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Knowledge Flows Barriers: An Exploratory Study in the IT Industry

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Abstract: Although invisible to the individual, knowledge flows are found within any team or department within the organization, whether or not they are used intentionally. Thus, in an organization with an emphasis on knowledge, knowledge flows become the main mechanism for the success of the organization. However, various barriers to knowledge flows often emerge that can make these flows difficult or even stop from their natural course through the organization, often directly affecting the intellectual capital of the organization. For this reason, many organizations are unable to reach their full potential despite efforts to manage knowledge flows effectively. This study aims to outline the main factors hindering the knowledge flows within IT organizations operating in Iasi (Romania) and to analyze statistical links between these factors. For this purpose, a quantitative method was selected, using descriptive analysis, factor analysis, correlation coefficients, and a regression model. The results obtained by this study show that factors acting as barriers to knowledge flows found in the literature cannot be generalized across all organizations. Thus, the way these factors are affecting knowledge flows varies from one organization to another depending on the industry in which they operate.

Keywords: knowledge management; knowledge barriers; IT industry; knowledge flow; organizational barriers, individual barriers, technological barriers.

Introduction

In our modern society, the economy increasingly relies on knowledge and less on physical assets. Thus, knowledge is becoming a key factor in individual and organizational development. In the business environment, there has been a change from a resource-based economy to a knowledge-based economy, with companies relying more on intangible assets that they can get as a result of knowledge flows. Therefore, organizational knowledge has become one of the most valuable resources in creating competitive advantages for the organization, so large companies invest in creating, applying, and transferring knowledge that is used to develop competitive advantages and achieve the organization's strategic goals. In this way, the success of organizations present in the current economic environment, especially those active in competitive markets, depends to a large extent on the investment they make in their human capital. All these investments are based on knowledge flows that are transferred from one individual to another to develop the skills of the person receiving knowledge flows, thus creating added value for the organization.

Although invisible to the individual, knowledge flows are found within any team or department within the organization, whether or not they are used intentionally. These flows are seen as a metaphor for analyzing the phenomenon of knowledge transfer between two individuals (Bolisani & Oltramani, 2012). A knowledge flow can be defined as a vector to successfully transmit knowledge from one individual to another based on a well-defined logical process (Zhuge, 2002). Therefore, an efficient knowledge management system helps the organization predict potential changes in its environment and establish its strategic plans correctly. Knowledge is flowing within the organization through working teams, cooperation between the members of the departments, or through mere collaboration between two individuals who voluntarily or involuntarily transfer knowledge to each other. Thus, in an organization with an emphasis on

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knowledge, knowledge flows become the main mechanism for the success of the organization. However, various barriers to knowledge flows often emerge that can make these flows difficult or even stop from their natural course through the organization, often directly affecting the intellectual capital of the organization. For this reason, many organizations are unable to reach their full potential despite efforts to manage knowledge flows effectively. This is due to a lack of full understanding of what may arise in the way of flows and often lead to loss of knowledge that might have been valuable to the organization.

Many scholars have researched this matter and discovered that there are various factors affecting knowledge flows within organizations. Many typologies of these factors are found in the literature regarding these barriers and the way that they are hindering knowledge flows. Therefore, the most affecting factors for knowledge flows are seen by some scholars as being linked to individual, organizational and technological factors (Disterer, 2002; Riege, 2005; Bratianu, 2011). Other scholars consider that besides these factors, that the knowledge characteristics may be another group of factors acting as barriers to knowledge flows (McLaughlin, 2008; Szulansk & Leei, 2018).

However, in the literature, studies analyzing the factors that may inhibit knowledge flows within a specific framework, such as the one proposed, have not been found. Therefore, from a theoretical point of view, this is one of the first studies analyzing the barriers to knowledge flows within the IT organizational framework in Romania, making it possible to shape future research directions in this respect. It also gives a new view of how different barriers arise to knowledge flows within the IT companies' organizational framework. From a practical point of view, the results of this study can help the managers of IT organizations to understand the main factors why the knowledge is not transferred or accepted by their employees. In this way, they can address specific techniques of knowledge transfer according to the characteristics of each individual in the organization. In this way, the results of this research can bring several benefits to managers of IT companies in Iasi by understanding those mechanisms that are the basis for creating barriers to knowledge flows. Therefore, based on them, they can understand how these barriers can be eliminated and how the organization can achieve its strategic objectives.

The focus of this research is on the factors generating barriers to knowledge flows within a specific organizational framework, its main research question being which are the main mechanisms generating barriers that can hinder the knowledge flows within IT companies operating in Iasi (Romania) and how they are statistically linked to each other. Therefore, this study aims to analyze the main factors hindering the knowledge flows within IT organizations operating in Iasi (Romania). To do so, the Statistical Package for Social Science version 20 was used to statistically analyze the data collected from respondents from IT companies operating in Iasi. This study is organized as follows: the first part is divided into two sections one reviewing the literature regarding the *knowledge flow* term and the other one reviewing the literature regarding the main factors acting as barriers to knowledge flow, then, based on the literature establishing the hypotheses of the study. The second part explains the methodology used in the research. The third section addressed the results and discussion of the research (the main barriers created by each dimension resulted from factor analysis). In the fourth section of the study, the hypotheses are tested and validated. The last section includes the study conclusions, limits, and future research directions.

Literature review

Literature review regarding knowledge flows

Knowledge flows definitions vary in literature from one scholar to another, but all refer to the same processes, i.e. knowledge transfer and knowledge sharing. Some scholars define knowledge flows as a process of transfer of competences between the departments of the

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organization (Gupta & Govindarajan, 2000), and others consider the transfer of working practices as the basis for knowledge flows (Argote & Ingram, 2000). Nissen (2011) considers that knowledge flows sum up both the knowledge transfer and sharing process, and by using the term 'flow' the author refers to the knowledge dynamics in the organization. On the other hand, Gupta and Govindarajan (2000) define knowledge flows as *"the sum of similar concepts such as conversion, transfer, sharing, integration, use and application of knowledge within a specific framework and over a given period"*. Schulz (2001) adopts a broader concept of knowledge flows. He defines a knowledge flow as an aggregate amount of know-how and information transmitted over a given time across the organization. Based on this definition, the author attempts to include in the term knowledge flows all know-how and information transferred within the organization in different ways using technology or face-to-face communication (Schulz, 2001).

Bratianu (2015b) notes that knowledge flows occur in the organization as a result of pressure between the person who sends the knowledge and the one who receives it. This pressure can be seen as the need to transfer knowledge from the higher knowledge-intensive individual to the lower knowledge-bearing individual. The author uses a metaphorical approach in explaining this phenomenon using the statement *source domain* that contains well-known concepts, and a *target domain* that contains the less known concepts (Bratianu & Bejinaru, 2019; Bratianu & Bejinaru, 2020). Thus, the main objective of knowledge flows is to transfer skills and expertise from their place of occurrence to the place where they are needed, in time and space. According to the author, a knowledge flow is seen from a metaphorical perspective associating the flow of knowledge with physics principles. Thus, according to Bratianu and Bejinaru (2019), knowledge is flowing through an organization always from a higher level of knowledge intensity toward a lower level of knowledge intensity within a certain field. According to Zhang (2016), knowledge flows are seen as a strategic element in the creation, transfer, and dissemination of knowledge to members of the organization. Zhuge (2002) defines the concept of knowledge flow as the process of knowledge transfer through nodes according to certain sets of rules and principles. Within the organizational framework, these nodes can be represented by an individual, a work team, or even a department. A flow of knowledge starts from one node and ends at another. This process can be analyzed from the perspective of the transfer of tacit knowledge from one individual to another. Thus, from an organizational perspective, knowledge flows can be seen as a method of supporting knowledge accumulation and transfer. Therefore, in the organizational environment, knowledge flows can be seen as the process of transferring tacit knowledge from one individual to another, which will create and accumulate new knowledge in the organization.

The role of knowledge flows in the organization is critical to internal processes. To this end, the performance of tasks arising in an organization requires a flow of knowledge through which the necessary know-how is passed on. In this way, knowledge flows have an increased impact on the processes carried out in the organization. So if a knowledge flow does not *"flow"* as it should, a process will not be carried out or will not be carried out effectively. Within the organization, knowledge flows can occur through multiple processes; training, mentoring, research and development sessions, discussions, observations, or the "trial and error" method (Nissen, 2006). The knowledge flows found in these processes lead to the key activity underlying organizational success, namely, learning. Thus, where there are knowledge flows, there are learning processes, whether at the individual, group, or organizational level.

Literature review regarding knowledge flow barriers

The literature analyzed a set of common factors that may create barriers to knowledge flows within an organization. Thus, most scholars have classified the main drivers of such barriers into separate categories. In a study carried out by Disterer (2001), the researcher discovers that barriers to knowledge flows can arise from *individual characteristics*. He finds the fear of losing power, uncertainty, and lack of motivation within this category of barriers. Thus, an individual possessing certain knowledge has a certain influence in the

organization based on the knowledge he or she possesses. By transferring some knowledge, individuals may feel that they may lose certain privileges, advantages, respect, or even job security. Disterer uses the phrase "knowledge is power" to explain this scenario. At the same time, the individuals suffer from a lack of motivation because they feel that there is no benefit in accepting new knowledge or transferring it while questioning the benefits of it is increasingly becoming embedded in his or her behavior. Thus, a lack of motivation for individuals to engage in a knowledge transfer process may arise as a result of their feeling that an exchange of knowledge does not bring them any benefit.

The most common barriers related to the individual characteristics outlined by Bratianu (2015b) are the fear of losing utility as a result of a transfer of knowledge, the lack of trust towards the colleagues, and the tendency towards individualism. These barriers are complementary and generated by a psychological mechanism of the individual and reflect a fear of losing some privileges acquired as a result of knowledge possession (Bratianu, 2015b). The author uses in later studies a metaphorical approach to explain this reluctance of individuals. He explains these reluctances as a form of inertial thinking that directly affects the knowledge flows through which individuals refuse to accept any kind of change (Bratianu, 2015a). Therefore, this reluctance to change can affect knowledge flows through a tendency of inertial thinking of an individual, refusing any knowledge which he cannot accommodate with. This individual behavior is explained as well by McLaughlin (2008), which he calls 'Not Invented Here' syndrome (N.I.H). The term *syndrome* is used as a metaphor that defines the individual's tendency to neglect, ignore or even discredit any knowledge that is not created at the level of the team or department he is part of. Riege (2005) considers lack of time, fear of losing power, low awareness, differences regarding experience within the organization, poor communication skills, lack of interpersonal skills, differences in education, and differences in age and gender as a set of factors that can affect knowledge flows. The lack of a reliable source of knowledge can act in the organizational environment, according to Szulanski and Lee (2018), as a barrier to knowledge flows. On the other hand, not only the presence of a reliable source of knowledge can influence the way knowledge flows are moving through the organization, but also the characteristics of the knowledge receiver such as his knowledge absorptive capacity (Cohen & Levinthal, 1990), retentive capacity (Argote, 2012) and perceived utility (Kane, Argote & Levine, 2005).

For other scholars, the main factors that may affect knowledge flows are *organizational* ones, the main barriers arising from the way employment relationships are conceived, technological procedures, internal organization regulations, and especially organizational culture. Several other organizational factors that inhibit knowledge flows such as leadership style (Bratianu, 2015b), organizational distance, or reward system (Riege, 2005) are identified by literature. Disterer (2002) discovers poor communication both vertically from management to employee and horizontally from employee to employee as one of the main drivers inhibiting the flow of knowledge. Claver-Cortes, (2007) argues that a centralized decision-making process, as well as a high degree of formalism in working procedures and relationships, prevents knowledge creation and the emergence of new ideas, while flexibility in activities increases the production of knowledge and facilitates knowledge flows. Lin (2012) analyses the presence of the main factors that can hinder knowledge flows. The main organizational barriers outlined by the researcher are the lack of proper leadership style, time and resource constraints, the competitiveness between the members of the organization, and the presence of technical terminology. In his study, Lin (2012) also finds out the lack of occasional knowledge-sharing meetings or the lack of dedicated knowledge-sharing rooms can act as organizational barriers that can hinder knowledge flows.

Knowledge flows can also be inhibited by factors related to the company's technology infrastructure. Thus, the effect of these technological elements on knowledge flows has become a concern for researchers, the results of their studies being summarized as *technological* factors acting as barriers to knowledge flows. The lack of up-to-date

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technologies within the organization, or even the lack of availability, makes it difficult to route knowledge flows (Riege, 2005). In a study carried out on seven companies from different industries, Lin (2012) discovers within the organizations analyzed the lack of tangible mechanisms such as phones, conference rooms or computer networks, the lack of integration of IT processes and systems, lack of compatibility between different it systems and lack of employee's experience with new IT systems as the main technological factors acting as barriers to knowledge flows. Also, in his study, the researcher defines the term "technophobia" as a factor in the same group of barriers. Using the term *"technophobia"* Lin analyses the reluctance of individuals to use technology for knowledge transfer purposes. Other scholars include within this group, the individual's lack of technological skills and lack of technical support as factors inhibiting knowledge flows (Szulanski & Lee, 2018).

The term *causal ambiguity* is described by Szulanski and Lee (2018) as an important factor inhibiting knowledge flows. The scholar refers to the absence of a logical reason in the individual's mind regarding the relationship between inputs and the results of knowledge flows in defining this term. In the organizational context, this term can be understood as the lack of clear lines between knowledge-flow processes and actions to be taken to improve those processes. This phenomenon is described as the main cause of the "stickiness" of knowledge flows when transferred to another individual; the knowledge can be considered ambiguous by the recipient. At the same time, the validity of the knowledge involved in transfer through previous use and provenance of knowledge are factors relevant in the researcher's studies as barriers to knowledge flows. All of these factors are found in literature in the group of factors that reflect the *knowledge characteristics*.

Hypothesis development

The analysis of the studies found in the literature shows that there are differences between the groups of barriers that can hinder the knowledge flows and the type of organization in which the studies were carried out. In this way, existing research in this field has been done in different organizations from various industries, which gives this study a uniqueness, with factors acting as barriers to knowledge flows being taken from other studies and tested within a specific framework. Thus, this study aims to analyze the factors acting as barriers to knowledge flows within IT companies operating in Iasi (Romania), based on which the following hypotheses were developed:

H1: Individual factors that can act as barriers to knowledge flows are positively correlated to motivational mechanisms.
- H1.1 There is a positive correlation between the '*Not Invented Here*' syndrome and individual barriers
- H1.2: There is a positive correlation between the '*Knowledge is power*' statement and individual barriers

H2: Organizational factors acting as barriers to knowledge flows are positively correlated to the organizational context in which differences occur between the members of the organization.
- H2.1: Differences in experience level are positively correlated to organizational factors that can hinder knowledge flows.
- H2.2: Job differences are positively correlated to organizational factors that can hinder knowledge flows.
- H2.3 Department differences are positively correlated to organizational factors that can hinder knowledge flows.

H3: Individual's reluctance regarding the use of technology in knowledge transfer is positively correlated to technological barriers.

Research methodology

Sample and data collection instrument

The study was conducted on a sample of employees from IT organizations operating in the city of Iasi (Romania). Within the IT organizations, due to their specific focus on creativity and continuous learning, knowledge flows are the basis of organizational success. Therefore, the intensive use of knowledge flows within IT companies is the base on which these flows become a key resource for the strategy of it. As such, employees of these companies are permanently involved in knowledge flow processes. To determine a representative sample for the study, 200 respondents working within IT companies operating in Iasi were selected using a systematic sampling method.

For data collecting from respondents, a questionnaire has been developed and sent to them online. The questionnaire used in the research was designed to fulfill the aim of the study. Thus, it was built based on literature, then pretested on 10 employees from IT companies operating in Iasi (Romania). The aim of this pretesting was to receive feedback from respondents regarding those statements' accuracy and reflect the objective of the study. As a result of this process, certain statements have been modified or removed to make them intelligible to the target respondents. In the final version, the questionnaire was structured into four sections; in the first section, a filter question was used to select the respondents working in the IT companies operating in Iasi. The second section of the questionnaire consists of eight statements regarding the presence of different barriers that hinder knowledge flows within the organization. In this section of the questionnaire, 38 statements were used, each analyzing the existence of a certain barrier. A five points Likert scale (1-total disagreement; 5-total agreement) was used to express their opinions given a certain statement. The last part of the questionnaire included statements that analyzed the demographic variables of the respondents: gender, age, level of education, and work experience years.

Data analysis

The quantitative results of the study were analyzed in Microsoft Excel version 2013 and Statistical Package for the Social Sciences (SPSS) version 20. During the analyses of the results, the following types of analyses were used: descriptive statistics, internal consistency analyses, factor analysis, correlation analysis, and multiple regression analysis. Descriptive statistics have been used to outline the main barriers that are found at the organizational level within analyzed companies. The consistency of the questionnaire and the scales found at its level was analyzed using The Cronbach Alpha coefficient. To extract the main groups of barriers, a factor analysis of principal components was used.

Therefore, factor analysis has been used to reduce the number of literature barriers to a specific number to the type of organization where research is carried out and the grouping of the remaining ones into specific categories of barriers. To test the study's hypotheses, the Pearson correlation coefficient was used. Based on the results of this coefficient, the hypotheses were validated or not. Finally, a series of multiple linear regressions were conducted following correlations between the variables of research hypotheses, to analyze the influence of the independent variable on the dependant variable at the level of each hypothesis.

Results and discussion

Demographic profile

Table 1 summarizes the demographic profile of the respondents. The results of the analysis show that 57% of respondents are male, and 43% are female. According to the

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results, 53% of respondents are aged between 18 and 24, 37% are aged between 25, and 34, 6% of respondents are aged between 35 and 44, and only 4% of respondents are aged between 45 and 54 years old. The majority of the respondents in the extracted sample show a level of 75% of undergraduate education, 22% of postgraduate education, and 3% of Ph.D. studies. The respondents work experience is distributed as follows: 7% of respondents have less than one-year work experience within IT companies, 63 % are ranged between one and three years of experience within IT companies, 20% of respondents work for a period ranged between 4 and 6 years within IT companies, and 10% of respondents have more than six years of working in IT companies.

Table 1. Respondents' demographic profile

Variable		Frequency	%
Gender			
	Male	111	56.6
	Female	85	43.4
Age			
	18-24	104	53.1
	25-34	72	36.7
	35-44	11	5.6
	45-54	9	4.6
Education			
	Undergraduate	147	75.0
	Postgraduate	44	22.4
	PhD	5	2.6
Work experience			
	Less than a year	14	7.1
	1-3 years	124	63.3
	4-6 years	39	19.9
	More than six years	19	9.7

Source: Own processing

Factor analysis

Given the lack of previous studies in the same organizational framework and the large number of barriers found in the literature (38 factors), to facilitate descriptive analysis, explorative factor analysis has been made. During factorial extraction, the Principal Component Analysis (PCA) method was used through Varimax rotation with Kaiser normalization. Table 2 shows that the components resulted from factor analysis and related factors for each component.

According to Hair (2006) in factor analysis, only loadings with a minimum value of 0.50 are of practical relevance and can be retained for the continuation of the study. In the table below, only the items with loadings over 0.5 are displayed those with values below this threshold being removed from the analysis. Following the factor analysis, eight items not meeting the minimum value of 0.5 within any dimension were reduced. Also, the total variance explained by the factor analysis solution equals to 79%.

To test the statistical link between the variables, Bartlett's sphere test was used. Besides, the Kaiser-Meyer-Ohlin test was used to evaluate the solution obtained by applying factor analysis. The Kaiser-Meyer-Ohlin test analyses the level on which the sample used corresponds to the research, one sample being considered suitable for the study when it exceeds the minimum value of 0.6 (Pallant, 2013). In literature, the values of this indicator

are considered mediocre if they are in the range 0.5-0.7, good if they are between 0.7 and 0.8, very good between 0.8 and 0.9, and excellent above 0.9 (Hutchenson & Sofroniou,1999). The value of the Kaiser-Meyer-Ohlin test is 0.771, which shows a good result of the solution obtained by applying factor analysis in this study.

Bartlett's sphere test analyses the statistical links between research variables. According to the literature, the significant statistical value of this test is below 0.05 as close as possible to zero (Pintilescu, 2007). In this study, the Sig value of Bartlett's sphere test is 0.00, which reflects with a confidence level of 95% that there are significant statistical links between the variables.

Table 2. Components resulted from factor analysis

	1	2	3	4	5
Organizational distance	.913				
Leadership style	.900				
Organizational culture	.812				
Lack of occasional meetings	.787				
Lack of trust between colleagues	.755				
Poor organizational communication	.749				
Departmental differences	.643				
Hierarchical differences	.621				
Lack of dedicated knowledge sharing rooms	.596				
Rewarding system	.595				
Differences regarding experience	.538				
'Knowledge is power'		.860			
Fear of losing privileges		.835			
Lack of time		.788			
Uncertainty		.778			
Individualism		.745			
High effort		.602			
Fear of exploitation		.591			
Lack of trust in the knowledge source			.887		
Absorptive capacity			.852		
'Not Invented Here' syndrome			.673		
Retentive capacity			.561		
Knowledge validation				.826	
Perceived utility				.763	
Causal ambiguity				.652	
Lack of technical support					.852
The individual reluctance in using IT systems					.846
Lack of IT systems					.843
Lack of integration of IT processes					.723
Individual's lack of technological skills					.615

Extraction Method: Principal Component Analysis./ Rotation Method: Varimax with Kaiser Normalization./ a. Rotation converged in 7 iterations.

Source: Own processing

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Resulting from the factor analysis extraction method, the remaining items were grouped as follows: 11 items were grouped to the first dimension, seven items to the second one, four items to the third dimension, three items to the fourth dimension, and five items to the fifth dimension. Considering the factor analysis solution and how the items were grouped, the resulted dimensions have been attributed the following names: dimension 1– '*Organizational barriers'*, dimension 2 – *'Individual barriers-knowledge source*', dimension 3 – *'Individual barriers-knowledge recipient'*, dimension 4 – *'Knowledge related barriers'*, dimension 5 – *'Technological barriers'*.

Internal consistency analysis

The internal consistency was tested on the 30 remaining items after factor analysis using Cronbach's Alpha coefficient. Also, in testing the internal consistency, there were excluded demographic variables. Table 3 shows the level of internal consistency of the research questionnaire concerning the 30 items analyzed.

Table 3. Reliability Statistics for the remaining items

Cronbach's Alpha	Number of items*
.875	30

*The items related to demographic variables were excluded
Source: Own processing

According to Nunnally and Bernstein (1994), a recommended level of Cronbach's Alpha is ranged between 0.7 and 1 so that the level of internal consistency of the research questionnaire can be considered reliable. Popa (2011) claims that Cronbach's Alpha values can be considered excellent if they reach the statistical threshold of 0.9, very good if the values are around 0.8, and adequate if the coefficient's values are 0.7. Cronbach's Alpha coefficient values for the iterations used in this study are 0.875, thus showing a very good internal consistency of the research tool.

Descriptive analysis

Regarding the analysis of the results, to outline the presence of the barriers in each resulted dimension a descriptive statistics analysis was made using SPSS. To analyze the presence of each barrier, the average value of the mean of each dimension was calculated.

Organizational barriers

Based on the analysis of the results, the average value of the group of barriers generated by organizational factors on the analysis scale is 2.26. The table below displays the results of the descriptive analysis of the main barriers generated by organizational factors that can hinder the knowledge flows within IT organizations operating in Iasi.

Table 4. Organizational barriers descriptive statistics

Barriers	N	Mean	Std. Deviation
Organizational distance	196	2.1429	1.21529
Leadership style	196	2.1888	1.20259
Organizational culture	196	2.0663	1.19430
Lack of occasional meetings	196	2.4745	1.24627
Lack of trust between colleagues	196	1.9949	.83203
Poor organizational communication	196	1.9541	.83693
Departmental differences	196	3.7500	1.02969
Hierarchical differences	196	1.7857	.88579
Lack of dedicated knowledge sharing rooms	196	2.4082	1.11251

Rewarding system	196	2.4439	1.22450
Differences regarding experience	196	1.6888	.83517
Valid N (listwise)	196		

Source: Own processing

Given the high number of items found on this dimension, to facilitate the analysis of the presence of these barriers, the results of the table above will be presented in graphical form. Thus, the figure below presents in graphical form the main barriers generated by organizational factors together with the specific mean of each item resulting from descriptive statistics that may hinder the knowledge flows within IT organizations operating in Iasi.

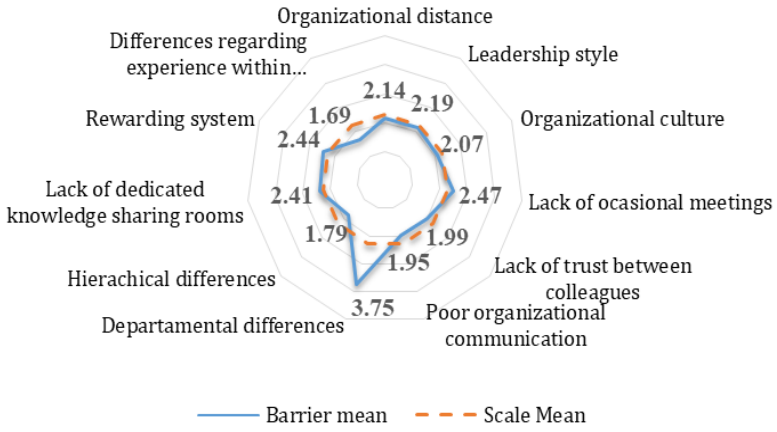

Figure 1. Organizational factors hindering knowledge flows
(Own processing)

Regarding the first dimension analyzed, 'Organizational barriers', 11 of the 30 items remained after factor analysis were significantly correlated with this dimension: *organizational distance, leadership style, organizational culture, lack of occasional meetings, lack of trust between colleagues, poor organizational communication, departmental differences, hierarchical differences, lack of dedicated knowledge sharing rooms, rewarding system and differences regarding experience within the organization.* Given the results shown above (table 4; figure 1) it seems that for IT companies operating in Iasi, the most important organizational barrier which can hinder the knowledge flows are the departmental differences (M=3.75, SD=1.029). Therefore, within these organizations, knowledge flows are affected by the reluctance of the members of a specific department regarding knowledge coming from another team or department, considering relevant only the knowledge which is created within their department or team. Also, other factors such as the lack of occasional meetings or knowledge-sharing spaces, as well as the reward system used by the organization, can act as barriers to knowledge flows within the IT companies operating in Iasi, therefore being necessary to analyze how these barriers can be eliminated by the managers.

Individual barriers-knowledge source

Based on the analysis of the results, the average value of the group of barriers generated by individual factors (source) on the analysis scale is 2.07. The table below shows the results of the descriptive analysis of the main barriers generated by individual factors as a source of knowledge which can hinder the knowledge flows within IT organizations operating in Iasi.

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Table 5. Individual barriers-knowledge source descriptive statistics

Barriers	N	Mean	Std. Deviation
'Knowledge is power'	196	1.5969	.93687
Fear of losing privileges	196	1.5816	.90495
Lack of time	196	3.9847	1.09768
Uncertainty	196	1.9541	1.18232
Individualism	196	2.0918	1.17309
High effort	196	1.3980	.67543
Fear of exploitation	196	1.8878	1.22271
Valid N (listwise)	196		

Source: Own processing

In terms of the Individual *barriers-knowledge source* dimension, following the factor analysis, seven items were extracted and correlated to this dimension: *'knowledge is power'*, *fear of losing privileges*, *lack of time*, *uncertainty, individualism*, *high effort,* and *fear of exploitation.* Following the descriptive analysis, the main individual factors as a source of knowledge-creating barriers that can hinder knowledge flows within IT companies operating in Iasi were being compared to the statistical mean of their specific dimension. Thus, the figure below presents in graphical form the main barriers generated by organizational factors together with the specific mean of each item resulting from descriptive statistics.

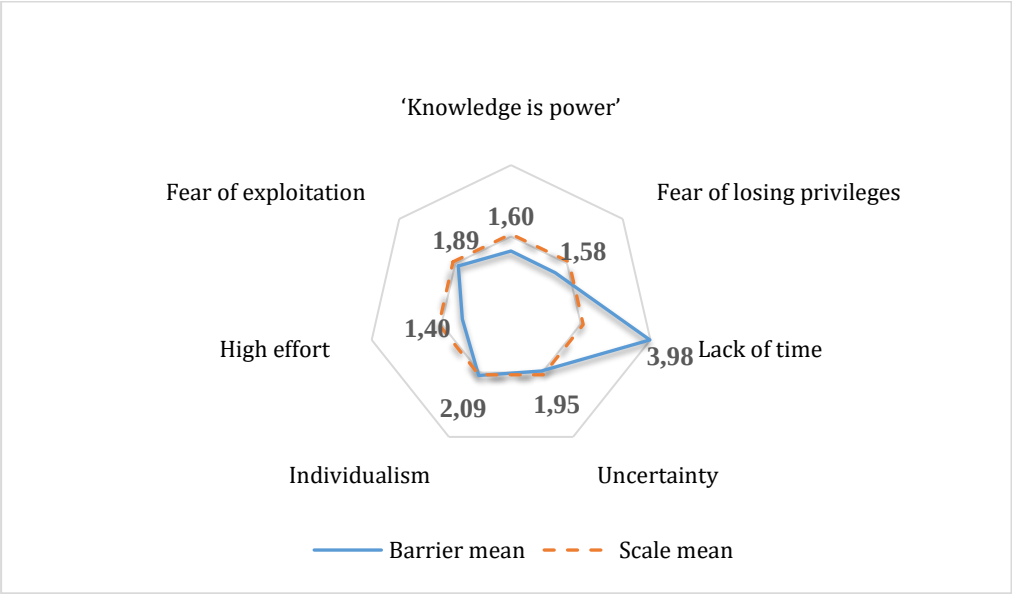

Figure 2. Individual source factors hindering knowledge flows
(Own processing)

As shown by the results above (table 5; figure 2), it seems that for IT companies operating in Iasi, the most important barrier generated by the individual factors as a source of knowledge that can hinder the knowledge flows is the lack of time (M=3.98, SD=1.097). Thus, within these companies, even if at the source of knowledge, there are no psychological factors to affect the transfer of knowledge, lack of time being the most important element which hinders knowledge flows.

Individual barriers-knowledge recipient

Given the analysis of the results, the average value of the group of barriers generated by individual factors (recipient) on the analysis scale is 2.53. In the table below are summarized the results of the descriptive analysis of the main barriers generated by

individual factors as a recipient of knowledge which can hinder the knowledge flows within IT organizations operating in Iasi.

Table 6. Individual barriers-knowledge recipient descriptive statistics

Barriers	N	Mean	Std. Deviation
Lack of trust in the knowledge source	196	1.7500	1.09252
Absorptive capacity	196	2.2653	1.24490
'Not Invented Here' syndrome	196	4.1514	1.09287
Retentive capacity	196	1.9337	1.01814
Valid N (listwise)	196		

Source: Own processing

Regarding this dimension, following factor analysis, four items were extracted on this dimension: *lack of trust in knowledge source*, *lack of absorptive capacity, 'not invented here' syndrome,* and *lack of retentive capacity.* The results of the descriptive analysis of the four factors specific to this dimension are showing that only 'Not Invented Here' syndrome acts as a barrier (M=4.15, SD=1.092) to knowledge flows, with employees refusing knowledge coming from other departments or working teams. Given the results, it seems that for IT companies operating in Iasi (Romania) the biggest issue in transferring knowledge is that the employees consider that to be able to engage in knowledge exchanges within their organizations, this knowledge should be created in the department or team they belong to.

Knowledge related barriers

Based on the analysis of the results, the average value of the group of barriers generated by knowledge characteristics on the analysis scale is 3.37. The table below shows the results of the descriptive analysis of the main barriers generated by knowledge characteristics that can hinder the knowledge flows within IT organizations operating in Iasi.

Table 7. Knowledge related barriers descriptive statistics

Barriers	N	Mean	Std. Deviation
Knowledge validation	196	2.4592	1.22929
Perceived utility	196	3.7602	.99158
Causal ambiguity	196	3.9031	1.11668
Valid N (listwise)	196		

Source: Own processing

In terms of the *'Knowledge related barriers'* dimension, three factors were extracted to this dimension: *knowledge validation*, *perceived utility,* and *causal ambiguity.* The results shown in the table above, reveals the fact that within IT organizations operating in Iasi, the involvement in knowledge transfer is taken into consideration only if the participants perceive that knowledge sharing process being useful for them. Therefore, the perceived utility (M=3.76, SD=.991) is acting as a barrier to knowledge flows within analyzed organizations. Besides, employees consider that it's necessary to understand what a knowledge exchange involves and the purposes and means in which knowledge must be used in such a way as to be able to engage in a knowledge transfer. Therefore, causal ambiguity (M=3.90, SD=1.116) may act as a hindering barrier to knowledge flows. On the other hand, the lack of knowledge validation (M=2.45, SD=1.229) does not affect knowledge flows. Most likely, this may be due to the specific nature of the organizations in which the study was conducted, with employees gaining new knowledge of the specific nature of the activity at all times.

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Technological barriers

Based on the analysis of the results, the average value of the group of barriers generated by organizational factors on the analysis scale is 2.17. The table below shows the results of the descriptive analysis of the main barriers generated by technological factors that can hinder the knowledge flows within IT organizations operating in Iasi.

Table 8. Technological barriers descriptive statistics

Barriers	N	Mean	Std. Deviation
Lack of technical support	196	1.9010	.53301
The individual reluctance in using IT systems	196	1.6480	.72575
Lack of IT systems	196	1.6020	.74061
Lack of integration of IT processes and systems	196	3.8418	.91174
Individual's lack of technological skills	196	1.8367	.69716
Valid N (listwise)	196		

Source: *Own processing*

Following the descriptive analysis, the technological factors creating barriers that can hinder knowledge flows within were being compared to the statistical mean of their specific dimension. Thus, the figure below presents in graphical form the main barriers generated by technological factors together with the specific mean of each item resulting from descriptive statistics.

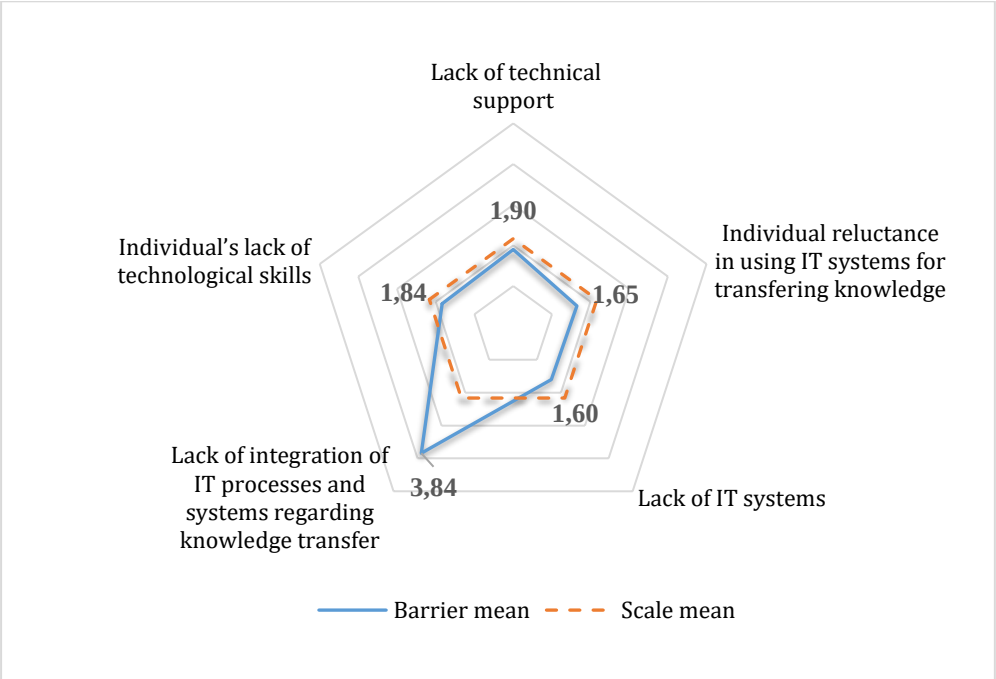

Figure 3. Technological factors hindering knowledge flows
(Own processing)

Regarding the '*Technological barriers*' dimension, five of the 30 items remained after factor analysis were significantly correlated with this dimension: *lack of technical support, individual reluctance in using IT systems for transferring knowledge, lack of IT systems, lack of integration of IT processes and systems regarding knowledge transfer* and *individual's lack of technological skills.* Given the results shown above (table 8; figure 3) it seems that for IT companies operating in Iasi, the most important technological barrier which can hinder the knowledge flows is generated by the factor called '*lack of integration of IT processes and systems regarding knowledge transfer'* (M=3.8418, SD=.91174). Employees of IT companies operating in Iasi (Romania) consider that the informational system from their organizations, even if available, are having limited functions regarding the

facilitation of knowledge transfer. Based on the results, within IT companies operating in Iasi, employees cannot use the available informational system to transfer knowledge, this factor, thus, acting as a barrier to knowledge flows.

Hypotheses Testing

The first hypothesis of this study aims to analyze the statistical links between motivational factors which can inhibit knowledge flows ('not invented here' syndrome and 'knowledge is power') and the group of individual factors acting as barriers to knowledge flow. To do so, firstly, the statistical mean of individual factors has been calculated to analyze the level of correlation between the proposed variables. The next step was to use the results obtained in a bivariate Pearson correlation method using SPSS. The results of the correlation between the variables of hypothesis H1 indicate a Pearson correlation coefficient value of .488** showing a positive but weak correlation between motivational factors and individual barriers. Furthermore, the positive correlation indicates the fact that when a variable increases the other variable increases. Thus, within IT organizations operating in Iasi, when the employee's lack of motivation in engaging in knowledge transfer increases, the more the knowledge flows are going to be affected by the individual. The value of the probability coefficient has a value of less than 0.05 (p= 0.000), in this way, showing the statistical link between the two correlated variables. Also, the correlation level of the two variables is significant at the 0.01 level (2-tailed). Given that, we can say with a 99% confidence level that there are significant statistical links and a positive but weak correlation between individual barriers and motivational factors, and the hypothesis H1 is confirmed.

Two secondary hypotheses were established to analyze the effect of each motivational factor on individual barriers which can affect knowledge flows within IT organizations in Iasi. Therefore, the following hypothesis was established: H1.1 *There is a positive correlation between the 'Not Invented Here' syndrome and individual barriers*, and H1.2: *There is a positive correlation between the 'Knowledge is power' statement and individual barriers.* The results of the correlations of the variables involved in the analysis of the secondary hypotheses are showing the significance value lower than the 0.05 threshold (p=.000), therefore being shown the fact that there is a significant statistical link between 'Not invented here' syndrome and individual barriers which hinder knowledge flows. However, the Pearson coefficient value (r=.332**) is showing a positive but weak correlation between the two variables. The *p-value* (0.01; 2-tailed) displays with a confidence level of 99% that there is a positive but weak correlation between the analyzed variables; therefore, the secondary hypothesis H1.1 being confirmed. Given the positive correlation between the two variables, is displayed the fact that when the intensity of the barriers generated by the 'Not invented Here' syndrome is raising the intensity of individual barriers is raising as well within IT organizations operating in Iasi. Secondary hypothesis H1.2 was confirmed as well. The significance value is lower than the 0.05 threshold (p=.000), indicates the fact that there is a significant link between the analyzed variables. The Pearson coefficient value (r=.493**) displays a positive, moderate statistical link between 'Knowledge is Power' and individual barriers. The *p-value* is below the 0.05 threshold value, which indicates with a 99% confidence level that there are significant statistical links between the analyzed variables, the secondary hypothesis H1.2 being confirmed.

Hypothesis H2 analyses the statistical link between organizational factors acting as barriers to knowledge flows and the hierarchical, departmental, and experience within organizational differences among employees of IT companies found in Iasi. A similar methodology used in the first hypothesis was used to test this hypothesis. Thus, to analyze the correlation between the variables used in the hypothesis, a statistical mean of organizational barriers was correlated with the means of the other three variables using the Pearson correlation coefficient in SPSS.

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The results of the correlation between the variables of hypothesis H2 are indicating a Pearson correlation coefficient value of .740** showing a strong positive correlation between organizational factors and employee differences acting as barriers to knowledge flows. Furthermore, the positive correlation indicates the fact that when a variable increases the other variable increases as well. Thus, the greater the differences regarding experience, the department employees belong to, or hierarchical differences, the more organizational factors are going to inhibit knowledge flows within IT companies operating in Iasi.

The value of the probability coefficient has a value of less than 0.05 (p= 0.000), in this way, showing the statistical link between the analyzed variables. Also, the correlation level of the two variables is significant at the 0.01 level (2-tailed). Given that, we can say with a 99% confidence level that there are significant statistical links and a strong positive correlation regarding employees' differences and organizational factors; thus, the hypothesis H2 is confirmed.

A similar methodology for analyzing the correlations between variables was used to test the secondary hypotheses. Thus, the statistical mean of the items analyzing the dimension '*organizational barriers*' was established as the dependant variable, excluding from the calculation of the means of the variables *'differences regarding experience', 'departmental differences'* and *'hierarchical differences'*, these three factors being involved in the correlation as independent variables. Given the results, it seems that within IT organizations operating in Iasi there is a significant statistical link between employees' differences regarding their experience in the company and the organizational factors acting as barriers to knowledge flows, the significance value is lower than the 0.05 threshold (p=.000). The p-value (0.01; 2-tailed) displays with a confidence level of 99% that there is a positive but weak correlation between the analyzed variables. Furthermore, the Pearson coefficient value (r=.618**) is showing a moderate positive correlation between the employees' differences regarding experience in the company and organizational barriers; thus, hypothesis H2.1 being confirmed. Due to the positive correlation between the analyzed variables, it revealed that the greater the differences regarding the experience of employees within the organization are, the more affected knowledge flows would be by organizational factors.

Hypothesis H2.2 has been confirmed as well. The results of the correlations between hierarchical differences and organizational factors are showing a significant link between these two variables (p=0.000). Regarding this hypothesis, the Pearson coefficient value (r=.710**) is showing a strong positive correlation between the two variables. Besides, the p-value (0.01; 2-tailed) displays with a confidence level of 99% that there is a positive but weak correlation between the analyzed variables. Thus, the greater the hierarchical differences of employees within IT organizations operating Iasi, the greater the impact of organizational barriers on knowledge flows.

Regarding hypothesis H2.3, given the significant value lower than the 0.05 threshold (p=.000), it is shown the fact that there is a significant statistical link between the analyzed variable. Furthermore, the Pearson coefficient value (r=.724**) is showing a strong positive correlation between the two variables. The p-value (0.01; 2-tailed) displays with a confidence level of 99% that there is a strong positive correlation between the analyzed variables; therefore, the secondary hypothesis H2.3 being confirmed. The positive value of the correlation coefficient indicates an increase of a variable when the other variable increases as well. Therefore, given the positive correlation between the variables, it seems that the greater the differences between the members of the organization that do not belong to the same departments, the more the organizational factors are hindering knowledge flows within IT companies operating in Iasi.

Furthermore, H3 hypothesized that there are statistical links between the barriers generated by the human factor regarding the *reluctance of individuals* to use technology for knowledge transfer and the existence of *technological barriers* within IT companies

operating in Iasi. The correlation results are showing that there are significant statistical links between the analyzed variables, the significance value being lower than the 0.05 threshold (p=.000). A strong, positive correlation between technological factors acting as barriers to knowledge flow and an individual's reluctance in using IT systems for transferring knowledge is indicated by the Pearson correlation coefficient (r=.712**). The p-value (0.01; 2-tailed) displays with a confidence level of 99% that there is a strong positive correlation between the analyzed variables, therefore the hypothesis H3. The positive value of r is showing an increase in a variable when the other variable is increasing as well. Therefore, the greater the reluctance of employees to use technology to transfer knowledge, the more knowledge flow is hindered by technological barriers. Thus, hypothesis H3 is validated.

A series of multiple linear regressions have been made following the correlations between the study hypotheses variables, to analyze the influence of the independent variables on the dependent variable regarding each hypothesis and to explore the effect of independent variables in the variance of the dependent variable within each hypothesis. Regarding the first study hypothesis H1, the dependent variable was considered the group of individual barriers, and the independent variable used in the regression were the two motivational factors affecting knowledge flows: 'Not invented here' syndrome and 'Knowledge is power'. The table below summarizes the results of linear regression regarding the analyzed variables of hypothesis H1.

Table 9. Linear regression on variables of hypothesis H1

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	2.587	.139		18.655	.000
	'Not invented Here'	.054	.017	.332	3.116	.002
	'Knowledge is Power'	.168	.025	.493	6.725	.000

a. Dependent Variable: Individual barriers

Source: Own processing

Analysis of the results of correlation shows that both independent variables used in hypothesis H1 are influencing the dependent variable 'Individual barriers'. In this regard, the *p-value* associated with the correlation coefficient is having values less than the significance threshold of 0.05 on both independent variable (0.002- *'Not invented Here'* syndrome;0.000- *'Knowledge is Power'*), thus, showing the fact that there is a significant statistical link between the analyzed variables. The *p-value* is lower than the assumed risk threshold of 5%; thus, the results of the variance (ANOVA) are showing that the model chosen for analyzing hypothesis H1 is statistically relevant. In this regression model, the statistical model used explains the variance of 27.2% (Adjusted R^2=.272) of independent variables on individual barriers. Therefore, both R^2 and R^2 adjusted are having lower values than the threshold of 0.04, which indicates a weak to medium proportions of the variation of the individual barriers given by the motivational factors. Thus, based on the results of the variance is shown the fact that only 27.2% of individual barriers are explained by 'Not invented Here' and 'Knowledge is Power' variables, within IT companies operating in Iasi (Romania).

Regarding the variables of hypothesis H2, the same multiple linear regression method had been used to analyze the influence of the independent variables on the dependent variable regarding this hypothesis and to explore the effect of independent variables in the variance of the dependent variable within the hypothesis H2. Therefore, the dependent variable was considered the group of organizational factors, and the independent variables used in the regression were the three factors analyzing the differences between employees: *differences regarding experience within the organization*, *hierarchical*

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differences, and *departmental differences.* The table below summarizes the results of linear regression regarding the analyzed variables of hypothesis H2.

Table 10. Linear regression on variables of hypothesis H2

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.013	.074		13.608	.000
	Differences regarding experience	.128	.046	.618	2.778	.001
	Hierarchical differences	.324	.042	.710	7.719	.000
	Departmental differences	.122	.031	.724	3.909	.000

a. Dependent Variable: Organizational barriers

Source: Own processing

Analysis of the regression shows that the values of the *p* coefficient are lower than the statistical threshold of 0.05, indicating that all of the three independent variables are influencing the dependent variable (0.001- *differences regarding experience;* 0.000- *hierarchical differences;* 0.000- *departmental differences)*, showing, thus, a significant statistical link between analyzed variables. The *p-value* is lower than the assumed risk threshold of 5%; thus, the results of the variance (ANOVA) are showing that the model chosen for analyzing hypothesis H2 is statistically relevant. Also, the statistical model used explains a 56.9% variance (Adjusted R^2=.569) of the independent variable on the dependent variable '*organizational barriers'*. Therefore, both R^2 and adjusted R^2 are having higher values than the threshold of 0.04, which indicates medium proportions of the variation of the organizational barriers given by the differences between employees. Thus, based on the results of the variance is shown the fact that 56.9% of organizational barriers are explained by '*Differences regarding experience within the organization', 'Hierarchical differences*', and '*Departmental differences'* variables, within IT companies operating in Iasi (Romania).

In terms of the regression analysis of the variables of hypothesis H3, the analysis of the influence of the independent variable on the dependent one was made using linear regression. Table 11 shows the results of the linear regression on hypothesis H3 variables.

Table 11. Linear regression on variables of hypothesis H3

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.160	.075		15.458	.000
	Individual's reluctance	.450	.042	.712	10.781	.000

a. Dependent Variable: Technological barriers

Source: Own processing

The regression results are showing that the independent variable (*Individual's reluctance in using IT systems)* influences the dependent variable (*Technological barriers*). Given this, the *p-value* (0.000) indicates that there are significant statistical links between analyzed variables. Besides, the *p-value* is lower than the assumed risk threshold of 5%; thus, the results of the variance (ANOVA) are showing that the model chosen for analyzing hypothesis H3 is statistically relevant. Therefore, both R^2 and adjusted R^2 are having

lower values than the threshold of 0.04 which indicates a weak to medium proportions of the variation of the technological barriers given by the individual's reluctance in using IT systems for knowledge transfer. Thus, based on the results of the variance is shown the fact that only 37.1% (Adjusted R^2=.371) of technological barriers are explained by an individual's reluctance in using IT systems for knowledge transfer, within IT companies operating in Iasi (Romania).

Conclusions

In the current socio-economic environment where the economy is based on knowledge, sets of knowledge are at the heart of the competitive advantages of organizations which is the pillar of organizational success. For success to appear in the organization, knowledge flows must go through their natural course. In this respect, the managers must be aware of these barriers, and of the impact that they have on knowledge flows, and, ultimately, solutions must be found to overcome them.

This study includes an analysis of literature inputs on the existence of different factors of a different nature that can act as barriers to organizational knowledge flows as a quantitative one in which the survey-based method was used. The purpose of the questionnaire is to outline the mechanisms for the emergence of different types of barriers that are found in the way of knowledge flows in the organizational environment of IT companies in Iasi.

In the first part of the study of the quantitative results obtained were analyzed by descriptive statistics to outline the perception of respondents about the existence of various factors inhibiting knowledge flows within IT organizations operating Iasi. Also, factor analysis was done to analyze how factors taken from the literature are converting to a certain dimension. Following the factor analysis, nine of the original 39 items were removed, in breach of the minimum threshold of 0.5 required by the literature. The results of the analysis of the main components (PCA) have outlined five dimensions grouping together specific to the different categories of barriers to knowledge flows within the IT organizational framework of companies operating in Iasi. The results of the descriptive analysis show that the differences between members of different teams or departments make their presence as a barrier to knowledge flows within IT organizations. Also, the *lack of time* factor acts as a barrier to knowledge flows within the analyzed organizations. Based on the results, from the four factors analyzing individual barriers at the source level, only the *NIH syndrome* (not invented here) impedes knowledge flows within IT organizations. This can be related to the factor called *'departmental differences'* at the organizational level; the NIH syndrome outlining the individual reluctance in accepting knowledge from other groups of colleagues. The results of the descriptive analysis of the *knowledge related barriers* component, only the *causal ambiguity* and *perceived utility* of knowledge can create barriers to knowledge flows across IT organizations operating in Iasi. *Knowledge validity* is considered not to be a factor that could hamper knowledge flows. At the same time, out of the total of five technological factors which, theoretically, can create barriers to knowledge flows, only *lack of integration of IT processes and systems regarding knowledge transfer* is considered to be an element that can hamper knowledge flows by employees of IT companies in Iasi.

In the second part of the analysis of quantitative results, the Bivariate Pearson coefficient correlation method was used to test the proposed research hypotheses. Summarizing the results obtained from the Pearson coefficient values all the proposed research hypotheses have been validated. Based on the validated study hypotheses, it seems that within IT organizations, the greater the tendency of individuals to refuse to receive or transfer knowledge, the more organizational barriers are inhibiting knowledge flows, as assumed in hypothesis H1. Regarding hypothesis H2, following its testing and validation, it is outlined the fact that within IT organizations operating in Iasi, the more the differences between the members of the organization in terms of membership of a particular group

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increase, the greater is the impact of organizational factors on knowledge flows. Besides, the results of the hypothesis H3 shows that while the reluctance of individuals to use technology for knowledge exchange increases, the more technological barriers are hindering knowledge flows.

The results obtained in this study show that factors acting as barriers to knowledge flows found in the literature cannot be generalized across all organizations. Thus, the way these factors are affecting knowledge flows varies from one organization to another depending on the specific or industry of which they are part. Even if at the literature level all the factors analyzed are presented as the main barriers to knowledge flows, testing their impact on an organization in a particular sector shows that they can or cannot become elements inhibiting knowledge flows. This study may come into helping the managers of various IT organizations to understand the elements underlying the reasons why the information is not transmitted or accepted by employees in the companies so that they can address specific techniques of information transmission according to the characteristics of each individual in the organization. In this way, the results of this research can bring several benefits to IT, company managers, by understanding these mechanisms which are the basis for barriers to knowledge flows, based on them, understanding how they can overcome these factors and the organization can achieve its desired goals.

Nevertheless, this study also has several limitations; the lack of previous studies on the topic of knowledge flows in the same field of analysis is a limit to the study, the research instrument, being structured without a basis for its development in the literature. Also, the sample used in the research cannot be considered to be representative at the level of the population of IT employees within Iasi. Therefore, the lack of 2020 official statistics on the number of employees in this industry in the city of Iasi makes it impossible to extract a representative sample. The analysis of the factors hindering knowledge flows was carried out within IT organizations in a given geographical area. Thus, cultural differences that can bring different perceptions from different regions are another limit of the study. However, given that organizational environments are similar in IT organizations, similar results are likely to be achieved.

The results of this study can be taken into account in the further in-depth analysis of the elements specific to categories of factors that may create barriers to knowledge flows, based on which new ways of overcoming them can be outlined. It is also possible, based on the results of this study, to analyze barriers to departmental flows within the same sector of activity and to analyze the differences regarding the results at the organizational and departmental levels. Further studies can also be carried out based on the barriers identified in this study to outline possible obstacles to the inter-organizational level in the same sector of activity.

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