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The Impact of Remote Work During the COVID-19 Pandemic on the Development of Competences in Selected Areas of Project Management

Keywords: remote work; COVID-19 pandemic; competences; project management

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Abstract

Theoretical background: The growing importance of remote work during the COVID-19 pandemic and its impact on the development of competences in selected areas of project management prompted the authors to conduct research on a group of 82 respondents working remotely on projects at the Project Management Institute Poland Chapter (PMI PC).

Purpose of the article: The aim of the article is to show the impact of remote work during the COVID-19 pandemic on the development of competences in selected areas of project management. The study is

theoretical and empirical in nature. The theoretical part shows the factors influencing the development of competences and the conditions of remote work. In the empirical part of the survey, employees' opinions on the impact of remote (online) work during the COVID-19 pandemic on the development of competences in selected areas of project management were presented. Five areas of project management were analysed, including: working time, communication, labour costs, risk and conditions for teamwork.
Research methods: Literature review and critical analysis of web research. Factor analysis was used for statistical analyses. To isolate the analysed factors, the principal components method was adopted, and the VARIMAX procedure was used as the rotation method.
Main findings: The conclusions of the research confirm the hypothesis that the COVID-19 pandemic had a significant impact on remote work, in particular on employee competences, work time and costs, motivation, effective communication and mutual relations between employees. The results of the research broaden the knowledge on the impact of various factors on remote work and the development of competences in selected areas of project management.

Introduction

The aim of the article is to show the impact of remote work during the COVID-19 pandemic on the development of competences in selected areas of project management. The study is theoretical and empirical in nature. The theoretical part shows the factors influencing the development of competences and the conditions of remote work. In the empirical part of the survey, employees' opinions on the impact of remote (online) work during the COVID-19 pandemic on the development of competences in selected areas of project management were presented. Five areas of project management were analysed, including: working time, communication, labour costs, risk and conditions for teamwork (PMBOK, 2017, p. 25). The SPSS factor analysis was used for the research. The adopted research assumptions allowed obtaining satisfactory results showing significant relations between constructs. The research hypothesized that the COVID-19 pandemic had a significant impact on remote work, in particular on employee competences, time and costs of work, motivation, effective communication and mutual relations between employees.

Literature review

As a result of the COVID-19 pandemic, the way many companies operate has changed and there has been an increase of interest in remote work. There emerged many new factors influencing the competences of managers and employees working remotely. The issue of competences has gained importance as a result of the pandemic crisis. There are many definitions of competences in the literature. Competences are considered to be integrated skills: organizational, conceptual, administrative, technical and interpersonal (Nogalski & Śniadecki, 1998, p. 98). In a holistic approach, they include cognitive competences (knowledge and skills), functional competences (related to professional competences), social competences (contacts and interpersonal relations) and metacom-

petences that relate to an active approach to self-development (Delamare et al., 2005). In addition, they include the ability to communicate effectively, motivate employees, the ability to work in a team and properly evaluate the team (Matysik, 2016, pp. 18–19). It is also essential to understand people, recognize their self-esteem and personal importance as well as a sense of social responsibility and teamwork (Penc, 2005, p. 124).

In project management, project factors and individual factors of employees, covering various aspects related to the implementation of the project, are important. Within the design factors, there are seven related determinants (Aguilar Velasco & Wald, 2022): (1) labour demand and labour resource issues, (2) role-related problems, (3) teamwork problems (e.g. conflicts, rotations), (4) leadership style and behaviour of the project manager, (5) project (sub)cultures (e.g. long working hours culture), (6) past episodic events (e.g. failure of a project), and (7) disruptions to work from home (e.g. constant communication).

Within the individual factors, on the other hand, there are 12 related subcategories (Aguilar Velasco & Wald, 2022): (1) demographic features, (2) human capital (e.g. competences), (3) professional orientation, (4) personal resources (e.g. self-efficacy), (5) personality features, (6) coping style (focused on the problem, orientation focused on emotions), (7) motivations, (8) emotional states, (9) professional identity (e.g. professional identification), (10) perceived job-related concerns (e.g. job insecurity), (11) attitude (e.g. paradoxical attitude); and (12) psychological contract (e.g. perceptions/expectations regarding employment practices).

During the pandemic, a number of new responsibilities related to remote work were imposed on managers and employees. In the face of the uncertainty, the key competences were the ones that ensured that enterprises were able to carry out their daily tasks. Competences allowing the use of knowledge and skills, as well as personality traits, motivation and experience to carry out tasks in conditions of many constraints related to the pandemic, gained in importance.

Also, a number of new responsibilities related to remote work were imposed on managers and employees. Employers had little experience of working remotely before the pandemic, and the change in working conditions during the COVID-19 pandemic was a big change for them (Dolot, 2020). The organization and coordination as well as the motivation to work remotely have changed. A lot of employees had to quickly adapt to the requirements of remote work. They had to gain skills related to the operation of computer hardware and programs independently at home. The pandemic caused this adaptation to be implemented faster than under normal circumstances (Nagel, 2020, p. 862). There has been an increase in the use of information and communication technologies (ICT) and the demand for e-skills, which are the basis of effective remote work (Caparrós Ruiz, 2022). It is also worth emphasizing that the COVID-19 pandemic created the need to look at project management problems from a completely new perspective (Müller & Klein, 2020).

The research by Carraher-Wolverton (2022) shows that people who experienced increased satisfaction with remote work plan to continue it in the future. On the other

hand, when expectations are not met, the willingness to continue working remotely decreases. Therefore, it is important for companies to understand the importance of managing employee expectations (Carraher-Wolverton, 2022). Employees see positive aspects of remote work as it allows employees to work more flexibly (Vyas & Butakhieo, 2021, p. 67).

Online communication requires greater precision and takes more time. Managers are less likely to allow remote work if the work requires high interdependence (Jamal et al., 2021). The pandemic influenced the dynamics of managing relations with employees in conditions of technological and social disruptions (Arslan et al., 2022). Remote work causes employees to lack interpersonal interaction, work environment and face-to-face interaction for better collaboration (Vyas & Butakhieo, 2021, p. 70). It is also emphasized that professional isolation can be an obstacle to career development (Caparrós Ruiz, 2022). Employees are exposed to adverse factors related to working on the project, such as heavy workload, insufficient resources, and lack of support from managers (Aguilar Velasco & Wald, 2022). Project participants are exposed to frustrating processes and stress caused by conflicts, overload and unfavourable working conditions (Havermans et al., 2019). Moreover, employees may experience greater stress, fear related to job security, anxiety, loneliness or burnout (Vyas & Butakhieo, 2021, p. 70). In fact, remote work can weaken employee ties, hinder teamwork, and diminish the benefits of collective intelligence (Caparrós Ruiz, 2022).

These types of situations require managers to take on new leadership roles that help reduce anxiety, fear and anger and build trust, loyalty and commitment (Durst & Henschel, 2021). According to the research by Mierzejewska and Chomicki (2020, p. 40), the greatest inconvenience of remote work is the lack of social contacts, the lack of direct communication and cooperation.

The considerations so far show that the pandemic has changed the current working conditions and has an impact on the shaping of employees' competences. The skills of acquiring and learning new competences and coping with uncertainty as well as applying new technological solutions are also important. It should be remembered that shaping the competences of employees, especially managers focused on achieving success in projects, is a very complex process, often dependent on variable external factors (Ahmad et al., 2022). It should be adapted to changing conditions, based on the current knowledge, improved abilities and accumulated experience of employees.

Research methods

The research was conducted by the Institute of Management and Quality Sciences of the University of Zielona Góra in cooperation with the Project Management Institute Poland Chapter (PMI PC). The PMI PC is a non-profit association of professionals involved in project management. It belongs to the global Project Manage-

ment Institute (PMI) association. The association has been operating in Poland since 2007. It currently has over 700 members. The members of the association are people holding positions of the highest, middle and operational level as well as specialists dealing with projects and consulting within Project Management.

The aim of the study was to learn about the opinions of employees on the impact of remote work during the COVID-19 pandemic on the development of competences in selected areas of project management. Five areas of project management were taken into analysis, including: working time, communication, costs and risk of work as well as conditions of teamwork.

Empirical research was preceded by studies of the literature. The CAWI method was used to obtain primary data. Over 200 people, specialists in project management, members of PMI PC were invited to the survey. In response to the invitation, 82 correctly completed questionnaires were obtained ($N = 82$). These were respondents who worked remotely on projects in various industries. The research was conducted in the period from November 2021 to March 2022. The questionnaire used a 5-point Likert scale: 1 – *I strongly disagree*, 2 – *I disagree*, 3 – *I neither agree nor disagree*, 4 – *I agree*, 5 – *I strongly agree*.

Factor analysis was used for statistical analyses. To isolate the analysed factors, the principal components method was adopted, and the VARIMAX procedure was used as the rotation method.

Characteristics of the research group

The study involved 82 employees who, due to the pandemic, worked remotely (Table 1). Large enterprises dominated in the group of respondents (69.5%). Half of all respondents were international corporations. The share of medium-sized enterprises was 19.5%, micro – 6.1% and small enterprises – 4.9%. About 70% of the surveyed enterprises run service activities. Manufacturing activity – 13.2%, mixed activity (trade, service and production) – 15.8%, and commercial activity – only 2.4%. The surveyed enterprises represented various industries, mainly IT (40.2%), industrial production (10.9%), and health protection (10.9%). Moreover, finance and insurance (9.7%), education (6.1%), transport (4.8%), construction (4.8%) as well as trade and the food industry (2.4% each). Their activities focused on domestic (71.9%) and foreign (28.0%) markets.

Taking into account the period of operation on the market, enterprises with many years of experience had the largest share in the research. Over 63.4% of the surveyed companies have been operating on the market for more than 16 years. And 14.6% of entities operated from 13 to 16 years. About 8% of companies operated from 9 to 12 years. Companies operating on the market for less than a year were 3.6%. The surveyed companies were dominated by design (47.5%) and matrix structures (37.8%), and functional structures accounted for approximately 14%.

Table 1. Characteristics of the surveyed enterprises

The frequency of remote work	The size of the company		Industry		Years of activity	
	type	%	type	%	range	%
Occasionally 1–2 days a week (18.3%)	micro	–	construction	13.3	5–8 years	6.7
	little	6.7	information technology	33.3	9–12 years	6.7
	mean	20.0	industrial production	40.0	13–16 years	20.0
	big	20.0	other	13.3	more than 16 years	66.7
	international	53.3				
Hybrid 3–4 days a week (21.9%)	micro	16.7	education	22.2	from 1 year	5.6
	mean	5.6	finance and insurance	5.6	9–12 years	5.6
	big	27.7	information technology	27.8	13–16 years	16.7
	international	50.0	industrial production	11.1	more than 16 years	72.2
			food industry	5.6		
			other	27.7		
Full-time work 5 days a week (59.8%)	micro	4.1	construction	4.1	from 1 year	4.1
	little	6.1	education	2.0	2–4 years	8.2
	mean	24.5	finance and insurance	14.3	5–8 years	6.1
	big	16.3	trade	4.1	9–12 years	10.1
	corporation	48.9	information technology	46.9	13–16 years	12.3
			healthcare	6.1	more than 16 years	59.2
			industrial production	2.0		
			food industry	2.0		
			transport	8.2		
			other	10.2		

Source: Authors' own study.

The key issue is the frequency of remote work. According to research, as many as 59.8% of managers and specialists have work computers and work remotely from home on a full-time basis, i.e. 5 days a week. This mainly applies to work in a corporation (48.9%) and in a medium-sized enterprise (24.5%). In small companies, less than 6% of the respondents worked remotely for 5 days, and in micro-companies about 4% of the respondents.

Hybrid work, including stationary and remote work, performed 3–4 days a week, was carried out by 21.9% of the respondents. They were managers and specialists working in international (50.0%), large (27.7%) and micro (16.7%) companies.

18.3% of the respondents indicated that only 1–2 days a week were to work remotely. They were employees of international enterprises (53.3%) as well as large and medium-sized enterprises (20.0% each). Employees communicate and stay in constant contact through communication platforms and phone applications, and use e-mail and phone calls. This allows them to carry out current tasks, solve problems and make decisions.

Presentation of the results

The first area of analysis was the identification of working time factors. Factors influencing individual and team work were identified. The result of the analysis was the two-factor solution, where the sums of the squared charges after isolation are greater than 1.0 (Table 2).

Table 2. Total explained variance for components in the area of working time

Total variance explained							
Component		Sum of squared charges after extraction			Sum of squared charges after rotation		
		Overall	% variance	% cumulative	Overall	% variance	% cumulative
Raw	1	6.968	75.758	75.758	4.738	51.519	51.519
	2	1.829	19.890	95.648	4.059	44.130	95.648
Scaled	1	4.683	78.046	78.046	3.720	61.993	61.993
	2	1.037	17.279	95.325	2.000	33.332	95.325

Source: Authors' own study compiled on the basis of the results of the analyses.

The first component includes all questions with load values greater than 0.6 (Table 3). The most frequently cited positive effects of remote work were time and money savings due to the lack of the need to travel to work (1.1), the possibility of adjusting work to private life (1.0) and the possibility of flexible working time at home (1.0). Moreover, the respondents indicated greater flexibility in organizing work (0.9) and greater timeliness of tasks performed (0.6). Within the second component, there were two responses with the highest value. They refer to the need to spend more time on operating the computer (1.6) and the timeliness of tasks (0.9).

Table 3. Analysis of working time factors

Factors	Raw		Scaled		Matrix of the evaluation coefficients of the principal components	
	Component		Component		Component	
	1	2	1	2	1	2
Time and money savings due to the lack of necessity to travel to work	1.073	.266	.955	.236	.325	-.130
More flexibility in organizing your work	.965	.271	.945	.265	.259	-.094
Possibility of flexible working time at home	1.025	.311	.941	.286	.288	-.097
Possibility of adapting work to private life	1.042	.553	.839	.445	.275	-.003
The need to spend more time operating the computer	.292	1.604	.178	.979	-.373	.882
Greater timeliness of performed tasks	.658	.969	.541	.797	.019	.278
Method of extracting factors – main components. Rotation method – VARIMAX with Kaiser normalization. Rotation converged in 3 iterations. Cronbach's alpha: 0.958; KMO: 0.846; df: 15						

Source: Authors' own study compiled on the basis of the results of the analyses.

In order to obtain a clear arrangement of charges, the variables were scaled up. This made it possible to obtain two hidden dimensions, giving a more transparent arrangement of factors. Within the framework of the resulting first dimension, there were four questions – statements (with charges above 0.8). They concerned savings in time and money due to the lack of necessity to travel to work, greater flexibility in organizing work, the possibility of flexible working time at home and the possibility of adapting work to private life. As part of the second component, the same statements were confirmed and they referred to the need to spend more time on operating the computer and the timeliness of tasks.

The second area of analysis was to identify factors related to communication while working remotely. As a result of the analysis, one component was obtained. The sums of the squares of the charges after isolation totalled 4.752, giving 79.199 percent of the variance. For the analysis, solutions were adopted whose sums of the squared charges, after isolating them, are greater than 0.8 (Table 4).

Table 4. Analysis of factors related to communication during remote work

Factors	Component matrix	Common volatility resources	Matrix of the evaluation coefficients of the principal components
	Component	Component	Component
	1	1	1
Online office access guaranteed	.970	.941	.204
No traditional coffee conversations	.968	.937	.204
Limited direct contact with other employees	.919	.844	.193
Using virtual platforms	.910	.829	.192
Fast information exchange via the Internet	.877	.769	.185
Difficult access to documents in the company	.657	.432	.138
Method of extracting factors – main components. Rotation method – VARIMAX with Kaiser normalization. KMO: 0.766; chi-square: 701.683; df: 15			

Source: Authors' own study compiled on the basis of the results of the analyses.

According to the respondents, the key factors influencing communication while working remotely are: access to an online office (0.9), lack of traditional coffee conversations (0.9) and limited direct contact with other employees (0.9). Virtual platforms (0.9) and quick information exchange via the Internet (0.8) were also helpful in communication. According to the respondents' opinions, there were no major difficulties in accessing company documents.

The third area of analysis was the cost of remote work. As a result of the analysis, one component was obtained. Charge squared sums after isolation totalled 4.320, giving 86.395 percent of the variance. For the analysis, solutions were adopted whose sums of the squares of charges, after isolating them, are greater than 0.8 (Table 5).

Table 5. Analysis of the factors related to the costs of remote work

Factors	Component matrix	Common volatility resources	Matrix of the evaluation coefficients of the principal components
	Component	Component	Component
	1	1	1
Limited access to company resources	.974	.948	.225
No financial support from the employer	.964	.929	.223
Own costs of purchasing hardware, software, Internet service	.943	.889	.218
Use of private computers	.939	.881	.217
Increase in the cost of office work at home (higher electricity, heating and water consumption)	.820	.672	.190
Method of extracting factors – main components. Rotation method – VARIMAX with Kaiser normalization. Cronbach's alpha: 0.958; KMO: 0.839; df: 10			

Source: Authors' own study compiled on the basis of the results of the analyses.

According to the respondents, in the first place, the key factor influencing the costs of remote work was limited access to the company's resources. Also, the lack of financial support from the employer was considered significant. During the pandemic, a lot of tasks and activities were shifted to employees working remotely from home. In most cases, the employees had to deal with the difficulties resulting from the sanitary regime on their own. A noticeable cost for the employees was the purchase of their own computer hardware, software and the cost of the Internet service. In many cases, employees used private computers. An additional burden for employees was the increase in the cost of office work at home. It referred to higher consumption of electricity, heating and water. Employees noticed the negative effect of remote work during the pandemic, which was the transfer of remote work costs to employees and the lack of adequate financial support by the employer.

The fourth area of analysis was risk when working remotely. The risk related to the operation of computer devices and the risk related to the possible occurrence of an employee's disease as a result of infection with the COVID-19 virus have been distinguished. As a result of the analysis, one component was obtained. The sums of the squared charges after isolation totalled 3.298, giving 82.449 percent of the variance. For the analysis, solutions were adopted whose sums of the squares of charges, after isolating them, were greater than 0.8 (Table 6).

Table 6. Analysis of risk factors when working remotely

Factors	Component matrix	Common volatility resources	Matrix of the evaluation coefficients of the principal components
	Component	Component	Component
	1	1	1
Increased vulnerability to cyber attacks	.944	.891	.286
The ability to work even when you are sick	.912	.831	.276
A sense of security against contracting the COVID-19 virus due to the lack of contact with other employees	.899	.808	.273
Danger of the appearance of computer viruses	.876	.767	.266
Method of extracting factors – main components. Rotation method – VARIMAX with Kaiser normalization. KMO: 0.666; df: 6			

Source: Authors' own study compiled on the basis of the results of the analyses.

As part of a single component, there were two answers with the highest value, which concerned increased susceptibility to threats of cyber-attacks on computer devices and the possibility of remote work even during the employee's illness. Two responses with a lower value of loads were complemented by the fact that remote work gives a greater sense of security against contracting the COVID-19 virus due to the lack of contact with other employees. However, with regard to computer threats, the risk of computer viruses was indicated.

Table 7. Analysis of factors related to the determinants of teamwork

Factors	Component matrix	Common volatility resources	Matrix of the evaluation coefficients of the principal components
	Component	Component	Component
	1	1	1
Increased satisfaction with the results of work	.977	.954	.088
Less access to training	.973	.948	.088
Mental comfort, calm atmosphere, no constant supervision	.969	.940	.087
Possibility of contact and teamwork	.964	.930	.087
Loss of motivation to work due to fatigue and excess work	.963	.928	.087
Isolation from co-workers, feeling lonely	.960	.922	.087
Limited direct contact with other employees	.958	.918	.086
Poor self-discipline of the employee	.956	.914	.086
Feeling lonely and unsupported	.954	.910	.086
Positive relationships between colleagues	.941	.885	.085
Limited direct contact with other employees	.937	.918	.086
Less conflicts	.858	.736	.077
Financial motivation for remote work	.475	.226	.043
Method of extracting factors – main components. Rotation method – VARIMAX with Kaiser normalization. KMO: 0.912; df: 78			

Source: Authors' own study compiled on the basis of the results of the analyses.

The fifth area of analysis was the determinants of teamwork. As a result of the analysis, one component was obtained. Charge squared sums after isolation totalled 11.086, giving 85.275 percent of the variance. For the analysis, 12 solutions were adopted, the sums of the squared charges of which, after isolating them, were greater than 0.8 (Table 7).

The obtained results were grouped under two criteria including positive and negative effects of remote work. According to the respondents, the positive aspects of working at home are:

– positive relations between colleagues,
– psychological comfort, calm atmosphere, lack of constant supervision,
– possibility of contact and teamwork,
– fewer conflicts,
– increase in satisfaction with the results of work.

In the respondents' opinions, remote work has a number of negative consequences. The most frequently indicated ones were:

– less access to training,
– decrease in motivation to work due to fatigue and excess work,
– isolating oneself from co-workers, feeling of loneliness,
– limited direct contact with other employees,
– poor self-discipline of the employee,
– feeling of loneliness and lack of support,
– limited direct contact with other employees.

Although the respondents demonstrated more negative than positive consequences of working remotely, it should not be considered in quantitative terms, but more in terms of value. The key factor seems to be that the respondents, despite many encountered difficulties and limitations, perceive an increase in satisfaction with the effects of work in the end result.

Discussion

The results of the research broaden the knowledge on the impact of various factors on remote work and the development of competences in selected areas of project management. They allow confronting the expectations of employers with the expectations of employees, which significantly affect the effects of work, motivation and intra-organizational relations between the employees themselves as well as the employee and the manager. Remote work requires independence and the ability to manage time and solve problems. It requires coping with professional isolation and lack of face-to-face interaction with employees. Project managers' leadership style and behaviour can positively or negatively affect the performance of subordinates.

In the conditions of changes, human capital plays a key role, especially employees' knowledge, their skills and ability to adapt to new (remote) working conditions,

especially in projects. This is confirmed by the fact of the complete reconstruction of the seventh edition of the project management standard (PMBOK, 2021), the structure of which is currently based on values, principles and domains anchored directly in systematically acquired knowledge and accumulated skills throughout life.

Conclusions

The conclusions from the research confirm that the COVID-19 pandemic had a significant impact on remote work and competence development in selected areas of project management. The studies show that employees efficiently communicated using modern technologies. They spent much more time in front of the computer. They missed the usual conversations with colleagues over coffee. As before the pandemic, they could not freely meet and discuss professional and private matters. They were unable to develop relationships with their colleagues at work through the ongoing pandemic. Sometimes they experienced the effects of being isolated from their co-workers, they felt lonely. They had to take care of the organization of work themselves, demonstrate greater discipline and motivation to work. Moreover, they had to learn and complete tasks and solve problems on their own. They needed to co-create new rules and principles of work in times of a pandemic, taking into account the lack of direct supervision by the superior. In addition, the lack of direct contact and conversations meant that they had to be more independent from their colleagues. They were largely autonomous in planning and carrying out tasks and realized that limiting contacts was an expression of responsibility for their own and others' health. They worked more efficiently and were more involved in their work.

The respondents also demonstrated negative aspects in the form of an increase in the cost of office work at home (higher consumption of electricity, heating and water). According to some respondents, home conditions make remote work difficult. They do not provide psychological comfort and peace for the sake of other household members. Furthermore, not all employees were provided with technical support in the form of hardware and software to improve communication and increase work efficiency. The research confirmed the hypothesis that the COVID-19 pandemic had a significant impact on remote work, in particular on employee competences, time and costs of work, motivation, effective communication and mutual relations between employees.

Remote work meant that employees working from home showed greater self-control over their work requiring many skills. They actively acquired knowledge and skills, systematically improved their personal qualities necessary to perform their professional duties. Competent managers and employees act as a catalyst ensuring, on the one hand, an appropriate level of the company's functioning and they are, on the other hand, a determinant of its development possibilities.

Further research should focus on concepts, rules and principles jointly developed by managers and employees in accordance with the guidelines of the new PMBOK standard, which will inspire and motivate employees to continue working remotely and reduce its negative effects. The results of the research can provide knowledge for top, middle and lowest level managers as well as for employees who work remotely and directly feel positive and negative effects of the pandemic.

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