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The onlinezation influence on knowledge sharing for corporate innovation during the CoViD crisis

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Abstract

The article describes the study of the influence of shock onlinezation caused by the CoViD-19 quarantine on the knowledge management performance and effectiveness in organizations. The methodology of the study is based on a set of multiple linear regression equations linking together the onlinezation, knowledge management parameters, problem-solving and financial performance. The results of the study allow developing a set of practical recommendations regarding the development of knowledge management systems in organizations under the onlinezation context, with a special accent to solving technical and/or marketing uncertainty-related problems with architectural or modular innovations.

1 | INTRODUCTION

Declared a global pandemic by the World Health Organization on March 11, 2020, Coronavirus (CoViD-19) crisis led to an increase in economic uncertainty where it created an unprecedented effect on organizations' survival. On the other hand, most organizations have shifted toward a new normal of online work, work from home, or virtual workplace. However, organizational stability relies on knowledge management practices and how efficiently and effectively managing their knowledge bases can provide them to work their way out of crisis (Nonaka & Takeuchi, 1995; Wang, 2009). This implies that knowledge management (KM) routines, such as knowledge identification, acquisition, sharing and transferring, creating, storing and so on are essential and access to knowledge routines may be an effective strategy to sustain critical resources (Meyer & Sugiyama, 2007).

As knowledge is recognized as a crucial asset for every organization in today's knowledge-intensive, sharing economy (Anand et al., 2019), the knowledge-based view of the firm considers knowledge to be the root of a company's strategic advantage (Grant, 1996a (1; 2); Cerchione et al., 2020). Among various knowledge management routines, knowledge sharing, albeit one of the most significant ones for the firm success (Wang & Noe, 2010) is one of the most affected by forced onlinezation (Lee et al., 2020), as knowledge sharing is by definition happening in communication between different people (Grant, 1996b (2); Husted & Michailova, 2002; Van den Hooff & de Ridder, 2004) and thus containing a various degree of knowledge

content distortion in various communication modes and situations due to, for example, different distribution of explicit and tacit knowledge (Gubbins & Dooley, 2021).

Thus, given the CoViD-19 situation, which has forced the organizations to work more through virtual ways than face to face, it is still unknown how the effectiveness of knowledge sharing is being changed, how can knowledge sharing be facilitated during the crisis and how effective it can be when the normal knowledge sharing routine becomes completely online. In light of these shortfalls, the research actuality is based on the worldwide transfer of work activities (particularly in management and R&D) in various companies from offline to online since the beginning of the CoViD-19 pandemic. It is obvious that this shift exerts significant influence on the knowledge management practices (especially the knowledge sharing ones due to their communication basis) in the companies having undergone this shift; thus, our study is aiming to figure out the main traits of this influence, both from process (i.e., how did the knowledge management processes change?) and effectiveness (i.e., how did the knowledge management processes effectiveness change?) viewpoints.

More precisely, the study is addressing the parameters of:

1. Knowledge sharing speed, fullness and adequacy of shared knowledge (with the respondent asked questions addressing her as both knowledge holder and requester).
2. Knowledge sharing barriers of technological and organizational types.

3. Resulting company effectiveness in shared knowledge application and new knowledge creation (assessed through the constructs of technological and marketing innovations; architectural and modular innovations; profit, sales and market share growth).

2 | RESEARCH BACKGROUND

The paper is oriented on assessment of CoViD-induced onlinezation on knowledge sharing; when speaking about any kind of knowledge sharing assessment, complex nature of this phenomenon must be taken into account, both considering knowledge sharing as a part of the knowledge management and overall organizational activities supersystems, and as a phenomenon consisting of several subsystems and/or various dimensions.

The first dimension of knowledge sharing that should be taken into account when assessing it is its interpersonal nature: for knowledge sharing at least two sides is required, that is, a knowledge holder and a knowledge requester (Grant, 1996b (2); Husted & Michailova, 2002; Van den Hooff & de Ridder, 2004; Riege, 2005; Olaniran, 2017).

Efficiency and effectiveness of sharing knowledge between the requester and holder can be assessed by several criteria, most of which can be generally divided into knowledge sharing speed and quality (Blagov et al., 2018, 2020; Ismail & Yusof, 2010; Rumanti et al., 2018; Wang et al., 2018). While knowledge sharing speed, that is, the speed of the requested knowledge transfer from the knowledge holder to the requester, is a considerably clear and homogeneous category, knowledge sharing quality is much more complicated and can be divided into several subcategories. A considerable amount of structures of such subcategories has been suggested in the literature (Cabrera & Cabrera, 2002; Rumanti et al., 2018; Witherspoon et al., 2013); one of the possible high-level classifications of knowledge quality criteria divides these into, for example, knowledge sharing fullness (i.e., does the knowledge holder transfer all the volume of the requested knowledge item) and adequacy (i.e., does the knowledge holder react to the knowledge sharing request by transferring exactly that knowledge item that is being requested) (Blagov et al., 2020; Doronin et al., 2020; Gavrilova et al., 2012; Younis & Adel, 2020).

These criteria, however, are describing the efficiency and effectiveness of knowledge management as such, without a relationship with the efficiency and effectiveness of the organizational activities; but knowledge sharing is not a "Ding an sich": it is happening in an organization to reach its goals and solve its problems.

Considering the integration of knowledge sharing parameters into the organizational goal and problems, two main levels of knowledge sharing results (and, thus, two stages of knowledge sharing effectiveness assessment following the assessment of knowledge sharing parameters as such) can be figured out.

The "final," "strategic" level is that of the organization's overall planned results, for example, financial results (sales, market share, costs minimization, profit, etc.) for a commercial company (Afriyie et al., 2018; Iske & Boersma, 2005).

To reach these results, however, the organization must solve operational and tactical level problems, which are usually topics of everyday knowledge sharing activities (Oztemel & Arslankaya, 2012). So, the "middle" stage of knowledge sharing effectiveness assessment (if we consider the knowledge sharing speed and quality the "initial" stage, and the organization's financial results as a "final" stage) is the organization's (or individual, or of a subdivision within an organization) success in solving such problems.

Several other classifications are of interest for the aims of current research.

If looking at this problems-for-solving from the perspective of uncertainties involved in these, the problems could be divided, for example, into technical (dealing with the uncertainty created by inanimate objects) and "human" (dealing with the uncertainty created by human interactions) (Aslam et al., 2018; de Almeida et al., 2016; Liu et al., 2020).

Problem-solving methods can be, in their turn, classified by approach to working with system elements. Every organizational or technical system can be, indeed, described as consisting from elements and linkages between elements (or, vice versa, as architecture and elements filling this architecture), not to say consisting of subsystems and itself being a part of a supersystem (Galunic & Eisenhardt, 2001; Henderson & Clark, 1990; Wang et al., 2018). Thus, problem-solving methods can be classified into mostly oriented on changes in architecture or changes in constituent elements (in terms of [Henderson & Clark, 1990]—on architectural or modular innovations respectively) (Fiorineschi & Rotini, 2019; Han, 2017; Liu et al., 2020).

The variables of the current research are based on these classifications; according to the described logic of three stages of knowledge sharing assessment (knowledge sharing parameters, problem-solving and financial results as a metric of organizational effectiveness), three variable blocks are developed.

Below we describe these variable blocks in the respective order.

2.1 | Knowledge sharing

The knowledge-sharing variables are constructed on the basis of the following inputs.

Firstly, as our goal is an inquiry into the CoViD-induced onlinezation influence on knowledge sharing, the variables should be describing changes in knowledge sharing parameters since the beginning of the CoViD pandemic.

Secondly, as knowledge sharing is by definition a process requiring no less than two participants—a knowledge holder and a knowledge requester—and as each person in her professional activity can play both roles, the variables should consider the change in knowledge sharing parameters as perceived by the knowledge holder and requester.

Thirdly, change of what knowledge sharing parameters should be included in the variables of this block?

Using the classification developed in Blagov et al. (2018, 2020)), it has been decided that such parameters should be knowledge sharing speed, fullness and adequacy.

Thus, the list of knowledge sharing variables is:

1) Change in knowledge sharing speed as perceived by the knowledge holder (for the sake of text brevity and readers' convenience further referred to as KS_1).

2) Change in the fullness of shared knowledge as perceived by the knowledge holder (respectively, KS_2).

3) Change in the adequacy of shared knowledge as perceived by the knowledge holder (KS_3).

4) Change in knowledge sharing speed as perceived by the knowledge requester (KS_4).

5) Change in the fullness of shared knowledge as perceived by the knowledge requester (KS_5).

6) Change in shared knowledge adequacy as perceived by the knowledge requester (KS_6).

2.2 | Problem-solving

The variables of this block have been constructed on the basis of the following principles.

Firstly, analogously to the previous variable block, these variables are describing changes in the problem-solving parameters since the beginning of the CoViD pandemic.

The first variable is the most "general," representing the creation of new products or services since the beginning of the research period.

The next variables are constructed on the basis of several classifications:

a) Of the problems being solved divided into technical (dealing with inanimate objects not having their own goalsetting) and marketing (as a proxy of a wider "human-related" problems category, used for a purpose of the respondents' ease of questionnaire understanding and, thus, response rate increase [Peñalba-Aguirrezabalaga et al., 2020]).

b) Of hierarchical levels of a respondent's participation in knowledge sharing activity, divided into individual, subdivisional (group, team, etc.) and organizational levels, as different complexity of problems solved on various organizational hierarchy levels can result in different effects of the same changes in interpersonal knowledge sharing parameters (Lu et al., 2006; Rohman et al., 2020).

c) Of innovation types divided into architectural (considering changes in an architecture of a system) and modular (considering changes in the constituent elements of a system).

Thus, the list of variables in this block is the following:

1) Creation of new products or services (further referred to as PS_1).

2) The company solving technical problems it had not solved before (respectively, PS_2).

3) The department solving technical problems it had not solved before (PS_3).

4) An individual (respondent) solving technical problems she had not solved before (PS_4).

5) The company solving marketing problems it had not solved before (PS_5).

6) The department solving marketing problems it had not solved before (PS_6).

7) The individual solving marketing problems she had not solved before (PS_7).

8) The company solving problems it had not solved before by introducing a new element into a system (PS_8).

9) The department solving problems it had not solved before by introducing a new element into a system (PS_9).

10) The individual solving problems she had not solved before by introducing a new element into a system (PS_{10}).

11) The company solving problems it had not solved before by rearranging elements of a system (PS_{11}).

12) The department solving problems it had not solved before by rearranging elements of a system (PS_{12}).

13) The individual solving problems she had not solved before by rearranging elements of a system (PS_{13}).

2.3 | Financial results

Analogously to the variables of the previous blocks, variables of this block represent the change in financial results variables since the beginning of the CoViD-19 pandemic.

The first variable of this block is continuing the idea of the first variable of the problem-solving block in being a "general" one; as Variable 1 of the problem-solving block is representing the creation of new products or services, the financial results block Variable 1 is representing the success in the commercialization of the new products or services.

The following variables of this block are more specifically representing the financial results themselves. Following such articles on CoViD influence on business as, (e.g., Shafi et al., 2020; Warsame, 2020), it has been decided to use several measures of financial results, namely, changes in profits, sales, and market share. For looking at the picture of the financial results not only from a static but also from a dynamic perspective (Goh, 2020; Kunieda & Takashima, 2020), variables of changes in profit, sales and market share growth have been also added.

Thus, the list of the financial results block variables is the following:

1) Successful commercialization of new products or services on the market (further referred to as FR_1).

2) Change in profits (respectively, FR_2).

3) Change in profit growth (FR_3).

4) Change in sales (FR_4).

5) Change in sales growth (FR_5).

6) Change in market share (FR_6).

7) Change in market share growth (FR_7).

2.4 | Onlinezation

In addition to the above-described three knowledge-sharing assessment variable blocks, it is logical also to add variables reflecting the processes of onlinezation induced by the CoViD-19 pandemic, as truly

TABLE 1 Questionnaire

Block	Index	Questions
1	Onl_1	Our company has transferred from offline to online work
	Onl_2	Not the whole company, but my department has transferred from offline to online work
	Onl_3	Not the whole company or department, but I have transferred from offline to online work
	Onl_4	Our company or department has transferred its core activities from offline to online
	Onl_5	Our company or department has transferred its supplementary activities from offline to online
2	KS_1	When my colleagues ask me to share knowledge, it became faster for them to get it
	KS_2	When my colleagues ask me to share knowledge, they get a fuller knowledge
	KS_3	When my colleagues ask me to share knowledge, they get more adequate knowledge
	KS_4	When I ask my colleagues to share knowledge, I get it faster
	KS_5	When I ask my colleagues to share knowledge, I get fuller knowledge
	KS_6	When I ask my colleagues to share knowledge, I get more adequate knowledge
3	PS_1	Our company has created new products or services
	PS_2	Our company has solved several technical problems it had not solved before
	PS_3	Our department has solved several technical problems it had not solved before
	PS_4	I have solved several technical problems I had not solved before
	PS_5	Our company has solved several marketing problems it had not solved before
	PS_6	Our department has solved several marketing problems it had not solved before
	PS_7	I have solved several marketing problems I had not solved before
	PS_8	Our company has solved several problems it had not solved before by introducing a new element in some system
	PS_9	Our department has solved several problems it had not solved before by introducing a new element in some system
	PS_{10}	I have solved several problems I have not solved before by introducing a new element in some system
	PS_{11}	Our company has solved several problems it had not solved before by rearranging elements of some system
	PS_{12}	Our department has solved several problems it had not solved before by rearranging elements of some system
	PS_{13}	I have solved several problems I have not solved before by rearranging elements of some system
4	FR_1	Our company has successfully commercialized new products or services on the market
	FR_2	Our company has increased its profits
	FR_3	Our company has increased its profit growth
	FR_4	Our company has increased its sales
	FR_5	Our company has increased its sales growth
	FR_6	Our company has increased its market share
	FR_7	Our company has increased its market share growth

a shock for lots of organizations, although lots of them had been transferring their operations from offline into online before, but much more gradually (Amankwah-Amoah et al., 2020; Kinnunen & Georgescu, 2020; Warsame, 2020).

The first three of these block variables, according to the division of knowledge sharing processes between the organizational, sub-divisional and individual levels, are representing onlinezation on the respective levels:

1) Company's transfer from offline to online work (further referred to as Onl_1).

2) Department's transfer from offline to online work (respectively, Onl_2).

3) Individual's transfer from offline to online work (Onl_3).

Finally, two more variables of the block represent the difference in onlinezation of core and/or supplementary activities of the company or subdivision (without individual level here, as the individual job duties can be rather narrow and thus hardly dividable into the core or supplementary ones), that is interesting to compare because supplementary activities onlinezation is surely a much wider phenomenon, but—at least for the industries and/or companies that had not been

TABLE 2 Age distribution of the respondents

Age group	Number and percentage of respondents
20–30	17 (32.69%)
31–40	27 (51.92%)
41–50	8 (15.38%)

TABLE 3 Industry distribution of the respondents

Industry	Number and percentage of the respondents
IT	17 (32.69%)
Education	8 (15.38%)
Management consulting	6 (11.54%)
Banking and financial services	4 (7.69%)
Manufacturing	3 (5.77%)
R&D	2 (3.85%)
Sales	1 (1.92%)
Construction	1 (1.92%)
Agriculture	1 (1.92%)
Sports	1 (1.92%)
Tourism	1 (1.92%)
Market research	2 (3.85%)
E-commerce	1 (1.92%)
Legal services (intellectual capital protection)	1 (1.92%)
Other	3 (5.77%)

TABLE 4 Respondents' work experience in the company or department

Work experience (full years)	Number and percentage of the respondents
Less than 1 year	3 (5.77%)
1	9 (17.31%)
2	7 (13.46%)
3	5 (9.62%)
4	4 (7.69%)
5	10 (19.23%)
6	2 (3.85%)
7	5 (9.62%)
8	2 (3.85%)
9	1 (1.92%)
10	3 (5.77%)
More than 10	1 (1.92%)

TABLE 5 Respondents' work experience in the profession

Work experience (full years)	Number and percentage of the respondents
Less than 1 year	0 (0%)
1	2 (3.85%)
2	3 (5.77%)
3	1 (1.92%)
4	3 (5.77%)
5	7 (13.46%)
6	6 (11.54%)
7	6 (11.54%)
8	2 (3.85%)
9	1 (1.92%)
10	2 (3.85%)
More than 10	21 (40.38%)

functioning online earlier—much less radical business model and technology change (Nhamo et al., 2020; Seetharaman, 2020).

Thus, two more variables are added to the block:

4) The company or department transferring core activities from offline into online (Onl_4).

5) The company or department transferring supplementary activities from offline into online (Onl_5).

3 | METHODS AND DATA COLLECTION

3.1 | Measures

For assessing the above-described variables, a questionnaire has been created (distributed with identical text in English and Russian; here the English version is demonstrated), with the following logic of blocks:

1) Demographic questions (approximate annual sales volume of a company; approximate number of employees in a company; industry; form of ownership; in what country does the company mainly work; respondent's age; respondent's full years of working in a described

company; respondent's full years in a profession and respondent's position in a company);

2) Onlinezation (as it influences knowledge sharing parameters, that are in turn influencing the "subsequent" variables according to the user knowledge sharing assessment stages model).

3) Knowledge-sharing parameters.

4) Problem-solving.

5) Financial results.

The variables in each block except for the demographic are translated into questions with a single-type beginning: "Since the beginning of the CoViD-19 pandemic…" The questions are using the Likert type scale with 10 answer variants from "fully disagree" to "fully agree"; for quantitative assessment the answers have been coded as numerical variables from 1 to 10, respectively. (Note that the formulations of

TABLE 6 Respondents' position in the organization

Respondent's position	Number and percentage of the respondents
Owner, founder, etc.	3 (5.77%)
CEO	8 (15.38%)
Senior manager	4 (7.69%)
Middle or operational manager	2 (3.85%)
Qualified specialist	35 (67.31%)
Unqualified specialist	0 (0.00%)

TABLE 7 Approximate annual sales volume of the organization

Annual sales volume, thousands of euro	Number and percentage of the respondents
10–100	2 (3.85%)
101–500	11 (21.15%)
501–1000	3 (5.77%)
1001–10,000	14 (26.92%)
10,001–50,000	13 (25.0%)
More than 50,000	7 (13.46%)
Non-profit organization	2 (3.85%)

TABLE 8 Approximate number of employees in the organization

Number of employees	Number and percentage of the respondents
Less than 10	4 (7.69%)
10–50	24 (46.15%)
51–100	7 (13.46%)
101–500	8 (15.38%)
501–1000	4 (7.69%)
More than 1000	5 (9.62%)

the variables themselves have neutral wording based on the word "change," while the questions in the questionnaire have positive intonation wording, for example, "I get more adequate knowledge" in a question uncovering the variable or "company has increased its profit growth" in a $KS6$ question uncovering the variable. Such formulation seems more informative than a $FR3$ neutral word "change," not showing its direction: answers with a numeric value from 6 to 10 represent a change in the increase direction (at least in the respondent's subjective perception), while answers with a numeric value from 1 to 5, respectively, represent the change in the decrease direction).

Table 1 shows the list of the questions in the order of the blocks.

The relationships between these variables have been assessed by several sets of multiple linear regression equations, numbered according to the variable blocks order. Thus, "Model 12" does depict the Block 1 (CoViD pandemic induced onlinezation) influence on the Block 2 (change in knowledge management parameters); the "Model 23"—the Block 2 (change in knowledge management parameters) influence on the

TABLE 9 Form of ownership

Form of ownership	Number and percentage of the respondents
Private	14 (26.92%)
Public	34 (65.38%)
State-owned	4 (7.69%)

TABLE 10 Main regions of operation

Russia	**27 (51.92%)**
Russia and CIS countries	1 (1.92%)
Russia and EU countries	1 (1.92%)
European Union	8 (15.38%)
France	5 (9.62%)
Italy	1 (1.92%)
Spain	1 (1.92%)
Germany	1 (1.92%)
United Kingdom	1 (1.92%)
United States	1 (1.92%)
Worldwide	5 (9.62%)

Note: Main regions of operation number and percentage of the respondents.

Block 3 (change in problem-solving capabilities); finally, the "Model 34" considers the Block 3 (change in problem-solving capabilities) influence on the Block 4 (change in company financial results).

3.2 | Sample and data collection

The questionnaire was distributed using the SurveyMonkey online survey service in two identical versions in English and Russian languages in early July 2020. Links to the questionnaire have been distributed by the authors in their social networks, professional and universities' Alumni communities for the time period of July–August 2020. We received a total of 52 responses with full answers to all the questions: 25 to the English language version of the questionnaire and 27 to the Russian one.

The quantity of 52 responses is not big enough to allow using the demographic statistics as control variables; the more so the quantities of Russian and English questionnaire version responses. Thus, in Tables 2–10 we give an excerpt from demographic statistics just for general information; further sample increase to the size allowing controlling for demographic variables sure can be one of the primary further research development directions.

4 | RESULTS

Multiple linear regression equation assessment results are presented in the Tables
11–13.

TABLE 11 Results of the Model 12 assessment

	KS_1		KS_2		KS_3		KS_4		KS_5		KS_6	
	p-value	IV coeff	*p*-value	IV coeff	*p*-value	IV coeff	*p*-value	IV coeff	*p*-value	IV coeff	*p*-value	IV coeff
Const	0.041	1.591	0.026	1.774	0.001	2.695	0.008	2.364	0.003	2.758	0,004	2306
Onl_1	0.006	0.495	0.026	0.406	0.161	0.223	0.192	0.257	0.326	0.197	0,685	0,070
Onl_2	0.266	−0.231	0.125	−0.327	0.578	−0.104	0.055	−0.455	0.028	−0.539	0,065	−0,387
Onl_3	0.101	0.351	0.036	0.462	0.322	0.191	0.019	0.572	0.068	0.453	0,073	0,384
Onl_4	0.014	−0.570	0.082	−0.405	0.225	−0.249	0.185	−0.338	0.457	−0.193	0,407	−0,187
Onl_5	0.0024	0.553	0.014	0.452	0.013	0.403	0.052	0.388	0.033	0.438	0,003	0,545

The table's design is the following: rows are depicting independent variables, columns are depicting dependent variables. Coefficients with *p*-values lower than 0.05, thus, statistically significant at the 95% significance level, are marked with green.

The tables are listed in the order following the logical order of models.

Table 11 depicts the results of assessing Model 12, Table 12 depicts the results of assessing Model 23, and finally, Table 13 does depict the results of assessing Model 34.

5 | DISCUSSION

In this section, we discuss the multiple linear regression equation assessments results in the order of the models.

Model 12

The most prominent result in this model is the constant, which is significant in every equation with a positive sign. As this model's dependent variables represent an increase in knowledge sharing effectiveness, this result can be interpreted as to its overall increase on all the researched levels throughout the respective period of time. The specific influence of some levels onlinezation, however, can be both positive and negative, as can be seen in other significant results within Model 12. This overall increase, thus, can be attributed to a possible bias of the research object, as the respondents answering the questionnaire containing specific KM terminology can either themselves be proficient in KM, or working in companies proficient and, to some extent thus, successful (Bao et al., 2016; Zhang et al., 2020). Overcoming this bias with, possibly, simplifying the questionnaire and broadening the research sample, could be one of the possible further research development directions.

Positive influence of Onl_1 on KS_1 and KS_2, in addition to the same overall positive influence bias or bias of humane proneness to self-praise, can be explained either by an increase of intrinsic motivation for knowledge sharing as a reaction on an onlinezation stress (Chedid et al., 2020; Nguyen et al., 2019), or by greater online instruments convenience for knowledge sharing (Kinnunen & Georgescu, 2020; Razif et al., 2020) in terms of both knowledge speed and fullness (but not adequacy, for which face-to-face tacit knowledge sharing could be more sensitive and influential (Blagov et al., 2020)).

The negative influence of not-company-but-department onlinezation on respondents' received knowledge fullness along with the positive influence of respondents' onlinezation on the colleagues' knowledge receiving speed can also be attributed to the abovementioned respondents' bias of overestimating their KM effectiveness and underestimating their colleagues' one. However, this suggestion cannot sufficiently explain the respondents' onlinezation positive influence on the respondents' perceived knowledge reception speed that can be rather attributed to the increased performance efficiency and greater convenience of online instruments.

Interesting results consider the contrast of only one—and, moreover, negative—significant coefficient of the core activities onlinezation variable on the KS quality variables, while the supplementary variables onlinezation does exert a positive influence on nearly all these variables except for the. An explanation to this can be that the core activities in the $KS4$ researched sample companies (belonging to various industries) are not obligatory these that are well suitable for onlinezation; thus, its effects could be not always positive. The supplementary activities, in their turn, are more onlinezation-friendly in every company or industry, even if its core business technologies and business model do not obligatory imply it. The importance of supplementary activities onlinezation is truly demonstrated by these results, with a notable exception of significant coefficient lack for KS_4; an explanation for this lack could be that the perceived speed of knowledge sharing is tending to be more dependent on personal relationships of a respondent with colleagues rather than the organizational variables (Blagov et al., 2018; Szulanski, 1996).

Model 23

Influence of change in knowledge sharing parameters since the beginning of the COVID-19 pandemic on changes in problem-solving in the researched companies is considerably vague, with three independent variables not exerting significant influence and one exerting it on only one dependent variable. It is interesting, however, that the three independent variables with no significant influence are the ones related to the perceived respondent's self-effectiveness in knowledge sharing; this lack of influence can be attributed to the abovementioned bias of the respondents' increased self-esteem, while the respondents' assessment of changes in the colleagues' knowledge sharing quality being more adequate.

Most of its influence is positive, which is rather logical (Keszey, 2018; Lee et al., 2020); an outlier of this result is a negative

TABLE 12 Results of the Model 23 assessment

	PS$_1$		PS$_2$		PS$_3$		PS$_4$		PS$_5$		PS$_6$		PS$_7$		PS$_8$		PS$_9$		PS$_{10}$		PS$_{11}$		PS$_{12}$		PS$_{13}$	
	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff	p-value	IV coeff
Const	0.802	0.229	0.297	0.782	0.837	0.174	0.727	0.329	0.361	0.763	0.883	0.132	0.812	−0.225	0.290	0.918	0.643	0.364	0.646	0.426	0.337	0.882	0.950	0.059	0.958	0.057
KS$_1$	0.320	0.318	0.184	−0.350	0.179	−0.401	0.906	−0.039	0.859	−0.052	0.544	−0.191	0.823	−0.074	0.375	−0.268	0.332	−0.267	0.116	−0.517	0.061	−0.610	0.096	−0.557	0.238	−0.447
KS$_2$	0.460	−0.179	0.123	0.309	0.144	0.330	0.341	0.238	0.839	0.045	0.217	0.296	0.194	0.328	0.299	0.239	0.205	0.266	0.320	0.245	0.099	0.406	0.130	0.383	0.542	0.174
KS$_3$	0.491	0.271	0.092	0.552	0.066	0.680	0.279	0.442	0.420	0.290	0.861	0.0679	0.585	−0.223	0.119	0.587	0.197	0.441	0.240	0.474	0.079	0.704	0.129	0.625	0.222	0.572
KS$_4$	0.238	−0.460	0.334	−0.307	0.144	−0.528	0.166	−0.559	0.437	−0.275	0.335	−0.368	0.557	−0.235	0.209	−0.462	0.048	−0.674	0.803	−0.098	0.372	0.347	0.897	0.052	0.447	0.348
KS$_5$	0.112	0.581	0.511	0.195	0.165	0.468	0.035	0.807	0.001	1.218	0.000	1.344	0.000	1.438	0.443	0.263	0.234	0.373	0.839	0.075	0.250	−0.419	0.509	−0.24736	0.522	−0.274
KS$_6$	0.127	0.499	0.033	0.577	0.109	0.485	0.748	0.107	0.383	−0.258	0.723	−0.113	0.528	−0.212	0.055	0.598	0.002	0.889	0.017	0.809	0.106	0.530	0.017	0.822	0.082	0.675

influence of KS_4 on PS_9. This difference—along with less significant coefficients for the KS_4 variable in comparison with KS_5 and KS_6—can show greater influence of knowledge sharing quality than knowledge sharing speed on innovation, especially on invention problem solving, as for creating new knowledge its constituent elements of reconfigured existing knowledge must be duly adequate to the problem at hand (Han, 2017; Scaringella, 2016). A more specific explanation to this result could be that onlinization stress on the subdivisional level leads to (both deliberate and indeliberate) attempts to increase knowledge sharing speed, with quality suffering from that (possibly in subdivisions having problems with knowledge sharing before onlinization, with its advent trying to "overcompensate" the changes by increasing KS speed as a parameter that is easier to change in comparison with shared knowledge fullness and adequacy (Younis & Adel, 2020)).

The KS_5 and KS_6 variables exert a positive influence, but on different dependent variables; the influence of KS_5 is more significant for sharing marketing problems, while the influence of KS_6—for technical problems. An explanation to it could be that $KS6$ marketing problems are ceteris paribus fraught with more uncertainty than the technical ones due to human beings as problem analysis objects are having its own goalsetting unlike the technical systems (Aslam et al., 2018; Liu et al., 2020). Due to that, for solving marketing problems fullness of involved knowledge is of critical importance, while for solving technical ones a more critical parameter is exact knowledge adequacy, oriented not on wider searching area, but on deeper analysis of exact object (de Almeida et al., 2016); in higher uncertainty related marketing problems, in their turn, it could be hard to understand what knowledge could be adequate for solving a problem, thus decreasing the significance of knowledge adequacy).

Model 34

In the equations with the researched companies' financial results (again, subjectively perceived by the respondents) the only one where the constant is significant is an equation with FR_1-dependent variable, depicting the respondent companies' successful new products or services commercialization on the market; all the other equations, with dependent variables of resulting financial success, are not significant. Thus, the commercialization success by itself does not lead the companies of the sample to financial success. Two main explanations can be given to that result. Firstly, by the time of questionnaire distribution, no more than half a year has passed since the beginning of the CoViD-19 pandemic; thus, it just had not been enough time for the financial results of this commercialization and market entrance to be significant. Secondly, this commercialization could often be itself not a large portion of the respondent company's business (as the overall effect of the pandemic on the economy is negative, this success could be evident mainly on specific narrow market niches), not exerting significant influence on the overall company's financials.

Indirect support of this suggestion could be the PS_3 variable significance in the FR_1-dependent variable equation and the PS_4 variable significance in the $FR_2 – FR_6$ equations—it is indeed logical that successful entry into a market niche relatively small in comparison with the overall company's activities could be a result of solving problems on a subdivisional and individual level.

TABLE 13 Results of the Model 34 assessment

	FR_1		FR_2		FR_3		FR_4		FR_5		FR_6		FR_7	
	p-value	IV coeff	*p*-value	IV coeff	*p*-value	IV coeff	*p*-value	IV coeff	*p*-value	IV coeff	*p*-value	IV coeff	*p*-value	IV coeff
Const	0.024	1.409	0.339	0.637	0.676	0.346	0.132	1.097	0.313	0.816	0.940	0.043	0.518	−0.470
PS_1	9.63E−05	0.551	3.13E−08	0.960	3.56E−05	0.812	1.648E−07	0.962	1.02E−05	0.856	0.002	0.404	7.95031E−05	0.672
PS_2	0.093	−0.464	0.639	−0.140	0.590	−0.201	0.675	−0.135	0.361	−0.332	0.679	0.107	0.990	0.004
PS_3	0.031	0.689	0.329	−0.334	0.108	−0.695	0.454	−0.277	0.314	−0.418	0.067	−0.553	0.375	−0.332
PS_4	0.175	0.349	0.025	0.646	0.0112	0.919	0.047	0.618	0.034	0.738	0.019	0.592	0.386	0.266
PS_5	0.330	−0.270	0.124	−0.472	0.216	−0.471	0.030	−0.735	0.128	−0.566	0.277	−0.287	0.672	−0.140
PS_6	0.426	−0.206	0.491	−0.195	0.856	−0.064	0.560	0.179	0.605	0.178	0.600	0.129	0.813	−0.073
PS_7	0.393	0.123	0.158	0.225	0.353	0.183	0.749	0.054	0.816	0.044	0.745	0.044	0.577	0.096
PS_8	0.232	0.479	0.326	0.430	0.959	0.028	0.868	0.079	0.499	0.358	0.322	0.378	0.740	0.159
PS_9	0.151	−0.665	0.567	−0.288	0.285	0.675	0.365	0.495	0.469	0.442	0.868	0.073	0.364	0.501
PS_{10}	0.491	−0.144	0.039	−0.488	0.002	−0.961	0.004	−0.754	0.004	−0.836	0.518	−0.130	0.115	−0.402
PS_{11}	0.230	−0.446	0.280	−0.440	0.833	−0.106	0.986	−0.008	0.786	−0.133	0.540	−0.216	0.936	0.035
PS_{12}	0.085	0.738	0.144	0.685	0.434	0.453	0.901	0.062	0.790	0.149	0.186	0.537	0.954	−0.030
PS_{13}	0.688	0.080	0.339	0.210	0.391	0.235	0.407	0.197	0.296	0.278	0.282	−0.206	0.503	0.160

Interesting enough is that the positive influence on the financial indicators is exerted by the subdivisional and individual-level success in solving technical problems, while company-level success in solving marketing problems exerts a negative one on the increase of sales.

The technical problems success result is rather logical and expected, while the considerably counterintuitive marketing one can be compared to a suggestion regarding successful market commercialization of new products or services not supported by sales growth due to its relation to an overall economic downturn and faster decline of the competitors than the focal company, thus leading to increase in potential market share but with lower purchasing power (a suggestion considerably close to the evidence of the CoViD19 pandemic on companies' success and general economic environment demonstrated in, for example, (Amankwah-Amoah et al., 2020; Shim et al., 2021; Warsame, 2020)).

"Creation of new products or services," in its turn—the PS_1 variable—does exert a significant influence on the market share increase. This is rather logical, although this market share increase is not significantly related to any profit growth (as in the CoViD-related economic downfall period the market share of a particular company can increase due to its competitors' share decrease, not necessarily meaning the increase of the customer purchasing power: the increased number of customers in such case can even be accompanied with profit decrease due to the customers' decreased willingness to pay the initial price, forcing the company to lower the prices (Nor et al., 2020)).

An interesting result in this equations block is the insignificance of most independent variables related to modular ($PS_8 – PS_{10}$) or architectural ($PS_{11} – PS_{13}$) innovations, except for the PS_{10} variable (that has a negative influence on the profit and sales as well as their growth). This does also support the suggestion that the respondent companies' effectiveness is related to the fall of the competitors', and not to knowledge sharing improvement as such. The perceived success of an individual respondent in innovation activities (PS_{10} variable) with its negative influence can also be a sign of the overall economic downturn exerting a stronger effect on the specific companies' results than the specific employees' creative and innovative effort disregard of their talent.

6 | IMPLICATIONS FOR PRACTITIONERS AND RESEARCHERS

The educed results, although being based on the analysis of a rather small sample, have several implications both for practitioners and future researchers.

Considering the implications for practitioners, insightful results are that of the greater influence of supplementary activities onlinization than the primary ones on knowledge sharing effectiveness, and greater influence of knowledge sharing quality than speed on problem-solving parameters.

Indeed, core activities in various industries can be more or less "onlinezable," while supplementary activities could be onlinezed more easily; in the context of fast and dramatic changes in work and social environment, supplementary activities (including, among all, knowledge management systems) should be oriented on minimizing distracting factors, allowing employees better concentrating on their primary activities (Chaurasia et al., 2020; Kang & Hwang, 2019).

Practical recommendations to knowledge management systems development in the onlinization (especially involuntary and unexpected) context could specifically stress the necessity of these systems' orientation on knowledge sharing quality—in terms of both fullness and adequacy to request—than on knowledge sharing speed (Dorasamy et al., 2013; Germain, 2010; Rao & McNaughton, 2019). Speed-related key performance indicators (KPI), if these are important for the organization, can be reached by technical means, for example, optimization of the knowledge sharing ecosystem supporting IT infrastructure architecture; increasing knowledge sharing quality, in its turn, should be rather reached by organizational means, for example, by developing precise systems of motivation to knowledge sharing, remuneration for that and protecting the knowledge holders' intellectual property and organizational security (Blagov et al., 2020; Xu et al., 2018).

Another result insightful for practical recommendations is that of various influences of change in shared knowledge fullness and adequacy on effectiveness in solving technical and marketing problems.

Practical implications from this result could contain a division of the organizational knowledge management systems (both in its technological and organizational components) in innovative companies into subdivisions oriented more on solving: a) "human-related" (including market and marketing) uncertainty based problems, containing KPI based on the fullness of shared knowledge and b) technological uncertainty based problems, containing KPI based on shared knowledge exact precision and adequacy to the exact solving problem. Surely, each organization in each project has its own distribution of uncertainty in a project between these categories, and often these uncertainty types in projects are too intertwined for a clear division between these; however, a general classification of problems and more or less important KPI for knowledge sharing activities related to each problem type is also possible to be developed.

Theoretical and methodological implications for the researchers, in their turn, can be divided into implications of the methodology and the results of the research.

Regarding the methodology, the model of three stages of knowledge sharing assessment (knowledge sharing parameters, problem-solving effectiveness, financial results or other organizational effectiveness parameters) can be useful as such, as well as the idea of dynamic assessment of the parameters on all the stages, for example, as an effect of an exogenous shock like the CoViD-19 pandemic. Considering the quantitative methods used for such an assessment, multiple regression equation sets, as suggested in the current paper, can be used, as well as structural equation models, allowing deeper insight into mutual influence of various blocks' variables; in more detail possible developments of the quantitative research methodology are described in Section 7.

Results of the research, showing statistical significance disregard of the considerably small sample size, demonstrate the actuality of the topic of CoViD-19 influence on knowledge sharing. Among the results of particular interest for further research such can be named as the above-mentioned intricate linkages between changes in knowledge sharing fullness and adequacy and changes in technology and marketing problems solving capabilities, as well as the possible influence of fundamental attribution bias on the respondents' assessment of change in knowledge sharing parameters.

7 | LIMITATIONS AND FURTHER RESEARCH DIRECTIONS

The limitations to the current study results validity and reliability could be divided into two categories.

Firstly, some limitations are caused by the sample characteristics, considerably small sample size most prominently. Further research directions that could serve to overcome such limitations could be called "extensive" directions, considering increasing the sample size and, probably, more profoundly organizing its structure without changing the research model and design.

Secondly, some limitations and further research development ideas are caused by the research model and design itself, thus requiring changes in these; such research development directions could be called, in their turn, "intensive" ones.

Considering the sample characteristics, we agree with the limitation of sample size and characteristics both as 52 respondents are just a bit above the threshold allowing multiple regression equations usage. Thus, further research can consider checking the suggestions on a wider sample. Moreover, as in the sample of 52 respondents it is hard to use the demographic statistics as control variables due to the low statistical significance of such analysis and its outcomes, in the wider sample the demographic statistics could be used as controls whatever exact quantitative methods—multiple regression or structural equations—would be used, allowing getting deeper insights into the onlinezation influence on knowledge sharing in various industries, age groups, and so on.

Regarding the limitations related to the research design, a significant limitation is that all the measures included in the assessed models are based on the respondents' subjective assessments and thus can be influenced by various subjective perception biases.

For instance, a bias that has been suggested several times to influence the regression model results is the respondents' overestimation of their knowledge management and problem-solving effectiveness, along with underestimation of such effectiveness of their colleagues (a version, thus, of the fundamental attribution bias, reported to be one of the biases influencing the accuracy of knowledge management (and knowledge sharing in particular) research results) (Cleverley & Burnett, 2019; Ekambaram & Økland, 2019). Among the possible primary drivers of such bias, respondents' proficiency in knowledge management terminology had been suggested, as the questionnaire—in both used languages—contains a fairly significant number of such terms. To overcome this bias, we suggest that a questionnaire version could be designed with simpler formulations, that can both allow increasing the effective response rate and widen the respondents' sample by adding there not only knowledge workers proficient in knowledge management terminology but also other employees whose perception of the researched influences and interdependencies would not be that distracted by this or related bias.

A more systemic approach to overcoming the subjectivity of the assessment may include complementing the used measures by objective ones. Such measures could be added to all the blocks (onlinezation, knowledge sharing quality, problem-solving—and, surely, financial results) and make the picture more voluminous. Particularly interesting could be discrepancies between the objective and subjective measures within each block and between them, which can shed more light on the abovementioned self-assessment biases as well as the respondents' deliberate attempts to demonstrate picture distracted from reality.

Considering the quantitative analysis methodology, the regression analysis that was used for "unidirectional" assessment of the relationship between the blocks could be complemented by structural equation modeling that can unite all the four blocks into one model with onlinezation block as independent variables, financial results block as dependent ones, and knowledge sharing and problem-solving ones as mediating blocks (and, continuing the "extensive development" suggestions—with demographic variables as control ones in case of sample extension). Although promoting knowledge sharing is considered to be more challenging, despite many processes and facilities for employees, future scholars should explore how these KS effects may increase or decrease the effectiveness of both individuals and organization, since the organizations are now moving toward online spaces after the CoViD catastrophe, for both economical and convenience reasons such as managing well-being, reduce the time for commute and increasing employee efficiency.

Furthermore, the implication of knowledge sharing in onlinezation context may be extended in the future by studying different relational elements such as the supervisor subordinate dyad, leader–follower dyad, co-worker/team member dyads, and so on. This may offer new results in comparison to our studies as knowledge sharing is mostly influenced and effective during interpersonal interaction (Anand et al., 2020).

Another interesting and potentially fruitful research development direction can consider including into the variable list changes in such long-duration knowledge management phenomena as, for example, organizational absorptive capacity or common language environment, that are unlikely to have undergone a significant change in a half-year period between the beginning of the CoViD-19 pandemic and the empirical research described in the article; however, as these organizational phenomena are closely and tightly interrelated with knowledge sharing (Ali et al., 2018; Curado et al., 2017; Dee & Leisyte, 2017; Fate et al., 2019), there is no doubt that their inclusion into the suggested or related research models for further research of longitudinal effects of the pandemic on knowledge sharing can give deeper insights into these effects' mechanisms.

Finally, in addition to quantitative methods, future research may also benefit from qualitative exploratory ones, which could help deeper establish the causality of the relations discussed in this paper.

8 | CONCLUSION

In the current paper, the COVID-induced onlinezation influence on knowledge sharing processes in companies has been assessed, with particular focus on the levels of knowledge sharing quality, problems solving, and organizations' financial results.

Our findings reveal important insights that can provide a new comprehensive explanation of CoViD-induced knowledge sharing effects. For instance, the importance of supplementary activities, various influences of knowledge fullness and adequacy on solving technological and marketing problems, and subdivisional level innovations influence on companies' financial effectiveness allow developing practical recommendations for the companies to manage the knowledge sharing processes in the shock onlinezation context. Several further research directions have been suggested of both extensive (considering sample extension) and intensive (considering research model development with including new variables or deeper inquiry into some of the educed interdependencies) nature. The developed results and recommendations allow adapting the knowledge sharing processes in contemporary organizations to the context of accelerated onlinezation caused by the CoViD-19 pandemic, thus helping to decrease the negative consequences of the pandemic, as well as to suggest further directions of technological and organizational forms of onlinezation as a part of the ongoing 4th Industrial Revolution.

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