

Article

The Online Adapted Transformational Leadership and Workforce Innovation within the Software Development Industry

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Abstract: Leadership and workforce innovation are the two most glazed over universal phenomenon across time within the management literature. Despite the status of the buzz words, few researchers studied if there is a link between the online leadership behaviors and the de(in)creasing innovativeness of the followers at work. The current research aimed for offering a viable solution for the online-adapted leadership–workforce innovation equation, by answering to the following research question: is online transformative leadership able, and if so, are its instruments sufficient for increasing followers’ organizational and personal innovativeness within an exclusively online work environment? Research used a two-tailed questionnaire as a research instrument and applied it within the IT&C Industry in Iasi, Romania, namely the software development branch. Results were gathered during the first months of the social lockdown due to the COVID-19 pandemic; therefore, the ongoing communication and online work procedures implementation were captured via the subjects’ responses. Data was analyzed by using SemPLS (v3.2.5.) software; results show that transformational leadership instruments, once shifted within an exclusively online working environment, suffer from losing in importance and designated effects. Research provides information in regards to four general hypotheses that prove to be partially supported, sending the reader to the idea that an exclusively online-adapted work environment does not show expected results in terms on transformational leadership, nor workforce innovation. Therefore, online-based transformational leadership instruments need to be reshaped and adapted so that followers correctly perceive their leaders’ actions and behaviors on all the five dimensionalities.

Keywords: IT&C management; innovation; leadership



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1. Theoretical Framework

Research in regards to transformational leadership has failed to deeply explore how within an extreme external context, the autonomy buffers of leadership [1] produce creative organizational outcomes. Transformational leadership gathered an increasing role within the creative oriented firms [2,3] where employee creative performance is being quantified through self-efficacy [1,2,4–6] and a knowledge-sharing culture. Employee creative performance is at the core of innovative businesses which struggle for raising and maintaining a competitive edge; at the center of attention are the transformational leaders whose enthusiasm and interest are considered to be the main driver for the business’ workforce innovation. Working settings, structural empowerment and process innovation become a driver for IT&C companies in sharing employee engagement and strengthening internal communication and performance within an exclusively online-based working environment [7–10].

The software development IT&C branch is one of the industry areas where individual creativity plays an essential role in the daily activities; moreover, the creative self-efficacy is a moderator of the relationship between transformational leadership and followers' creativity [11,12]. Moreover, the leadership standards play an ongoing significant role in enhancing the development of the productive innovative thinking [13] where creative solutions must be delivered. The management model for software development companies is considered to be different from a simple standard organizational process because it implies working with highly ingenious projects, half of the time online-based, as forms of temporary organizing [14]. Transformational leaders must comply when working with personal constellations with a high degree of creativity heterogeneity because requirements and work themes are not always alike.

Recent studies in regards to transformational leadership evolution and industries approaches analyze subjects as organizational citizenship behavior [9] employee engagement [7,10], HRM practices [15], and also transformational leaders' and followers' creativity [16] and innovation capability [17]. The literature suggests that there is a dearth of empirical and theoretical approaches of transformational leadership from project-based organizations [18]. Transformational leadership was found to have a positive influence on the followers' creativity [19], considering both individual and organizational levels. The role of an effective communicator assumed by a transformational leader, if found within a direct collaboration with managers, will result in a higher effectiveness in conveying organizational goals [18,20].

Despite the increased effects presented by the literature in regards to the transformative tools of small business management and workforce creativity and innovation, the (online) transformational leadership tools and actions that encourage/discourage workforce innovation coming from software development businesses have not been sufficiently examined.

We sought to contribute to the software development business literature by performing a quantitative study during the initialization of the COVID-19 pandemic on data collected from software development companies from Iasi, Romania. Considering the central role played by the leaders within software development companies, their tools and instruments, once developed exclusively online, may have a rather different (or no) influence over the workforce creativity and innovative performance.

Consequently, we addressed the following research question: how do the exclusively online tools specific to transformational leadership affect the home-based workforce creativity and capacity to innovate, in the midst of the COVID-19 pandemic social interaction and work restrictions?

The current outlook was explored through a nonprobability sampling method applied across one of the seven IT&C industry branches from Iasi, Romania, namely the software development industry branch, within the early stages of the COVID-19 pandemic—February 2020 until April 2020. Research has succeeded in developing a theoretical background that explains the effects of the online-suited transformational leadership across the innovation status specific to the software developers that work for/within these businesses.

The research tries to see if there is a connection among the dimensions of two entirely online adapted research instruments, i.e., transformational leadership and organizational innovation, within the software development companies in Iasi, Romania. Results will show that the COVID-19 pandemic has made its mark on the studied industry because neither of the two research instruments proved to be fully-adapted for being used and provide expected results within an exclusively online working base.

As for assessing the contributions of the current research brought to the IT&C business literature, a number of five distinct ways need to be counted. First, a theoretical contribution is assessed by conceptualizing the transformational leadership roles, links and path dependencies between the personal transformational leadership role and workforce innovation in software development companies in Iasi, Romania. Based on a top-down theorization, the current research identifies the leadership experiences and expectations of individual software development followers as a key-prerequisite for achieving innova-

tive results, features that were largely ignored in the software-development businesses and organizational small business literature. Second, by drawing on transformational-leadership-specific software development practices, we introduce a novel perspective to the study of online home-based workforce innovation. Third, we contribute on a theoretical level to the software development transformational leadership literature through context-based theorization by contextualizing our findings in the COVID-19 pandemic. Fourth, we provide new empirical knowledge on the underpinnings of online transformational leadership and home-based workforce innovation in software development companies. Fifth, by performing an analysis at an individual level, we contribute methodologically to the transformational leadership–workforce innovation literature.

1.1. Software Development Companies during COVID-19 Pandemic

Like other rarely occurring catastrophes [21], the SARS-CoV-2 virus which stands for the origins of the COVID-19 pandemic, has a time and place of emergence—as for the current case, December 2019 in Wuhan, China. The immediate effect over industry and small businesses was fought at first by nations, who responded by implementing a wide range of measures meant to diminish the effects of closing national borders [21,22], quarantining regions and cities and limiting the moving of people through imposing the physical distance [23]. The governmental lockdown measures due to the COVID-19 pandemic affected the socio-economic systems across countries and changed the ways people and businesses interact [24]. Due to the economic uncertainty [21] economies and businesses alike were heavily affected by the COVID-19 pandemic, generating a chain of more or less well-suited responses in regards to their current activity [24]. The majority of small and medium financially vulnerable companies faced closure and/or encountered syncope which resulted in serious economic disruptions [25] while the healthy businesses, despite the large impact generated by the COVID-19 pandemic, were forced to reduce their activities and adopt cost-cutting measures, often resulting in shifting their activities to online platform-based models and establishing their entire activity via online communication and working channels [26,27].

Threats generated by exogenous shocks compel businesses to adopt changes that would shield and strengthen their activities, ensuring survivability in cases such as the COVID-19 pandemic [28,29]. Past research has associated the exogenous shocks with the businesses that are susceptible to resilience [30], suggesting that yielding businesses are the most likely to survive the financial disruptions and make the transition, as for the current case, to the post COVID-19 era [31,32].

Under a direct and close influence of their owner–managers, the smaller businesses in times of crisis heavily rely on filling resource gaps and engage in practices, by making intuitive leadership and innovation decisions in order to keep the viability of the business; the highest risk in times of crisis is for the leaders to manifest signs of weakness, fear, negativity or lack of resilience, resulting in a direct trajectory into an organizational commitment deficiency [33] and business failure [34,35]. To study the effect of the adverse circumstances directly generated by the leaders within the IT&C industry as a direct consequence of their online-shifted leadership practices, the current study focused on the software development IT&C branch and the processes specific to the leader–follower dyads [36–38], where seniority at work often becomes bestowed upon the position held within the organization, while software developers are by default seen as followers.

There is a short list of studies that have hinted that the transformational leadership practices are linked to the followers' innovation and creativity at work [39–42]. Altogether, followership perceptions are subject to alterations when contextual factors such as the COVID-19 pandemic apply [43]; for instance, transformational leadership has been presented by literature as a main driver for encouraging followers' innovation [19,41,44]. Particularly, transformational leaders stimulate, inspire and support the work and personal development of their disciples [45].

For this reason, the current research addressed the first Hypothesis H1. The online adapted Organizational Innovation is explained by the five dimensions of the Online Adapted Transformational Leadership within the Software development Industry in Romania.

Despite the increased evidence that grants the influence of transformational leaders over their followers across industries, the resilience literature offers little understanding on biased elements such as gender, age, hierarchical levels, or seniority at work of the followers and of their leaders, across the IT&C industry.

In regards to the view that leader–follower constellations present stability and are considered to be continuous [46–48] the literature also presents the argument that the underlying mechanisms of the transformational leadership process in times of crisis [47] may not be applicable to every industry. transformational leadership prototypes are stable across time but are not invulnerable to external extreme contexts, being subject to organizational changing factors [43,49].

1.2. Transformational Leadership Theoretical Specificities

Leadership is one of the most important researched areas within old and recent literature [15,16,50]. As the ultimate goal of the largest variety of creative oriented companies [51], the sustainable competitive advantage could be the result of a healthy knowledge-sharing organizational culture mechanism, namely transformational leadership and followers' performance. While largely untested [52], transformational leadership theories suggest that its effects widely vary in accordance with the extremities of the business environments in which it is exercised.

The transformational leadership model [53–55] has been embraced not only by scholars but also practitioners and has been presented as a method in which organizations actively encourage employees to perform beyond individual and organizational expectations alike. Previous research focused on aspects of motivation [38], situational expectations [56], emotional intelligence [37,57] and/or personality and life experiences [58,59]. Despite the high interest that has been manifested in regards to transformational leadership, the proposed model presents ambiguity [60–64] in regards to the transformational leadership subdimensions differentiation.

Transformational leadership has the ability of motivating the followers in order to achieve a high degree of performance by transforming their beliefs, behaviors and values, and not only gaining compliance [65]; moreover, it is considered that transformational leaders have the ability of inspiring the employees, resulting in higher levels of motivation and performance [66], endeavoring to manage the meaning of work for the followers. The model as defined in 1985 [53] proposes a number of subdimensions that define transformational leadership as charisma (currently renamed and known as idealized influence [46,67]), inspirational motivation, intellectual stimulation and individual consideration. The five-factor structure of the model has been identified [68] as having a lack of empirical support and highly connected components.

In contrast, transactional leaders emphasize the exchange relationship between leader and follower, as leaders offer followers benefits such as increased wages and prestige if they complying with leaders' wishes. Therefore, transactional leadership carries contingent reward along with management-by-exception [69].

The dynamics of the process that enables growth within organizations and transformational leadership is not yet well understood. Generally, IT organizations are knowledge based, and their development resides in factors such as innovation on organizational, team and individual levels, but also on employees' creativity and innovativeness. Innovation became a crucial factor in developing a long-term organization, while the innovation capability, understood as the capacity of an organization to understand and defeat factors that affect its products and processes, becomes an increasingly weighty component for success and survival.

There is a multitude of authors that focus on defining innovation [70–72] covering a vast area of outcomes and processes innovation. On another side, authors did not limit

their research by neglecting the innovation context where innovation was seen as a tangible organizational outcome or a new ideas process, but rather included in their research the multi-stage process that describes innovation [73,74]. Therefore, the ideas are not only created, developed and reinvented, but also innovation is assumed to exist from many perspectives as individualist and interactionist [75,76], but also structuralist [77].

As for the second Hypothesis, H2, the current research considered that the Innovation Climate specific to the software development companies in Romania is directly explained by each of the five dimensions of the Online Adapted Transformational Leadership. As for this perspective, within the current research, it was considered that workforce innovation derives from soft innovative behaviors, a process that includes not only the examination of innovation on a multitude of levels, but also includes the organizational climate created and derived from transformational leadership behaviors. Workplace innovation can be organizationally created and subsequently analyzed with the help of four major factors: Organizational Innovation (OI), Innovation Climate (IC), Individual Innovation (II) and Team Innovation (IT) [71]). When assuming an organizational level, workforce innovation is positively related to transformational leadership because the individual creativity has a direct effect on organizational innovation [19].

Transformational leadership is not only a famous concept within the literature as described [51] but an organizational managerial style that confounds with relational and motivational activities. It has been more than four decades since it was introduced for the first time within the literature the concept of transformational leadership [55], by distinguishing the characteristics of transformational as from the transactional leaders. Further developed this theory emphasizes the transformational leadership aims for enhancing subordinates' motivation and creativity [78], establishing effective relations between leader and follower by promoting ethical and creative aspirations and enhancing potential as well as good value systems and a higher need for organizational and personal success [79].

Leaders who demonstrate a transformational leadership behavior [80,81] and are being perceived by their followers as respectful, fair and believed not only to display but actually have high ethical and moral standards will be able to expect higher organizational attachment, influence the followers' daily work engagement [82] while foreseeing a brighter future and setting higher organizational goals.

While taking into consideration organizational behaviors and strategy, a third hypothesis (H3) was developed, stating that the online-adapted Individual Innovation could be explained by the five dimensions specific to the online-adapted Transformational Leadership within the software development organizations in Romania.

This type of behavior specific to individual innovation of IT&C developers can be explained through the social learning theory [83] where people are likely to learn within organizations through observation of both self and of the others. Leaders are being observed by their followers while learning how to think creatively, become problem solvers, generate solutions and be intellectually stimulated [84]; this process results in shaping the followers' daily environment [82]. The current perspective was presented by emphasizing the effects on followers of the transformational leaders' knowledge sharing, who will use the individual consideration as support for determining employees to display creativity and motivation and becoming able to challenge organizational goals [53,83]. The transformational leaders have the ability to increase the followers' intrinsic motivation while developing a high level of self-efficacy [85]; according to this theory the obstacles during work are minimized and the level of self-performance becomes highly increased [86].

As a result, for actively implementing transformational leadership behaviors within organizations, followers will display higher levels of motivation and cohesion, by working not only with self-interest but also for a greater organizational benefit. This conduct was also tested by the current research through the online-adapted Team Innovation dimension, which was tested for whether it can be explained by each of the five dimensions of the online adapted Transformational Leadership (H4). A theoretical perspective states that this type of leadership can mostly be displayed within organizations with a dynamic internal

environment, while transformational leaders have the most important role in training and improving the creativity level of their followers [87]. As the literature interest in regards to the influence of transformational leadership in creativity and innovation is growing [19], the transformational leaders' expectations from their followers' performance raises. For this reason, the followers' personal values need to be moved [88,89] and reach higher levels of needs and aspirations through the perceived internal climate and the goal clarity they provide.

Transformational leadership becomes a construct that is used in order to describe the process used by leaders in influencing and inspiring their followers [52], such as setting objectives that seemed difficult to achieve and determining them to behave beyond expectations. The transformational leadership phenomenon continues to be one of the the most studied leadership subjects within the literature [45,90,91] and was developed at most through a theory [22] according to which this type of leadership drives companies for reaching high and ambitious objectives, within an unsecure and continuously evolving economic environment.

2. Methodology

If prior studies' principles in regards to pragmatism and practice are used, this research used a nonprobability sampling, a voluntary response sampling method, where the sample is mainly based on ease of access. More specifically, data was gathered via an online Google Forms questionnaire distributed to software development companies in Iasi, Romania by e-mail and other electronic means of communication. Respondents were guaranteed the strict confidentiality in regards to the answers, while the results were to be used only for academic purposes; the aim was to better understand the dynamics between leadership and innovation within the companies the respondents work within. The respondents were not to be compensated for agreeing to participate to the study. Because the questionnaires were distributed online, data was gathered not only from simple employees but also supervisors covering various organizational levels. The response rate was low because the questionnaire was distributed via online Google forms, by using a multitude of apps and internet platforms; by the first week, only 19 filled in questionnaires were submitted; the response rate increased to 34% at the end of the four months of gathering data (February 2020–April 2020), and only 389 correctly filled in questionnaires were obtained.

Reflections on the specificities of the software development in Romania enact three main regions, out of which Iasi reflects the third. In 2019, IT&C industry in Iasi included 1037 active companies and 12,380 employees; a proportion of 45.42% (namely 471 companies) developed software on demand, custom oriented activities, and included a number of 5950 employees (48.06% from the total industry).

During 2020, the IT&C Industry continued to grow, reaching a total number of 12,571 employees distributed within 1167 active companies. Data shows that with the amount of software on demand, custom-oriented companies continued to grow, reaching a proportion of 46.36% of the total industry (namely 541 companies), while the number of employees acting within the given IT&C branch reached a number of 7404 (representing 58.07%) from the total industry [63,92].

The research problem states that within an increasing software development industry from Iasi, Romania, the COVID-19 pandemic forced organizations to practice leadership and deliver innovation adapted to an exclusively online-based activity. For this reason, companies searched for better solutions as for transformative leaders to represent companies' culture and reach to the follower, which, in turn, should have delivered the same (if not higher) innovative solutions for arising problems, compared to traditional (pre-pandemic) outcomes.

For this reason, the current research addresses the question of whether the online-adapted transformational leadership could offer similar results in terms of follower's innovation, during the COVID-19 pandemic.

2.1. Measures

The used questionnaire consisted of three parts: at first, demographical data was required; the second and third parts referred to studying the peculiarities of transformational leadership and workforce innovation, within the given industry branch (McMurray et al., 2003).

Transformational leadership was measured by adapting the Multifactor Leadership Questionnaire (MLQ_a) the 5X Form [22]. Each respondent completed a 20-item questionnaire, with anchors 1 = totally agree to 5 = totally disagree. This instrument followed the conceptualization as for five adapted distinct components [17]: Idealized Influence (Attributes)—IIA_a, Idealized Influence (Behavior)—IIB_a, Inspirational Motivation—IM_a, Intellectual Stimulation—IS_a and Individual Consideration—IC_a.

The adapted Workplace Innovation Scale (WIS) refers to a 35-item scale instrument, anchored from 1 = totally agree to 5 = totally disagree, which was used in order to analyze the relationship between innovation and organization learning [71]. It consists of four adapted factors as Organizational Innovation—OIn_a, Innovation Climate—InC_a, Individual Innovation—IIn_a and Team Innovation—TI_a. In previous research, IC and IS have revealed high predictability [93], while other authors [94,95] consider IC and II to be the strongest components to predict the transformational leadership efficiency and effectiveness.

It was important for the questions to be addressed and worded so as to avoid any misunderstandings and misconceptions and for the instrument to be the English version counterpart when adapted for the Romanian language. For this reason, recommendations of the literature were followed and a translation back conversion process was used, thus ensuring the equivalency in regards to the meaning of the items [52]. A pilot study preceded the current research and was developed inside one of the software development companies in Iasi; for testing the instrument, the data collection procedure and answers gathering and interpretation, 21 answers were gathered. A pilot study is the right method from which changes can be made for the methodology [96], data administration and interpretation, design of the study and also detecting and preventing possible shortcomings. The results of the qualitative pilot study showed no misunderstanding or miswording related to the current study, so the instrument was relevant in regards to further research developments.

As usual practices suggest [97], emphasis is put on the role of parameter estimates and control variables within research; the current study did not include any control variables so that the results did not meet the possibility of reduced statistical power and degrees of freedom when analyzed. As for this reason, the current study showed an improved interpretation of the results.

2.2. Research Methodology

For the purpose of this study, from the entire IT&C Industry, only software on demand, custom oriented companies were studied, in order to identify if there is an equation among two studied concepts: the adapted transformational leadership and workforce innovation. The research consists of four main hypotheses that, as previously stated, will be analysed and further discussed (see Figure 1).

As for studying the relationship among the two constructs, SmartPLS (v.3.2.7) was used in order to develop a structural equation modeling, based on partial least squares. The method used follows a path modeling method (known within the literature as PLS structural equation modeling) as a sequence of regressions considered through weight vectors [98–101]. The method design includes weight vectors that, through convergence, allow setting outer weights for every indicator.

SmartPLS analysis results into two models: the first model, the measurement model (also known as the outer model), relates to the observable variables yielded to their own latent variables; as for the second result, the inner model (also known as the structural model) relates latent variables to another latent variables.

Testing the measurement (outer) model implies reliability and validity analysis, while the structural (inner) model will be tested by using path coefficients among the constructs of the model.

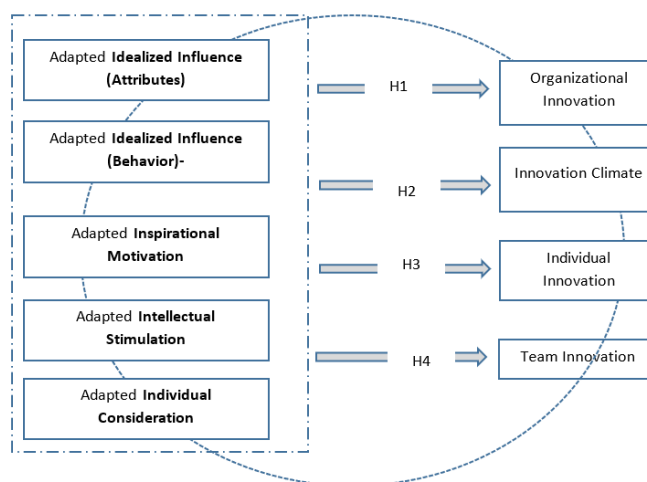


Figure 1. Research design in regards to the online environment during COVID-19 pandemic into software development companies in Iasi, Romania.

3. Results

The current research aimed for testing whether, within the COVID-19 pandemic restrictions, the software development companies in Iasi, Romania could adapt to an exclusively online working style and reach (at least) the same organizational innovative degree as previously. In order to reach this goal, SmartPLS software was used, results showing connections between the degree on innovation reached by the industry (through the four specific dimensions) and the practice of online transformational leadership (measured through five distinct dimensions).

In order to check the reliability of the SmartPLS construct scores, the modern literature suggests the use of “rho_A” coefficient instead of Cronbach’s Alpha and composite reliability [102,103]. According to the Construct Reliability and Validity Table, all the “rho_A” values that subscribe to the interval 0.7–1 prove a reliable composite. As for analyzing the convergent validity, the Average Variance Extracted (AVE) for each variable is evaluated; because, within the current case, all the values are greater than 0.5 [100] the convergent validity is confirmed (see Table 1).

Table 1. Construct Reliability and Validity.

	Cronbach’s Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
InC_a	0.865	0.867	0.899	0.598
IC_a	0.869	0.869	0.910	0.717
IIA_a	0.895	0.895	0.927	0.760
IIB_a	0.877	0.878	0.916	0.731
InO_a	0.905	0.906	0.929	0.724
TIn_a	0.842	0.847	0.888	0.614
IIn_a	0.901	0.904	0.920	0.592
IM_a	0.880	0.885	0.917	0.736
IS_a	0.878	0.878	0.916	0.731

Source: Authors’ calculation with SmartPLS (v. 3.2.7) software.

Regarding the goodness of fit of the model (SRMR) from SemPLS, the indicator is generally used for avoiding the model misspecifications [103]. As for the current model values, 0.1:0.05:0.08, they fit the specified interval for the saturated model, therefore indicating a good fit of the proposed model [104].

Rms_Theta must fit for values lower than 0.12 [105] because the current model presents the value of rms_Theta = 0.113; the current model indicates a good fit (see Table 2).

Table 2. Fit Summary.

	Saturated Model	Estimated Model
SRMR	0.050	0.071
d_ULS	2.508	5.023
d_G	1.366	1.698
Chi-Square	2864.094	3269.473
NFI	0.811	0.785

Source: Authors' calculation with SmartPLS (v. 3.2.7) software.

Furthermore, the relationships specific for the structural model were tested; the significance levels for the path coefficients were tested with the help of bootstrapping procedure. As the data from the Table 3 suggests, according to the Path Coefficients and the T Statistics Values, the adapted leadership five dimensions do not have a clear predictive ability to explain each and every one of the four adapted workforce innovation dimensions.

Table 3. Path Coefficients and *p* values.

	Path Coefficients	T Statistics (O/STDEV)	<i>p</i> Values
IC_a → InC_a	0.278	3.350	0.001
IC_a → OIn_a	0.208	2.342	0.020
IC_a → TIn_a	0.109	1.478	0.140
IC_a → IIn_a	0.205	3.009	0.003
IIA_a → InC_a	−0.010	0.132	0.895
IIA_a → OIn_a	0.130	1.399	0.163
IIA_a → TIn_a	0.153	2.086	0.037
IIA_a → IIn_a	0.118	1.638	0.102
IIB_a → InC_a	0.171	1.824	0.069
IIB_a → OIn_a	0.371	4.335	0.000
IIB_a → TIn_a	0.252	3.169	0.002
IIB_a → IIn_a	0.191	2.597	0.010
IM_a → InC_a	0.019	0.222	0.824
IM_a → OIn_a	0.012	0.126	0.900
IM_a → TIn_a	0.099	1.184	0.237
IM_a → IIn_a	0.117	1.511	0.131
IS_a → InC_a	0.369	3.513	0.000
IS_a → OIn_a	0.074	0.708	0.479
IS_a → TIn_a	0.265	3.003	0.003
IS_a → IIn_a	0.264	3.163	0.002

Source: Authors' calculation with SmartPLS (v. 3.2.7) software.

IM_a path coefficients are not significant for any of the four dimensions of the workforce innovation dimensions. IIB_a \rightarrow TIn_a path coefficient (0.25) and IS_a \rightarrow InC_a path coefficient (0.36) show the most significant values for the model constructs. Figure 2 presents the coefficients of the structural model using the SmartPLS software. Results show that the path coefficients indicate values above the minimum accepted amount of 0.1 [105,106]. Moreover, the IIn_a is explained in a proportion of 71.6% from the transformational leadership practices, while the TIn_a has the characteristic of being explained within a proportion of 69.3% from the transformational leadership practices from within the software development companies.

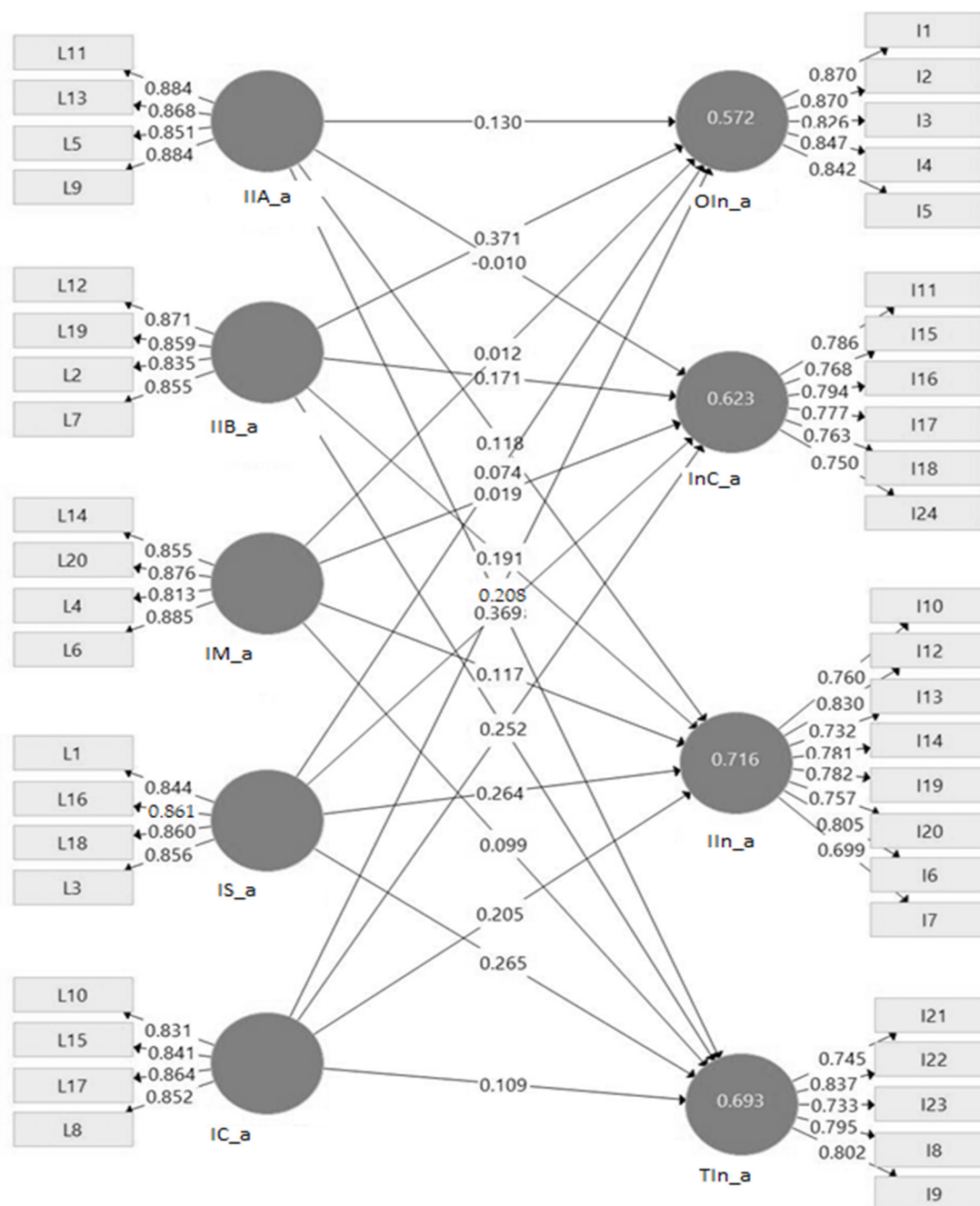


Figure 2. The Online Adapted Transformational Leadership-Workforce Innovation Path Coefficients. Source: Authors' calculation with SmartPLS (v. 3.2.7) software.

3.1. Hypothesis Testing and Validation

Results from Table 3 and Figure 2 show the depths of the adapted online transformational leadership and workforce innovation path coefficients equation. IT&C companies in Romania, during COVID-19 pandemic were forced by Romania's internal law to translocate all the activities via online. Leaders and followers found themselves as obliged to find ways to work and communicate, only helped by internal companies' infrastructure, if available; given the general lack of experience of such companies with emergency situations as the COVID-19 pandemic, and the underdeveloped management systems, along with an organizational culture with numerous gaps, home-based communication and working measures proved to be inefficient and underprepared; this situation occurred despite the peculiarities of software development activities, where the large majority of the communication and work conditions are online-based. COVID-19 pandemic proved software development companies with the importance of leader–follower physical working interaction. As for this perspective, software development companies' workforce needs, in order to function, a higher degree of innovativeness, because the working conditions and arising problems are neither continuous nor repetitive. Online transformational leadership attributes and behaviors efficiency needs to be addressed as for assessing the direct effects over the organizational innovation as a whole, and equally considering team and individual innovation, along with the newly created climate for innovation within the home-based software development companies.

Results show that all of the four main hypotheses were partially supported, explaining the fact that software development companies in Romania were not prepared for implementing and practicing online-based leadership within the COVID-19 pandemic lockdown (see Table 4).

If considering the theoretical background, the practice and innovative results of the practice specific to the online adapted transformational leadership within the software development companies in Iasi, results show that IM_a is not subject to any of the online adapted transformational leadership–workforce innovation equation. As for a generic view, inspirational motivation seeks for online transformational leaders that provide followers with a vision, by giving them meaning for their work and organizational activities, by active and productive challenging activities, resulting in a higher confidence level and dedication for solving existing and future causes. Results show that both followers and leaders are failing when asked about sharing a common resolution in regards to theoretical and practical industry background.

As for the IT&C industry the current article refers to, being all around the world, on the edge on expansion, it is currently caught in an international emergence trend-line that encourages individuals to become engaged. Within the 2008–2020 timeframe, the IT&C Industry in Iasi almost doubled its size (194.82%), increasing to 337.06% the employees' effectiveness [63]. Therefore, the brief and fast evolution specific to the IT&C industry in Iasi articulates a number of questions in regards to (online) management and leadership effectiveness, especially considering the confidence that the company and/or department they work within has a strong vision for tasks to be achieved that contribute to a compelling future evolution. Results show that employees do not have the possibility or an educated ability to express in regards to their role within the future of the company they subscribe to.

When considering the predictive ability of OIn_a dimension, only two of the online transformational leadership dimensions, IC_a (20.8%) and IIB_a (37.1%), can be considered (as 57.2% in total) because IIA_a, IM_a and IS_a path coefficients have values lower than 0.1. The OIn_a therefore expresses a direct relation with leadership quality within organizations, as a direct expression of leader's patience and availability to spend time teaching and coaching, resulting into a strong and equilibrated development of followers' strengths; moreover, organizational innovation is largely explained by moral and ethical leaders' decisions' consequences, where the collective sense of mission is equal and unidirectional, for both leaders and followers. There are the reasons for which the first hypothesis of the current research (H1) was only partially supported, for H1.1. and H 1.5. (see Table 4).

Table 4. Hypothesis testing and validation.

Hypothesis No.	Hypothesis Text	Supported	Not Supported	Observations
H1. P5	OIn_a is explained by the five dimensions of the ATL within the Software development Industry in Romania.			Partial supported
H 1.1.	OIn_a is explained by IIA_a.		✓	
H 1.2.	OIn_a is explained by IC_a.	✓		
H 1.3.	OIn_a is explained by IM_a.		✓	
H 1.4.	OIn_a is explained by IS_a.		✓	
H 1.5.	OIn_a is explained by IIB_a.	✓		
H2.	InC_a is explained by the five dimensions of the ATL within the Software development Industry in Romania.			Partial supported
H 2.1.	InC_a is explained by IIA_a.		✓	
H 2.2.	InC_a is explained by IC_a.		✓	
H 2.3.	InC_a is explained by IM_a.		✓	
H 2.4.	InC_a is explained by IS_a.	✓		
H 2.5.	InC_a is explained by IIB_a.	✓		
H3.	IIn_a is explained by the five dimensions of the ATL within the Software development Industry in Romania.			Partial supported
H 3.1.	IIn_a is explained by IIA_a.		✓	
H 3.2.	IIn_a is explained by IC_a.	✓		
H 3.3.	IIn_a is explained by IM_a.		✓	
H 3.4.	IIn_a is explained by IS_a.	✓		
H 3.5.	IIn_a is explained by IIB_a.	✓		
H4.	TIn_a is explained by the five dimensions of the ATL within the Software development Industry in Romania.			Partial supported
H 4.1.	TIn_a is explained by IIA_a.	✓		
H 4.2.	TIn_a is explained by IC_a.		✓	
H 4.3.	TIn_a is explained by IM_a.		✓	
H 4.4.	TIn_a is explained by IS_a.	✓		
H 4.5.	TIn_a is explained by IIB_a.	✓		

Source: Authors' development.

The InC_a is only explained by two (out of five) online adapted transformational leadership dimensions; according to data from Table 3, the InC_a has a predictive ability of 27.8% from IC_a and 36.9% from IS_a; this relation does not include online leadership dimensions such as IIA_a, IIB_a and IM_a. Results show that the departmental companies' innovative climate accentuates a specific need of followers to be under the coordination of leaders that, even within online platforms, engage in current working tasks by suggesting and determining them to see and solve problems from different perspectives. As for the second general Hypothesis (H2.), results show that it is supported by H 2.4 and H 2.5., revealing the fact that the online-adapted transformational leadership during the social lockdown specific to COVID-19 pandemic was not well adapted for implementing all of its exclusively online instruments.

The third workforce dimension, the IIn_a, has a predictability of 76.1% coming from three online TL dimensions (20.5% IC_a, 19.1% IIB_a and 26.4% IS_a), while adapted online

leadership dimensions such as IIA_a and IM_a are not part of the influence sphere. For IT&C companies to determine followers to increase innovation under an individual level, companies should have an IIn_a-oriented organizational culture, where online transformational leaders treat followers rather as individuals and not as a simple group member, by considering their needs and abilities, and encouraging their aspirations. Leaders' online input regarding existing or future arising problems is highly appreciated within the IT&C companies because followers need the results of critical assumptions re-examination and suggestions from their leaders. The current results show the fact that H3 is not fully supported, because on an individual level, working exclusively online during the social lockdown, it seems that leaders did not have well-adapted instruments in order to enrich one's experience and influence their behavior in the desired direction.

As the most representative workforce innovation dimension, TIn_a, is explained by three online-adapted transformational leadership dimensions—15.3% IIA_a, 25.2% IIB_a and 26.5% IS_a—while IC_a and MI_a are not part of the current software development online transformational leadership–workforce innovation model. The IT&C TI_a is derived from online transformational leadership behaviors, where the collective sense of purpose and moral and ethical consequences of internal decisions is largely valued, while leaders share with followers important values and beliefs. These final conclusions also shot that H4, as the last general hypothesis of the current study is also partially supported by three (out of five) working hypotheses; the COVID-19 pandemic also affected team leadership that can only be expressed through idealized influence as attributes and behaviors, while leaders appear to be able to reach enough to each individual in order to intellectually stimulate them.

3.2. Theoretical Implications

The current research aims for proving that there is a positively correlated relationship among the online adapted transformational leadership and workforce innovation practices within the software development companies in Iasi, Romania. As for the first general assessment of the current research, an analysis of the online equation in regards to the hierarchical position within the organization was considered; results show that there is little evidence on how the five dimensions of the online adapted transformational leadership interact with the four dimensions specific to the instrument used to measure the workforce innovation adapted.

Authors searched whether software development companies' online adapted transformational leadership from Iasi, Romania varies according to the hierarchical levels of the employees. The findings showed that there are systemic differences in regards to online transformational behavior among employees that fill in nonmanagerial positions and the ones that are specific to top management, as the late ones present better online transformational leadership behaviors. With an emphasis on middle management for all the five dimensions, the analysis showed that as for the IIA_a dimension, the most important feature of the online adapted transformational leaders is giving up their own interests for the wellbeing of the group, while the second dimension that regards IIB_a is highly appreciated when the leader emphasizes the importance of the personal goals and the collective sense of purpose. The IM_a dimension sets off the ability of the leader of inspiring a compelling vision of the future and evolution of the company and industry altogether and provides the followers with the conviction that the goals will be successfully achieved. The IS_a emphasizes the power of the leader to examine the conditions concerning new arousing situations for each of the employee and help determine their appropriateness, while looking for different perspectives in solving problems. The IC_a is the dimension with best scores when analyzing the connection between online-adapted transformational leadership and the position within an organization, while the ability of the leader to help the employee to develop their own strengths seems to be of utmost importance.

As for the third point of the current research, it addressed whether the employees' innovation varies according to the hierarchical position within the organization. Emphasiz-

ing the most considered results for all the four dimensions specific to the WI_a, results show that on the individual innovation level, employees value the most the fact that their own activity implies making innovative decisions; on the team innovation level, working groups welcome the most the uncertain circumstances in regards to their activities at work; the third WIS_a dimension regards the innovation climate as the most valued ingredient as the possibility of each individual to make time to follow its own ideas and/or projects. In the last WIS_a dimension, the adapted organizational innovation emphasizes the job-specific vision that gives to the employees the necessary help when setting goals.

Results show that in both cases, of online-adapted transformational leadership and workforce innovation, when analyzed depending on the hierarchical levels, leaders and followers that acquire a higher level within organization seem to have both a stronger bond resulting in an increased degree of influence and reciprocal respect, as well as a higher level of innovation. It is an interesting pattern because the direct relationships between TL_a, WIn_a and hierarchical position follow a common rule. The fact that TL_a and hierarchical position emphasizes the IC_a and the need for the worker to be assisted in developing their own strengths and the WI_a stresses the importance of the OIn_a and the vision specific for each organization explains the fact that the software development companies (should) take into consideration when defining their vision the role and importance of the online-adapted transformational leadership when considering the development of their specific workforce. The nature of the IC_a presumes the close work relationships between leader and follower and enable followers to feel free to innovate, develop and feel rightfully treated and valued within an organization. When about the co(in)firmation of the two theoretical models used, results show that the online adapted transformational leadership on the five components is not entirely being recognized as specific for the analyzed industry, while the workforce innovation only distinguishes three usable dimensions.

Within the COVID-19 pandemic, software development leaders in Iasi failed for displaying their capabilities and determination, mainly during the first months of the social lockdown, because these two features appear as being mostly misunderstood and not perceived as important drivers for innovation. Managers did not assume their willingness for taking risks via online working conditions, within an economic environment already put at risk, so precaution was used instead for achieving collective goals. IC_a practices during pandemic do not respect the pattern out of which followers manifest a one-to-one relationship with their leaders, who are able to assess and pay interest to their individual specific needs. Encouraging the skills development and fulfilling followers' aspirations is a practice that, within an exclusive online work environment, loses its significance and power. Reflections on the specificities of IC_a during COVID-19 show an opaque relation between leader and follower because one-to-one relationships were cleaved via online communication platforms; but mostly, research shows writing as the main tool for interaction between parties [107,108]. For this reason, the coaching and mentoring processes, were not only verbal, but also nonverbal and paraverbal; suddenly, work activities became obscure and difficult to manage, the physical distance between the two actors, leader and employee, sending cooperation into an abstract level, where readiness for change is with a stringent importance [109]. IM_ component traditionally enacts the leader as the vision provider, a role model for the followers in regards to achieving goals and advocating for it. As for this perspective, COVID-19 pandemic alleviates the transformational leadership challenges, because the simplicity of the work environment language, the symbols and the images utterly needed to be translocated within a virtual world. The role of leaders as setting high expectations for the followers and providing optimism and enthusiasm within the work environment becomes incomplete because a virtual communication world does not provide appropriate reciprocal means for expressing feelings and insights from leader to follower. According to theorists, IS_a is designed for the leader to excite and spur the interests of their followers and encourages them to offer solutions to old problems in a new and innovative way [53,54]. The COVID-19 pandemic finds the online transformational leadership in Iasi, Romania insufficiently developed as for means and methods to

encourage creative thinking; therefore, followers lack the leaders' activities of sufficiently and efficiently reframing problems which will determine them to question assumptions within their pursuit for achieving goals. The effects of the COVID-19 pandemic on the IT&C industry could result in an unexpected industrial revolution, adapted to every national and organizational culture it worked within [17,109,110].

As for the four adapted WIS components, the InC_a traditionally emphasizes both leaders' and followers' role in supporting creativity. In detail, the COVID-19 pandemic, if manifesting a vertical communication and attitude, and encouraging a culture for inferiority by promoting poor lateral communication, this dimension within the studied organizations not only stifled the innovative climate but also disheartened followers. IIn_a advocates promote the internal champions, the promoters and other organizational roles that result in fueling innovation to enhance communication and networking. The COVID-19 pandemic broke the direct link for followers' competitiveness, a fact that resulted in an indirect effect for nurturing innovation on department and even organizational levels. As defined by literature and practice, team innovation [111] involves an increased number of perspectives for solving problems and thus enhancing teamwork defined by clear and defined tasks and objectives, team roles and team leadership. Because it is exclusively online working and interacting, team working is based on tasks and objectives expressed in writing and often lacunary explanations because communication barriers were installed. By following the same pattern, the need for the organization to create a vision and innovate, as a practice embraced and assumed by the employees as a direct consequence of the organizational leadership during online working, OIn_a is a main driver for innovation; but while the followers' implication within the innovation process highly encourages the organizational outcomes, transformational leadership practices during the pandemic hardly find instruments and uses for encouraging innovation on an assumed organizational scale.

The online-adapted transformational leadership results are quantifiable through the innovation and creativity that becomes a specificity for a given IT&C workplace, by enhancing vision and autonomy; therefore, the online adapted transformational leadership should maintain its role of challenging, encouraging and giving recognition for the followers [112]. The leader's behavior displays enhancing creativity through charisma, and it offers the possibility for reward and recognition through IC_a, by allowing and encouraging an exploratory thinking and providing the ground for IM_a, as encouraging the idea generation processes. The online-adapted leader-follower engagement provides support for accomplishing the organizational vision [54,113,114] while the resulting followers' motivation becomes one of the main drivers for the individual creativity levels [115].

Therefore, the emphasis of the two components within the current study, the online-adapted transformational leadership and workforce innovation, rest on their theoretical notions in relation to the COVID-19 pandemic assumptions.

3.3. Practical Implications

The results of the current research reside from the fact that the IT industry in Iasi is relatively young, while the software development branch is currently forming. For this reason, being a branch with a high need for innovation and an average employee age between 21 and 30 years old, by adding a wide lack of (online adapted) management structure, transformational leadership appears to be a stringent solution for organizational management and development. For example, in order to encourage followers' attachment towards their organizations, (online) leaders should take more into consideration the moral and ethical consequences of the decisions they make, take initiative and present followers with inspiration and new perspectives for solving existent problems. This type of leadership behavior has the ability of promoting a higher job satisfaction as well as organizational citizenship [116,117]. In order to increase the individual as well as organizational innovation levels, online-adapted leaders should encourage followers to increase creativity, freedom for risking and taking group decision without prior permission, and last, but most important, online adapted leaders should grant followers with opportunities

to learn from their own mistakes. Literature searched over the productivity level of an organization [80,81] with a better understanding of the psychological process that defines and underlies transformational leadership.

The online-adapted transformational leadership exposure to extreme events emphasizes the stress and the challenge the software development companies are subject to, when followers levels of performance are highly related to creativity, individual and team innovation [52,118]. In practice, the COVID-19 pandemic effects show how changes specific to leaders' transformative behaviors, once online oriented, largely affected followers' performance [90]. These results represent an obliteration from the business literature conceptualization, a model that parsimoniously explains how COVID-19 affected the online adapted transformational leadership–workforce innovation dyad.

3.4. Study Limitations and Directions for Future Research

The results of the current study must only be considered if taking into consideration the limitations of the research, suggesting altogether directions for future research. First, data was collected from an (in)definite number of small to medium software development companies in Iasi, Romania. However, more data need to be collected from larger companies to ensure a generalization of the results. Second, the data was collected only from companies that develop software development activities in Iasi, Romania, the third largest city in Romania; for this reason, if a thorough country representative research was to be made, data will need to be collected by addressing companies from all the cities and all the geographical regions of Romania. Third, the current study applied a cross-sectional design, providing information about what is happening within the software development population that was studied, but it does not allow manipulating variables and limits the interpretation of the results. For this reason, a longitudinal approach appears to be necessary, because leadership and innovation within an organization need to be analyzed according to factors that are interchangeable over time. Fourth, data was collected online during the early beginnings of the COVID-19 pandemic, when transformative behaviors and innovative results were struggling for an efficient adaptation to an exclusively online work environment; for the real impact of the current study, data should be gathered and analyzed for the same population after restrictions clearance. The main concern for launching such an initiative is that many of the IT&C studied companies, after months from lifting restrictions, keep ongoing their home-based activities, meaning via an exclusively online work environment, so such an analysis becomes not as relevant, at least for the 2022-year level.

Recommendations for future research on the topic of transformational leadership and workforce innovation should be initiated by improving respondents pool, not only from a specific industry branch (as the current study does) but also from the entire IT industry. The inclusion of a third instrument is recommendable (such as workforce innovation, organizational culture or climate for innovation) so that transformational leadership could be studied from at least two different organizational perspectives. Moreover, the role of moderating values could also be brought into discussion.

4. Conclusions

The current research has examined the ways in which the COVID-19 pandemic has affected the online-adapted transformational leadership attitudes and shaped innovative behaviors within the software development companies in Iasi, Romania. We provide insights in regards to the underpinnings of workforce innovative results, on organizational, team and individual levels, as a direct result of the online-adapted leadership practices within an exclusively online-based work environment. By drawing a practical perspective, we provide a novel assessment of software development companies for the online leader–follower interaction and the evolution of online-adapted follower work-assessed innovation. Our study is the first to contextualize the IT&C niche of software development (not) during the COVID-19 pandemic.

The challenge of the IT&C industry as a whole, along with the software development branch for the companies that develop activities in Iasi, Romania was to follow work protocols and continue gathering even more innovative solutions for arising problems, even during the COVID-19 pandemic, when individuals (managers, leaders and followers) were forced to work and adapt to an exclusively online set of activities.

Results show that none of the four main hypotheses is fully validated in the context of the COVID-19 pandemic lockdown; the implications of such findings have a double perspective. At first, from a theoretical perspective, as literature prior suggests [3,4,119] during the pandemic, transformational leadership was not prepared to positively affect workers behaviors and performance, but it is very important to bring into light its readiness to change. The reason for such a result comes from the industry specificities, because the profile of the average software developer include an individual 20–30 years old, with 3–5 years of experience, able and used to being asked to adapt to a multitude of situational and contextual requirements.

As for the managerial implications, the current results suggest that the software development branch, as one of the most dynamic and important branches of the entire IT&C industry, should pay more attention to the transformational leadership practice because workers performance seems to be partially influenced (therefore positively influenced) by the managerial/leadership practices within an exclusively online world. The current suggestions gain even more importance because the IT&C industry is distinctive through its working methods and specific organizational behavior, where followers work remotely online as a rule [120,121]; teamwork brings into light peculiarities such as online-based task or progress communication, reaching even to online socialization because private language seems more adjusted to these singular individuals.

Adjusting transformational leadership practices within the Iasi (Romania) software development companies to an exclusively online practice could not only benefit the profits and positive national and international evolution of the studied companies, but it could also adjust one of the most expensive factors that spreads instability and increases competition among them, namely the turnover. It is widely known that most of the industries, but IT&C especially, are facing a lack of commitment from employees towards the organization [3,122,123]; so far, as results suggest, transformational leaders strived for exhibiting better performance from their followers, having rather a mediating than an inspiring role. By reducing turnover and fully adapting the five leadership dimensions to an exclusively online world, software development organizations could manipulate turnover intention and increase altogether the employee performance and well-being.

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