being (Rothmann, 2008), physical and temporal separation (Lautsch et al., 2009), job satisfaction (Kelliher and Anderson, 2010), working long hours (Grant et al. 2013), autonomous ways of working (Suh and Lee, 2017), work stress (Perry et al., 2018), productivity and creativity (Hunter 2019), job satisfaction (Schall, 2019), motivation and burnout (Nyanamba et al., 2021), psychology and many others (Charalampous, 2018) as well as the impact of the Covid-19 pandemic.

In 2017, remote work in Poland was performed by 6% of employees – definitely less than in Denmark or Sweden, where work in this way was performed by over 15% of employees, according to a World Bank report (2019). It changed totally during the Covid-19 pandemic, where millions of workers began remote work for the first time. Cities in which the population of remote workers increased significantly were referred to as zoom towns (Rosalsky, 2020). According to an Owl Labs report (2021) 70% of employee want a hybrid or remote working style after the pandemic was over and 1 in 4 would quit their job if they could no longer work remotely after the pandemic, with an additional 19% still undecided.

This distribution is completely different in the IT industry, where remote work is much more popular – 61% in Europe (Jarząbek, 2022). This industry technologically - due to its specification - has the appropriate tools for remote work, but also struggles with the deficit of specialised employees. This kind of work significantly facilitates the employment of IT specialists, regardless of their place of residence and nationality (Trziszka, 2019). Nowadays, in IT companies, some form of remote work (hybrid) is becoming a standard, especially looking at major players in the market. They are also agile in a form of work.

3. Organisational climate

Organisational climate is a difficult concept to define because it is most often identified with the subjective feeling and perception of the atmosphere prevailing in any given organisational unit, which affects people (Dessler and Turner, 1992). It is widely understood as a set of norms characteristic for an enterprise that condition the behavior of employees and is a result of objectively functioning organisational processes and subjective feelings (Wereda et al., 2016). Therefore, in the literature on the subject, this concept is broadly discussed with its context in the development team that work specifically with agile methodology (see more: (Grobelna, 2019), (Grobelna, 2020), (Grobelna, 2021)).

For the purposes of this research, the author adopted the factors of the organisational climate listed and categorised them into nine groups (dimensions) by Wudarzewski (2012) in the systematic literature review (shown on Figure 1). These factors and dimensions were used in the author's measurements of the organisational climate.

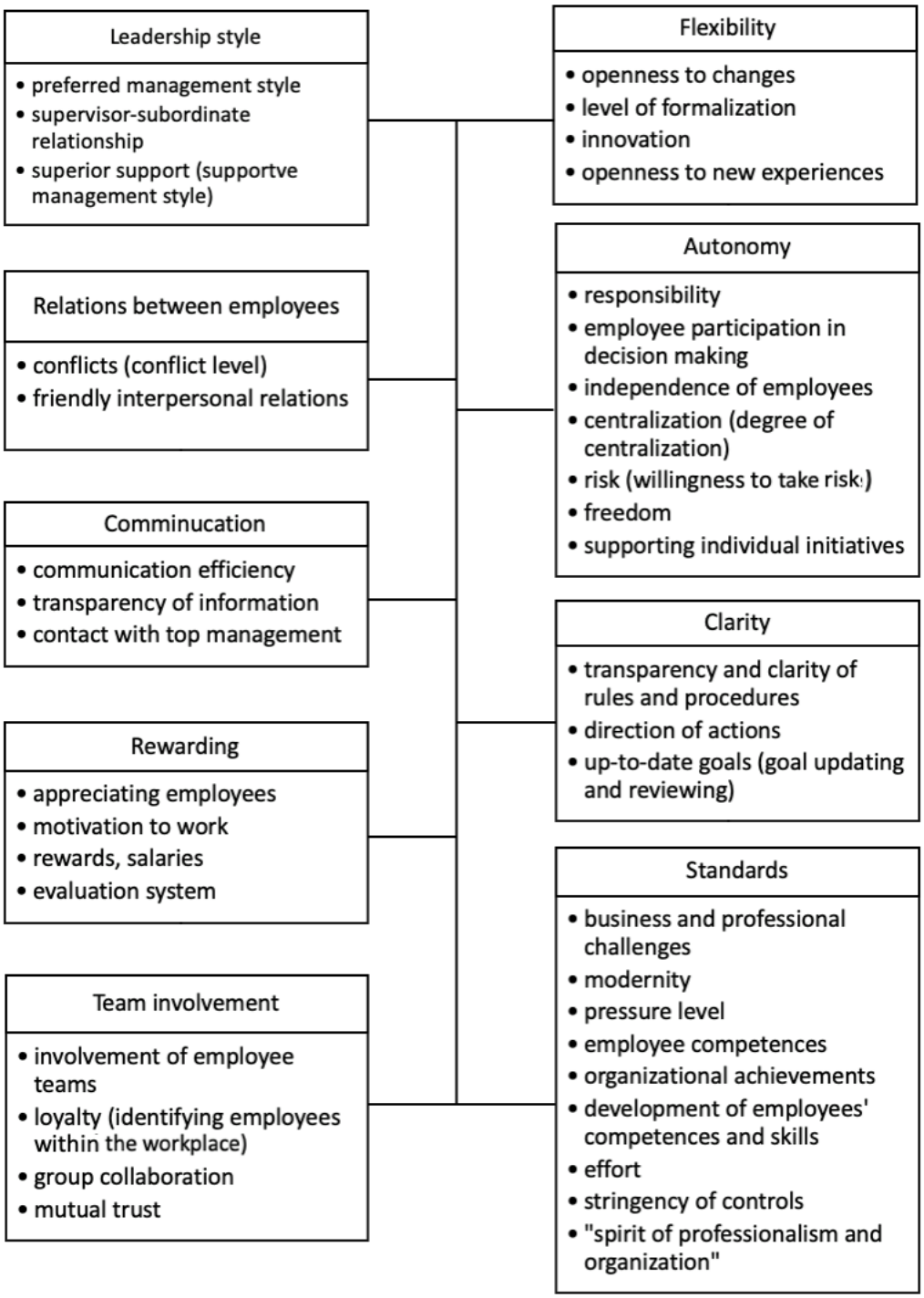

Figure 1 Dimensions and descriptive components of the organisational climate
Source: own elaboration based on Wudarzewski 2012

The question to be asked in the context of remote work and the above-mentioned factors is: are all of them are still relevant in the new context of a different way / place of work? The author, analysing the factors in each of the dimensions, believes that all of them are still applicable to agile development teams working remotely. Dimensions such as relations between employees, communication or team involvement have not lost their importance and can even be more consciously shaped in such teams. Currently, it is common, even obvious, especially in IT, to use communication and collaboration tools that allow remote teams to remain fully

connected. Thanks to this, according to the author, the organisational climate in such teams can be described and measured using the same factors and dimensions as teams working in a stationary or hybrid way.

4. Organisational climate of remote agile software development teams - research results

Empirical research was conducted in ten development teams using agile software development methodology. These teams operate in various Polish cities. The number of members of the analysed teams varies from four to eight people, depending on the team and they consist of different roles (like leader, product manager, front-end developer, back-end developer, tester, full-stack developer etc.). The elements proposed by Wudarzewski (see Figure 1) were conceptually narrowed by the author, and the most common ones were categorised into nine groups described as dimensions of the organisational climate. According to this, the research was conducted with the use of a questionnaire[1] with 5-point Likert scale[2], built by the author based on twenty-eight factors (those after limitation) of the organisational climate, divided and grouped into nine dimensions. These dimensions are: relations between team members, leadership style, communication, flexibility, autonomy, clarity, rewarding, team engagement and standards.

Nine teams were taken for further analysis, because unfortunately, one of the teams could not be included in the analysis due to insufficient data. In general, 63 members of the surveyed teams participated in the study. All these teams participated in previous studies, where organisational climate was measured during their stationary work (in the author's previous research, using the same research methodology). Now, as a result of the post pandemic reality, they have completely or almost completely[3] switched to remote work. It is clear, that during that time, these teams are working on different products or projects and their personal composition changed. However, the teams included in that research have undergone the least significant changes (the leader remains the same, they work for the same company[4], they identify as the same team – same name, etc.). Thanks to this, it will be possible to compare the organisational climate present in these teams during stationary work (previous research) and currently during remote work.

Table 1 presents the organisational climate in the surveyed teams working remotely, divided into dimensions. The table also includes the sum of the team members' average ratings for the "overall" assessment of the organisational climate. The higher ratings, the more liberal, open-minded, based on trust, autonomy and friendly atmosphere – extremely positive is the organisational climate in the teams. The table also shows the average scores for any given dimension obtained in all the teams surveyed, with the most positive grades marked.

Table 1 Dimensions of the organisational climate in programming teams working remotely

Team/ Dimension	Relations between team members	Leadership style	Communi-cation	Flexibility	Autonomy	Clarity	Rewarding	Team engagement	Standards	Sum of average ratings
A	3,917	4,250	4,000	4,125	4,400	4,167	3,500	3,833	3,375	104,50
B	4,6667	5,0000	3,3333	3,4167	4,0667	4,222	4,000	4,000	3,667	105,50
C	4,313	4,500	2,938	3,656	3,800	3,875	3,708	3,542	3,500	111,00
D	5,000	4,500	3,000	3,500	4,600	4,333	2,667	4,333	4,250	111,17
E	5,000	4,000	3,500	3,750	5,000	4,000	3,000	4,333	3,000	113,00
F	4,500	4,500	3,000	4,250	4,600	5,000	4,000	4,000	4,250	113,50
G	4,250	4,417	3,333	3,944	4,167	4,111	3,667	4,056	3,833	115,000
H	4,500	4,000	3,500	3,875	3,800	3,500	3,500	3,333	2,875	120,00
I	5,000	4,667	4,333	3,833	4,133	4,222	4,333	4,222	4,083	120,00
Average	4,572	4,426	3,438	3,817	4,285	4,159	3,597	3,961	3,648	

Source: own elaboration

[1] More about the construction and application of this questionnaire can be found in: (Grobelna 2021) and the questions from the questionnaire can be found in appendix 1.
[2] Where 1 for low occurrence of the factor and 5 for high/strong occurrence.
[3] They appear in the office in exceptional situations, only "on request", like in workshops or trainings.
[4] Especially in the case of software houses.

Analogical data is presented in Table 2 for the same teams during their stationary work in the pre-pandemic period (from previous research).

Table 2 Dimensions of the organisational climate in programming teams working stationary

Team/ Dimension	Relations between team members	Leadership style	Communi-cation	Flexibility	Autonomy	Clarity	Rewarding	Team engagement	Standards	Sum of average ratings
A	4,6667	3,8333	4,0000	3,6667	3,9333	4,000	3,778	4,444	3,333	109,33
B	4,750	4,750	3,750	4,500	4,700	4,500	4,167	4,500	4,375	125,00
C	4,750	4,750	3,750	4,500	4,700	4,500	4,167	4,500	4,375	125,00
D	5,000	4,500	3,833	3,917	4,333	3,889	2,111	4,667	2,875	107,50
E	4,500	4,625	3,500	3,438	4,650	4,167	3,167	4,583	3,750	113,00
F	4,625	3,500	3,125	4,000	3,950	4,083	3,583	4,083	3,625	108,00
G	4,0000	3,5000	3,3750	3,6875	3,5500	3,667	3,833	3,167	3,313	99,500
H	3,300	3,200	3,100	3,550	3,600	3,200	1,867	4,133	3,750	94,00
I	4,800	4,500	4,200	3,900	4,240	4,133	4,467	4,533	3,950	119,00
Average	4,488	4,129	3,626	3,906	4,184	4,015	3,460	4,290	3,705	

Source: own elaboration (Grobelna, 2021)

Undoubtedly, remote work had an impact on all dimensions of the organisational climate in all surveyed teams. Based on this data, it is impossible to estimate whether it had a positive or negative effect. In some agile development teams, the climate has become "loosened" and liberalised (positive values changes, even very significant), while in others it has become more restrictive (changes in negative values). During both remote and stationary work, the highest rated dimension is “relations between team members” and the lowest rated are “rewarding”, “communication” and “standards”.

To better visualise these changes Table 3 demonstrate the differences (deltas) between the assessments for dimensions of the organisational climate in the period of remote work and stationary work for every team and the difference in average rating for every dimension. The average change for the dimension is also presented in percentage view.

Table 3 Difference in assessments of organisational climate in remote and stationary work

Team/ Dimension	Relations between team members	Leadership style	Communi-cation	Flexibility	Autonomy	Clarity	Rewarding	Team engagement	Standards	Sum of average ratings
A	-0,750	0,417	0,000	0,458	0,467	0,167	-0,278	-0,611	0,042	-4,833
B	-0,083	0,250	-0,417	-1,083	-0,633	-0,278	-0,167	-0,500	-0,708	-19,500
C	-0,438	-0,250	-0,813	-0,844	-0,900	-0,625	-0,458	-0,958	-0,875	-14,000
D	0,000	0,000	-0,833	-0,417	0,267	0,444	0,556	-0,333	1,375	3,667
E	0,500	-0,625	0,000	0,313	0,350	-0,167	-0,167	-0,250	-0,750	0,000
F	-0,125	1,000	-0,125	0,250	0,650	0,917	0,417	-0,083	0,625	5,500
G	0,250	0,917	-0,042	0,257	0,617	0,444	-0,167	0,889	0,521	15,500
H	1,200	0,800	0,400	0,325	0,200	0,300	1,633	-0,800	-0,875	26,000
I	0,200	0,167	0,133	-0,067	-0,107	0,089	-0,133	-0,311	0,133	1,000
Average	0,084	0,297	-0,188	-0,090	0,101	0,144	0,137	-0,329	-0,057	
Average [%]	1,83%	6,72%	-5,48%	-2,35%	2,36%	3,45%	3,82%	-8,30%	-1,56%	
Cohen's d	0.3597	1.0103	-0.9443	-0.7250	0.5194	0.8354	0.2075	-1.7823	-0.2140	

Source: own elaboration

To be able to determine, whether the “effect size” (i.e., changes or fluctuations in particular dimensions), is relevant and statistically significant, Cohen's d statistics were used. It is defined as the difference between two means divided by a standard deviation for the data, calculated according to the formula:

$$d = \frac{\bar{x}_1 - \bar{x}_2}{s},$$

where:

$\bar{x}_1$ – average for dimensions in stationary work (Table 2),

$\bar{x}_2$ – average for dimensions in remote work (Table 1),

s - pooled standard deviation.

The interpretation of the effect of the size of the descriptors for magnitudes for this metric is as follows:

$0 - 0.2$ – slight, almost none,

$0.2 - 0.5$ – small,

$0.5 - 0.8$ – medium,

$0.8 - 1.2$ – large,

> 1.2 – very large.

Therefore, a negative result indicates the opposite effect of the tested factor.

Its results are also presented in the Table 3.

According to the above, the changes for all dimensions are statistically significant. The "team engagement" dimension took a very large negative (-8.3% / Cohen's d -1.78) effect in remote work as well as "communication" – a large negative (-5.48% / Cohen's d -0.94) effect. This is not surprising, as due to the lack of face-to-face contact, despite all new technology available, the manner and style of communication had to changed and required more effort on the part of the team members. Similarly, team engagement, group collaboration and cooperation as well as all forms of team work now require changing the habits, other tools and additional effort on remote communication (without, for example, informal meetings or non-verbal communication). Also, dimensions "flexibility" and "standards" are worse – appropriately, a medium negative effect (-2.35% / Cohen's d -0.73) and a small negative (-1.56% / Cohen's d -0.21). The surprising result for the author is for "flexibility". It seems to be, that during remote work, the flexibility, agility and customisable of work conditions should be better assessed, because of a less arbitral approach, the possibility of combining work and personal life and the lack of supervision, but its change has a medium negative effect.

A significantly improved dimension is "leadership style" – a large positive effect (6.72% / Cohen's d 1.01), which means that team leaders took great care of good relations with team members and adapted their management style to the existing situation and conditions. With less oversight and less control, the management style in those teams has become more democratic and integrative. Also, a large positive effect (3.45% / Cohen's d 0.84) is in "clarity". This means that the guidelines, rules and procedures were better formulated, transparent, clear and the goals were understandable and direct. It may also be related to the change in management style and the work of leaders and managers to stay in touch with employees and clearly formulate tasks and expectations. A moderate change is observed in "autonomy" – a medium positive effect (2.36% / Cohen's d 0.52) – team members felt more independent, freedom, individual, but also responsible for their work and the tasks entrusted to them. A small positive effect is in "relations between team members" (1.83% / Cohen's d 0.36) and "rewarding" (3.82% / Cohen's d 0.21) dimensions.

In the author's previous research[5] it had been noted, that in agile software development teams desirable organisational climate is extremely positive and liberal. The more liberal, open-minded, based on trust, autonomy and friendly atmosphere (extremely positive, as expressed by the sum of averaged scores) organisational climate there was in the team, the better motivation was assessed and the higher efficiency of the team. This rule has been confirmed for teams working stationary. It is hard to say whether the correlation between organisational climate and team efficiency will be similar when working remotely. Considering the changes in the assessment of each dimension of the organisational climate, an unequivocal conclusion cannot be drawn, whether remote work had a positive or negative impact on the overall organisational climate in these teams. It is certain, that it had an impact in every area of it.

5. Conclusion and future research

Generalising the above research results and analysing documents and articles about teleworking, first of all, it should, be noted that remote work is not a new approach, but as a result of the Covid-19 pandemic has gained popularity and is used much more often with the satisfaction of both parties. Remote work is desirable and most

[5] Read more in: (Grobelna 2019), (Grobelna 2020), (Grobelna 2021).

likely inevitable (in different forms and range) in the IT sector and programming teams. The organisational climate in teams working stationary and remotely can be defined using the same factors, so that the methodology of its measurement can be the same, which allows it comparison it in both ways of working. Remote work has an impact on the organisational climate observed in programming teams. Teams using agile software development methodologies, also using the agile way approached the new form of work, using the available ICT tools and changing their approach to work in a different reality. This has an impact on each of the dimensions of the organisational climate. It cannot be clearly said whether remote work shifts the organisational climate more towards a liberal and open or a formalised and authoritarian one. Different dimensions of the organisational climate have different effects (positive and negative) as a result of remote work, although for all of them it was significant change.

Remote work has a large negative effect on "team engagement" dimension and "communication", which is understandable due to the lack of face-to-face contact, focusing on more individual work and difficulties in contact and communication, which takes place only through tools and is devoid of non-verbal and informal layers. Quite unexpected and requiring in-depth further analysis is the medium negative impact on the dimension of "flexibility". Remote work has a positive large effect on "leadership style" dimension and "clarity", which is related to the work of leaders and managers to make the tasks and requirements clear, precise, and understandable and not leave the employee alone when working from home.

Future research work should include and deepen elements such as:

- the desired organisational climate in agile teams working remotely,
- the impact of the organisational climate on the work efficiency of these teams,
- does the work methodology (agile vs waterfall approach) contribute to a change in the organisational climate in remote work?
- if there is a difference in organisational climate change for remote agile development teams working for companies whose main activity is based on software development vs those teams that work for companies not from the IT sector.

It is possible that the previous research results and analyses do not apply to development teams working remotely and it should be the subject of future research.

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Appendix 1

1. Organizational climate in development teams – survey questions

Relations between team members

1. The level of tensions (conflicts) in the team
2. Team working atmosphere

Leadership style

1. Supervisor's leadership style
2. Superior-subordinate relationship

Communication

1. Team communication efficiency
2. Contact with top management

Flexibility

1. Openness to changes in the team
2. Formalization level
3. Innovative ideas in the team
4. Team members openness to new experiences

Autonomy

1. Product responsibility as a team member
2. Participation in decision-making of team members
3. Independence of team members
4. Willingness to take risks in the team
5. Supporting individual initiatives

Clarity

1. Transparency and clarity of rules and procedures
2. Relevance and clarity (knowledge and understanding) of the team's goals
3. Purposefulness of the team's activities (whether the team's activities support the set goal)

Rewarding

1. Level of employee appreciation
2. System of evaluations, awards and promotions
3. Remuneration (in relation to the market, other employees)

Team engagement

1. Identification with the team and the workplace
2. Teamwork
3. Mutual trust in the team

Standards

1. Task difficulty level (professional challenges)
2. Modernity (attitude to new technologies) during work
3. Degree of stakeholder pressure on the team
4. "Spirit of professionalism and organization"