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Organizational Culture as a Prerequisite for Knowledge Transfer among IT Professionals: The Case of Energy Companies

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Abstract: The energy sector is the epitome of Industry 4.0; therefore, it should be developed in line with the Industry 4.0 implementation framework and be managed according to the guidelines dedicated to knowledge-based enterprises. Under this model of evolution, the layers surrounding the technological aspects are first, knowledge management (in particular, its transfer), and then people, and culture. This study addresses two of the three identified levels by attempting to verify the organizational culture that supports professional knowledge transfer as the leading factor in effective specialist knowledge exchange in the energy sector. Recently, this sector has become highly dependent on IT solutions as the main factor for its development and security. A key role in this respect is played by IT professionals, whose attitudes and employee behavior are critical to the stability, efficiency, effectiveness, and security of IT systems in the energy companies. The purpose of this paper is to propose a theoretical construct, based on indicated norms and values as organizational culture foundation and cultural practices. This article also aims to analyze and diagnose the components that support the professional knowledge transfer in different groups of organizational stakeholders. Systematic analysis of the scientific literature, expert evaluation, and structured questionnaires were used to develop and verify the hypotheses. The research results supported the hypotheses that organizational culture tailored to the knowledge workers' needs and expectations, influence the effective and efficient circulation of IT expert knowledge.

Keywords: organizational culture; knowledge transfer; 4.0 Industry; IT professionals; energy sector



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1. Introduction

Already in early 1960s, in presenting his visions of the future, P. Drucker indicated that the 21st century would belong to a completely new, emerging class of workers: professionals of the new millennium who would take over their organizations. They themselves, as well as their productivity, would become the main areas of management activity [1]. While these predictions were treated as metaphorical images of a futurologist at the time, they came true and were confirmed surprisingly quickly in the 1990s. Knowledge orientation as a key and strategically valuable resource of the present day [2–8], commenced to dominate and formulate as a knowledge-based development strategy [9]. Knowledge has not only become an important factor input, but also a major source of employment and wealth creation [10], and turned out to be a conduit to entrepreneurs as a vehicle for adopting incoming knowledge spillovers [8]. Focusing on the individuals who are owners, carriers, and holders of knowledge has become a manifestation and one of the

foundations of such a policy, i.e., the knowledge-based development agenda. In the case of organizations, these were the employees to whom P. Drucker referred as knowledge workers. This newly-formed class of the labor force, described in synonymous terms as “gold collars” [11], “cognitarians” [12], or “intellectual workers” [13], began to dynamically replace and displace mass workers [14], and is becoming an increasingly important and larger group of employees [15–19]. Ultimately, in most developed economies, the occupational structure has changed substantially over at least 30 years [20]. As a consequence, currently in knowledge-based economies, knowledge workers account for a quarter to half of all employees [21].

These individuals have become the most precious capital [22,23] and core personnel of modern organizations [24–27], as they are vehicles of the today’s most valuable intangible resource—professional knowledge. Thus, for the first time ever, they own and control both the means and tools of production [28,29], and enterprises; in fact, they constitute the sum and the result of their knowledge. Being fully aware of their role in gaining and maintaining a competitive advantage of the companies with which they are associated, they are more demanding as stakeholders [30], and behave inversely compared to general personnel [31,32]. This makes the clear and transparent management of such employees challenging and complicated. Therefore, they should be managed according to a tailored formula [28,33].

As knowledge workers are essential drivers of economic growth, regional innovation, and knowledge circulation [34], their performance is vital to gaining competitive advantage. Encouraged to open participation in the exchange of knowledge, they are a catalyst for the emergence of an inequality-free Society 5.0. Without their full support, it is also difficult and even impossible to expand business knowledge and make an enterprise a knowledge-based organization. These qualities have increased focus on attracting and retaining knowledge workers as a source of competitive advantage [29]. Moreover, as part of the knowledge protection strategy, the management is taking measures to capture and collect professional knowledge, converting it into the company’s structural capital, and securing against its loss when key knowledge workers leave the company [35,36]. This is especially so since it has been noticed that most intellectual workers consider their precious knowledge too valuable for uncontrolled and unhampered exchange [37], and treat it as a base of power [32], restrain and deliberately conceal its flow [38], or at least hoard or withhold it [39]. As a consequence, the process of transfer of specialists’ knowledge has become crucial.

In this context, it has been determined that only when committed, will knowledge workers voluntarily pass their expertise to others. Therefore, a relationship between the organization and these employees should be created on mutual commitment [27,40–42], mutual care, interdependence, reciprocity, and fairness [43]. The context for developing interdependencies based on the identified properties is the organizational culture. As a specific attribute of a particular company, it can be a reference point for the analysis of cognitarian actions and attitudes [44], and an instrument to control their organizational behaviors, especially those related to active participation in the knowledge transfer process. Proper organizational culture is a prerequisite for the satisfaction of professionals [45], which precipitates their loyalty and commitment to the company and is a strong motivation to contribute their knowledge to the organization [46,47]. Liberation of such attitudes in cognitarians results in high job satisfaction [48], openness to knowledge sharing [46,49], and an increase in innovation at the company level [50]. Therefore, organizational culture is a precondition for the effectiveness of knowledge management in a contemporary company [51–54], and significantly contributes to the increase in knowledge exchange and intensification of all subprocesses of its transfer [55,56].

Considering this background, this article aims to identify the basic assumptions as well as the norms and values that form organizational cultures preferred by IT knowledge workers and thus create optimal conditions for stimulating the active participation of gold collars in the knowledge transfer in various groups of stakeholders in the energy sector. The aim is also to indicate the directions of improvement of organizational cultures to such

an extent that they would constitute an optimal context for the exchange of professional knowledge. Therefore, an in-depth analysis and assessment of the principles, norms, and values constituting the organizational cultures of contemporary energy sector enterprises in Poland was made, to identify the extent to which they coincide with the preferences of IT gold collars. The inference was made across generations of intellectual workers, groups of cognitarians participating in the knowledge exchange, and across knowledge transfer sub-processes.

The considerations are in line with the pursuit of Industry 4.0., of which an immanent component is the energy sector. In the three layers of the concept, the core area is culture and people (in this case, professionals and norms, values, and principles of their organizations' cultures), and the other is knowledge management. These are the two layers on the technology that define Industry 4.0. Under the Industry 4.0 implementation framework, the elements were indicated in the general areas of change, while knowledge exchange and absorption were indicated as activities necessary for transformation into a smart enterprise [57]. Hence, the implemented context of analyses was the energy sector—precisely IT cognitarians of energy companies in Poland.

The study contributes three-dimensionally to research on the challenges of managing energy enterprises within the Industry 4.0. conditions. It fills the cognitive, practical, and managerial gap in this regard. In the cognitive dimension, it contributes to the compilation of literature on managing knowledge workers by developing a research area of organizational culture appropriate to IT gold collars. For this purpose, a critical analysis of the subject literature, face-to-face interviews, and Online Focus Group Interview were used. From a practical and managerial perspective, it provides empirical work on components of an optimal organizational culture conducive to the transfer of professional knowledge. Moreover, it provides specific development guidelines towards designing the organizational culture preferred by the energy sector's stakeholders. Thus, it delivers specific, utilitarian managerial tools. Since IT professionals are harbingers of change, they represent, to the greatest extent, the profile of employees of the future and the key element of Industry 4.0 structures, of which the inseparable component is the energy sector.

The organization of this paper is as follows. Section 2 is the synthesis of the subject literature, dedicated to the knowledge worker phenomenon, organizational culture role in management of contemporary organizations and its stakeholders, and knowledge transfer process specificity. The result of this section is the formulation of hypotheses, described together with the research procedure in Section 3. In Section 4 the results and their analysis are presented. Ultimately, Section 5 is devoted to the results discussion, conclusions, as well as to pinpointing the limitations of research and further research direction.

2. Literature Review

2.1. *Knowledge Workers as Gold Collars of Modern Organizations*

The redefinition of work in the new millennium was already signaled in the 1950s by F. Machlup. He initiated the interest in knowledge-based work, hailing it a characteristic feature of the coming times [58]. More and more often and more intensively, significant features of the emerging canon of work, i.e., knowledge-based work, were emphasized. It was noted that such work is becoming increasingly popular and it concerns many areas of the economy [59]. Its specificity lies in its comprehensive and mainly cognitive character [21].

In fact, in knowledge-based work, as strictly intellectual and cognitive work, knowledge is utilized and created [60]. It is not easily observable or measurable [61] and it has two main components: the accumulative, consisting of building new knowledge; and distributional, which boils down to making the available stock of knowledge accessible to those who need it [62]. The inherent construct of knowledge-based work, whose carriers are symbols and people [63], is the transfer of knowledge. It is the result of high task variety and complex or unanalyzable conversion processes [64], and it is unpredictable, multidisciplinary, nonrepetitive, nonroutine [65] expert work. Therefore, the essence of knowledge-based work is the generation, transfer, and implementation of knowledge by

highly skilled and autonomous workers, who are using tools and theoretical concepts to produce complex results, both intangible and tangible [66]. These employees are referred to as knowledge workers, as first described in the publications of P. Drucker. Currently, they operate under many other names, e.g., professionals or specialists [67], cognitarians [12], intellectuals [13], or more metaphorically—as free workers [68], troubadours of knowledge [69], digital nomads [70], or deep smarts [71].

Due to the peculiarities of knowledge-based work, employees who perform it constitute a special group and are an example of changes in the work formula, especially in the social aspect [72]. Therefore, the term “knowledge worker” is more a theoretical construct referring not to the specific position of certain cognitarians in the organizational structure, but describing their key role in their organization. The foundation of their position is undeniably the value they generate for the organization based on the rare, specific, and valuable knowledge they possess. Hence, they can perform various functions and occupy multiple positions in their organizations. They can work as managers, representatives of traditional professions (e.g., doctors, lawyers, scientists, architects, or engineers) or associate professionals (e.g., programmers, IT analysts, designers, or financial consultants) [58,73–75]. Usually, they are classified into two categories: knowledge workers (traditional professions) and data workers (managers and associate professionals) [14]; although, these membership boundaries are fluid and depend on the specific scope of work of each specialist. Importantly, they are those who perform tasks that require expert thinking and complex communication skills with the support of advanced technologies [75]. The mental models they use and the skills they possess come from advanced (usually higher and specialized) education, continuous on-the-job learning, and experience. Therefore, formal education is usually a barrier to entering such a group of intellectuals [63,76].

In this context, the following orientations classifying employees as gold collars available in the literature can be helpful in identifying knowledge workers [33,77]:

- The position, by which every employee operating in sectors, enterprises or structures, or departments or knowledge-intensive tasks, is a cognitarian (the technical-factual orientation, also called a data- (industry-) driven approach).
- The orientation of taking into account the content of the work (i.e., performing knowledge-based work) as the main indicator of belonging to the group of intellectual workers (the functional approach referred to as the job content approach).
- The trend of treating employees with a key position as cognitarians based on the specificity of their knowledge-based work (the attribute-based, or conceptual approach).

Consequently, knowledge workers are defined as autonomous individuals who contribute their expert knowledge to generate added value for the organization, which is the product of their knowledge [32,41]. They are held accountable principally for the results of their knowledge-based work (which can take a variety of forms), rather than for the work itself. They are employees whose key role for the enterprise is determined by the above-average and exceptional efficiency and effectiveness in searching for, and creating, innovative solutions using their own intellect, experience, contact network, and their available and well-mastered technical tools [18]. Their task is to create, share, disseminate, and reuse tacit and explicit knowledge in ordinary work and to deal with complex issues [78,79].

Professionals of the new era are therefore characterized by comprehensive specialist competences related to their abilities to deal with the abstract, systems thinking, experimentation and cooperation, having above-average creativity, a pro-innovative attitude, self-determination, inner control, independence, and mobility. They are characterized by highly developed interpersonal competences manifested in justified, high self-awareness, and high self-esteem, as well as the effort to maintain wide, close, personal relationships with other cognitarians, and thus an extensive network of professional contacts [14,18,30,80,81]. Belonging to closed cohorts of communities of practitioners or experts, which is a prerequisite for their professional position, is a priority for them [41,82].

Due to the character of their work, position in the organization and skills, intellectuals are a category of employees with exceptional and sophisticated needs concerning their

work, as well as the companies that employ them and the managers who manage them. These are: the need for self-development, the need for job autonomy, the need for work achievement, and the need for fairness and justice [31].

The following amenities could contribute to meeting these expectations: knowledge management processes implemented in organizations [26], an optimal knowledge environment (both technical and social, enabling the celebration of contacts in communities of practice and communities of expertise) creating the intellectual employee's comfort zone [14,30,41,83–86], a properly designed psychological contract [86–88], organizational support [43], and adequate organizational culture [45].

Hence, the outlooks of golden collars on organizations can be classified into the following categories: working conditions, organizational culture, and management of people [89].

2.2. *The Role of Organizational Culture in Affecting Specialists' Behavior*

The current definition of organizational culture treats this attribute as one of main aspects of the organizational behavior, useful for understanding how organizations work and how well a worker fits into a particular organization [45]. The definition treats organizational culture as a shared set of values, norms, assumptions, and beliefs characteristic of members of a given organization, which affects their attitudes, way of thinking, mental models, decisions, and actions [53,90,91]. Therefore, the core of a specific organizational culture are symbols, ideas, myths, and rituals shared by its participants, which determine the ways of perceiving, understanding, and interpreting organizational life [50,92]. Thus, organizational culture includes a set of generally applicable and deeply rooted norms and values, which emerge over a long period of time. They define the way employees' function, and thus the organization of which they are members [93–95]. All these components control the behavior of the organization's members [53] and motivate them act in a specific, appropriate manner, because it creates rules and norms regarding what is right and wrong [46,96]. In fact, it clarifies the behavior patterns that are expected from employees and which they embrace [97]. These are the peculiarities of a specific organization that set it apart from others. Therefore, organizational culture as a product of social interaction is built on a hierarchical model of interdependence between basic assumptions that are most often unconscious and invisible, partially observable, and consciously applied by members of the community, values and norms, as well as being visible but requiring appropriate interpretation through artifacts. They constitute a complex of fundamental premises that a group has developed during the ongoing organizational processes of the organization and its mechanisms of internal integration [98].

It is characteristic for an organizational culture that it is the result of social interactions and it has a holistic nature. It is the resultant of the synergistic effects of the activity of individual members making up a specific community. Moreover, in reflecting the organization's past, it is historically determined and it has an anthropological context: it is constituted by rituals and symbols [99]. As a consequence, it is resistant to change and is classified as one of the soft elements of the organization [100].

Hence, today, the organizational culture of modern enterprises is consciously modeled and it serves primarily as a tool to implement individual enterprise policies in key areas of its operations [101], and an instrument to form desired organizational routines [102]; although, it is not naturally evident for specific organizations [91].

Therefore, the current dominant approach is that organizational culture should be treated as an internal variable. It is one of the three orientations: recognizing culture as an independent variable, an internal variable, and a root metaphor [103]. The trend that treats organizational culture as a dependent variable and predicates that an organization has culture; or in other words, an organization is a culture and should be studied as such [104]. Thus, organizational culture is created within the organization and depends on its other components (subsystems), such as technologies, structural solutions, management methods,

or organizational efficiency [105]. Moreover, it can be modeled and its development can be consciously controlled to achieve the company's goals.

This study also follows the current trends and recognizes that organizational culture is an attribute of a specific institution, an internal dependent variable, subject to modeling factors and processes.

Organizational knowledge development and management are now widely recognized as basic survival activities in a knowledge-intensive era [95], and an organizational culture is described as an imperative to increase knowledge management [53,106]. From the process perspective, these activities are basically the management of knowledge flows and corresponding multiple, repeated, and interactive processes of creation, storage, transfer, and utilization of knowledge [46,107]. One of the key processes that condition effective knowledge management is knowledge transfer [102]. As a consequence, scholars have highlighted, explained, and confirmed the importance of an organizational culture on regulating knowledge transfer behavior [52,54,96,108–112]. In particular, the impact of organizational culture on one of the elements of its flow, i.e., knowledge sharing, was investigated and the undeniable diverse impact of organizational culture on the effectiveness of this sub-process was proved [93,97,113].

Undoubtedly, the organizational culture regulates the behavior of employees and affects the level of their job satisfaction as well as the sense of happiness and professional fulfillment [114]. These characteristics are of particular importance in the context of knowledge workers whose motivation to work is multidimensional and complicated. This is even more so because empirically a positive correlation has been proven between organizational culture, which is in line with the expectations of professionals, and the individual motivation of cognitarians [115,116].

It is reasonable to concentrate efforts on shaping an organizational culture that meets the expectations of intellectual employees regarding their desired comfort zone. Providing them with an optimal environment to function triggers an attitude of openness, engagement, and loyalty. Therefore, inferences should be made toward the analysis and diagnosis of all layers of organizational culture. Exploration should cover both its core, as a hidden layer in the form of assumptions, unwritten rules, and expectations, and the visible layer in the form of cultural practices, such as the company mission, its history, and heroes, as well as myths and rituals [117].

Scholars and researchers set the directions of research in this area by exploring the types of organizational cultures adequate to the contemporary requirements of enterprises operating in a knowledge-based economy, essentially oriented towards processes involving knowledge, including its transfer. They can be a reference for developing a construct of an optimal organizational culture for intellectual employees, aimed at the effective flow of their knowledge. For example, such a model organizational culture can be the culture of learning, knowledge sharing, participatory, or finally the culture of cooperation.

Since organizational learning and knowledge management are interdependent [107], a model construct can be a learning culture, most often defined by the following organizational elements: learning, tribal leadership, competence, community involvement, trust [118,119], or the culture of knowledge, which inspires employees to generate, share and apply knowledge on behalf of organizational continuous success. It is a set of conditions that aim for effective knowledge exchange [120], which is characterized by a high level of mutual trust between employees and within the organization's environment, an attitude of openness to all contacts, including external ones (careful observation and vigilant reaction to change, as well as a friendly attitude towards external stakeholders), shunning power cravings and rivalry, as well as openness of the organization to its members and receptiveness to variety of untested approaches and solutions [108].

The culture of knowledge sharing also deserves special attention. Its three pillars are: reward (benefit from the exchange based on contribution), tolerance (the contribution will not be criticized unfairly or personally attacked), and trust (the contribution will not

be exploited and used unfairly) [121,122]. It could result in the liberation of attitudes of voluntary participation in sharing knowledge, especially among gold collars [32,54].

All of these subcultures, backed by the networking technologies, social media, and knowledge-sharing orientation, result in the emergence of a participatory culture in which all stakeholders and other communities, including ordinary workers and intellectual workers, as well as enterprises as themselves, increasingly engage in the co-creation of knowledge [47].

In all these types of organizational cultures, the cult of knowledge is central, and therefore the culture of knowledge seems to be of paramount importance. This, in turn, must be a driver of collaboration routines at work and lead to the creation of the collaborative culture, which provides the right context for the diffusion of knowledge. The diffusion is the result of cooperation and open communication, which is conducive to learning such organizational behavior by employees, as well as assimilating organizational routines, which lead to gaining a knowledge-based competitive advantage [123]. Collaborative culture is primarily a plane of collective strength. Therefore, it is based on mutual respect, care, and support. At its core are the following cultural values: long-term orientation, openness to change, teamwork, efficient and effective communication, respect, reciprocity, empowerment, promoting the knowledge of individuals [95]. As a consequence, members of the organization see each other as helpful, free from opportunistic behavior, sensitive to others, and able build mutual relations based on the principle of reciprocity [54,105,123], which has a positive effect on knowledge sharing, both tacit and explicit [95,124,125].

Hence, the expectations of knowledge workers as to the ideal organizational culture come down to a construct based on such foundations as: trust, cooperation, open communication, and continuous learning [89].

2.3. Professional Knowledge Transfer as a Key Process in Effective Knowledge Management

Knowledge transfer is an area of interest and intense effort in more and more organizations, as an important way for organizations to create knowledge, reach their goals, and gain sustainable competitive advantage [96,126].

Since it ensures knowledge distribution among all organizational stakeholders, it is treated as a critical, intricate process (not a simple act) of knowledge management. Understanding this activity enables organizations to design a better strategy of intelligent responses to environmental turbulence and the optimal and quick use of opportunities [108,111,127,128].

Knowledge transfer is based on the direct or indirect migration of knowledge between various actors, some of whom play the variable roles of sources/senders, and others of recipients [127,129]. Scholars sometimes use the terms knowledge circulation, exchange, transfer, diffusion, dispersion, spreading as synonyms, and discussion on the unequivocal designation of the phenomenon in the subject literature is still pending [130,131]. Generally, it is a process consisting of the migration of knowledge from one place, person, or form of ownership to other entities. It takes place in specific circumstances and is aimed at creating new knowledge and applying it in the organization [132,133]. Its main task is to exchange relevant knowledge presented in the appropriate context that is understandable for all parties [134]. Therefore, the essence of this process is the fact that the knowledge transmitted from the sender to the receiver is understood, digested, fused, and applied by the latter. Fundamentally, knowledge transfer is about how to acquire and absorb knowledge well enough to make things more efficient and effective [135]. As a consequence, this vital knowledge-based process is composed of three fundamental elements: process participants (the owner and receiver of knowledge), context (a precise situation or environment), and intention (the advisability of allowing the knowledge recipient to accumulate and apply the knowledge) [7].

We can find in the subject literature three approaches towards knowledge transfer essence—syntactic, semantic, and pragmatic. The first one stays in line with the western orientation in defining knowledge in the form of the data–information–knowledge–wisdom hierarchy [136], and it could be described as technical orientation, according to which,

apart from active participation in the knowledge transfer process, its participants should be able to find the ways for knowledge institutionalization as well as reduction in its stickiness [108]. A semantic approach, which is in line with the Japanese orientation [137], is built on the assumption that individual context-specific aspects of generating and exchanging knowledge must be taken into consideration [111]. It highlights the social nature of knowledge transfer [138,139] and requires understanding of the intercommunication skills of participants in the knowledge process. Therefore, this approach emphasizes the following determinants of effective and efficient knowledge exchange: structure, culture, activities, and control of teams and networks [108]. The third, pragmatic approach focuses on capturing the differences in the practices of actors who are involved in knowledge flow and their consequences [111]. This study strictly follows both the semantic and pragmatic approach.

Consequently, many factors determine knowledge transfer, including the ability to obtain and apply the knowledge of actors involved in its migration, the strength of their interrelations, the technological conditions for the realization of this process, and the managerial support, relevant incentive system, and organizational culture with cooperation, sharing, and participation as its core, fundamental values [140]. Moreover, knowledge transmission refers also to the fluency of managers to create knowledge governance mechanisms that stimulate the quality and the quantity of the exchanged knowledge [127].

Undeniably, knowledge transfer also relies on the type of exchanged knowledge and the context of knowledge flow. Tacit knowledge, because it is usually personalized and highly contextual, is difficult to diffuse without active human involvement and explicit knowledge, because it is on the contrary, easy to codify, retrieve, and transfer [141].

Knowledge transfer encompasses a myriad of sub-processes [102]. It is composed, e.g., of knowledge acquisition (from both internal and external sources), knowledge disclosure (targeted transmission to a specific audience), knowledge dissemination (the intentional publicizing of specific knowledge to a wide, often unknown audience), and knowledge sharing (mutual exchange of knowledge in the communication process, also using technology) [142,143], or knowledge creation, organizing, formalization, sharing, application, and refining [144]. Characteristically, the subprocess of knowledge sharing is the most frequently analyzed. It has been dubbed a critical component of knowledge transfer as the most sublime and based essentially on the exchange of the most valuable tacit knowledge [37,55,81].

The process of professional knowledge transfer is unique because fundamentally the professional's knowledge is specific and their organizational behavior is extraordinary. Commonly, they try to carefully control the flow of their distinguished knowledge. Therefore, the biggest challenge of their knowledge diffusion, is its mutual exchange between professionals and other participants of this process. Therefore, it is worth taking actions orientated on designing an appropriate context for the course of this process and releasing honest intentions for the active participation of professionals in it.

2.4. Strategic Role of IT Professionals in the Energy Companies

The number of workers whose most important asset is specialist, personal, and advanced knowledge has increased. They are referred to as knowledge workers, cognitarians, or gold collars, as they are the most precious and core element of intellectual capital of contemporary organizations. Literally their knowledge is the most valuable, strategic asset of modern enterprise. Moreover, because their work is based on a wide network of expert contacts, mainly from outside of their parent organizations, knowledge workers are more a part of the environment than of a specific organization. Their personal connections with external peers and other business partners at their disposal are valuable; however, their personal knowledge is also most useful in relations with the environment [145]. Hence, cognitarians fit perfectly into the role of knowledge brokers both inside the organization and in relations with its external partners.

The IT sector is recognized as one of the industries that constitute the driving force of the new economy [26,43,88]. It represents the so-called Fourth Sector, or the knowledge sector (acquiring, processing, and providing information, including IT services) [146]. Like a lens, it focuses on all contemporary global development trends. It stems out of digital transformation, relies mainly on knowledge workers, operates within technical and social network structures, and is dominated by services based on information and knowledge. Not only is it an element of Industry 4.0, but by providing IT solutions, including network solutions, it builds the context of cyberspace for Industry 4.0, which is the result of the advances in Information and Communication Technologies (ICT) implemented in industry. It is a construct that can be interpreted, e.g., as a technical integration of virtual and physical systems called cyber-physical systems (CPS) in production and logistics systems [147]. It should also be emphasized that the aim of applying innovative solutions in the Industry 4.0 concept is not only technological change, but also creation and implementation of new ways of working and the new role of employers and employees in the industry [148]. IT professionals are the emanation of these regularities. The source of a sustainable competitive advantage in this industry is mainly the specialist knowledge of highly qualified experts: professionals understood to be knowledge workers [14,58,67,73–75]. Therefore, they have a central role within their organization, especially in terms of tacit knowledge management. The importance of IT professionals is related to their role in activities such as knowledge management, organizational learning, and knowledge transfer [97].

Due to the above-mentioned attributes, the IT sector, and the solutions it offers, have a multidimensional and close relationship with the energy sector, and the most important trends in this sector are related to information and communication technologies (ICT) [149]. First of all, from the perspective of the energy sector, IT systems and services are one of the key factors in increasing its efficiency. These solutions are responsible for the connections in the entire chain of processes characteristic for the energy sector and include: fuel, energy production, transmission, or trading, and service for corporate and retail customers. They provide, *inter alia*, tools that support individual devices operating in a power plant or elements of the transmission and distribution networks. Usually equipped with optimization and diagnostics modules, they also manage the operation of power units [150]. Thus, Smart Grids [149] are common. In addition, IT instruments play a special role by integrating data at the level of power plants and entire clusters, and provide support for commercial processes, comprehensive production analysis or collective, central measurement systems or customer service systems. One should also not forget about the applications provided by the IT sector supporting management processes, based on a comprehensive analysis of all data available in production, industry, and trade, subjected to sophisticated processing with the use of Business Intelligence tools. In addition, the role of cloud computing is becoming more and more important in this sector—both private cloud (dedicated to energy corporations and concerning, among others, centralization of processes and using, for example, data buses) and public cloud (intended, for example, for smaller rotary companies conducting specific activities) [150]. Therefore, the use of technologies such as the Internet of Things, cloud computing and machine learning enables the implementation of advanced automation and process optimization scenarios [149]. Hence, as a consequence of digitalization, electrical energy systems require embedded systems, Internet of Things, computation clusters, and data analytics [151]. Secondly, and most importantly at present, IT solutions are one of the guarantors of energy security. After all, it is a strategic sector from the point of view of both the security of countries and economies, and in a global perspective—of nations and civilizations. Hence, analysis from Hiscox has revealed that the energy sector is most at risk of cyber incidents [152], and is strictly dependent on dedicated and sophisticated cybersecurity solutions.

3. Materials and Methods

For several decades the issue of knowledge transfer as well as its factors, determinants, and components have been the subject of increased research interest among academics.

However, it is still emphasized that this area is fragmented and that the often-explored aspects of this multidimensional problem are inconsistent. There is definitely no comprehensive approach that would thoroughly analyze a specific domain of knowledge transfer. As a result, it can be observed that the analyses of this concept are erratic [106]. This poses a problem for researchers, especially since recent studies have proved that knowledge transfer still remains poorly managed. This means that organizations do not exchange and disseminate valuable practices and capabilities [126]. The role of knowledge brokers (so characteristic of intellectuals), who are important actors in knowledge transfer, is often overlooked in the analyses, because they function as connectors and catalysts for knowledge flow. They act as intermediaries between unrelated organizations, groups, or individuals concentrated on collecting and disseminating knowledge, and as role models, promoting knowledge sharing [153].

It has also been noted that mutual understanding of values among different stakeholders (e.g., co-workers, cooperants, and other business partners) support to diminish the cognitive distance between actors that could create barriers to communication and the exchange of knowledge from one party to another [111]. However, research on the roles of particular cultures in knowledge transfer is still lacking [96].

In light of the above, it was decided to conduct research on the components of organizational culture that facilitate knowledge transfer. It was decided to inference in the context of sub-processes of knowledge exchange, knowledge transfer participant groups, and generational affiliation of the professionals. It was determined that the IT knowledge workers operating in enterprises in the energy sector in Poland will be the context of the knowledge diffusion process verified in the study, for several reasons.

As representatives of one of the most knowledge-intensive and networked sectors, IT professionals are the *crème de la crème* of knowledge workers. At the same time, they combine the features of the knowledge-based economy, knowledge work, and knowledge worker. Their organizational behavior is a prediction of the actions and attitudes of all employees of the future. As the longest-serving remote worker, they are also a benchmark for other employees forced to work remotely due to the COVID-19 pandemic. Therefore, it is necessary to study the behavior of IT gold collars in detail and put them into a model framework. Particularly since the role of IT professionals is crucial for the stability, efficiency, effectiveness, and security of IT systems, exclusively in the energy sector. Careful exploration of their behavior will allow for the formulation of generalizations, the indicating of regularities, and the clarification of management guidelines as reference for other sectors or enterprises. They will allow to grasp clearly and thoroughly to understand the essence of the organizational culture supporting knowledge transfer, as well as its components, the peculiarities of intellectual workers, as well as their values and attitudes. It will also enable to identify the existing gap between the practices and rituals stimulating the diffusion of knowledge and the specific expectations of professionals in this regard.

The following hypotheses were formulated (Figure 1):

Hypotheses 1 (H1). *Particular practices used in professional knowledge transfer have a different force of impact on the course of each of the knowledge transfer sub-processes.*

Hypotheses 2 (H2). *The components of the organizational culture supporting knowledge transfer differ in importance depending on the groups participating in the knowledge exchange.*

Hypotheses 3 (H3). *The importance of specific elements constituting the knowledge diffusion-oriented organizational culture differs for each generation of knowledge workers.*

Hypotheses 4 (H4). *IT knowledge workers expect an organizational culture tailored to their values, norms, and needs.*

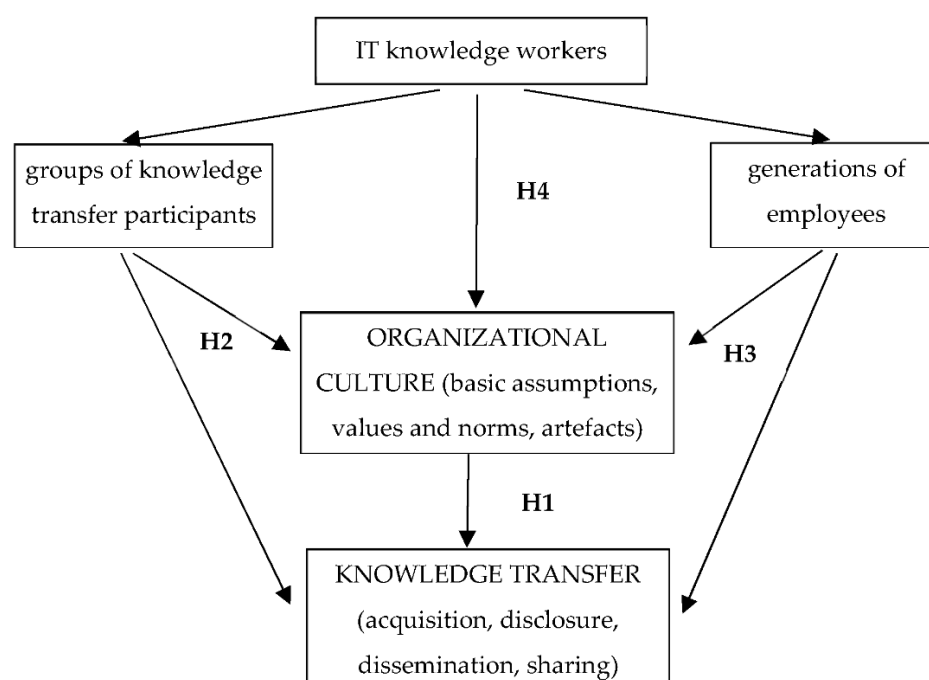


Figure 1. Conceptual model of hypotheses development.

The thus presented theoretical assumptions implied specific questions, and thus research tasks, i.e., answering to the following:

- What rules supporting knowledge transfer are considered important by the professionals in the course of particular subprocesses of knowledge exchange?
- Whether the importance of individual principles governing the migration of knowledge depends on the participants of knowledge diffusion and the sub-process of knowledge transfer.
- Whether the generational affiliation of employees affect the perception of the importance of the principles of knowledge transfer as well as the norms and values that create the organizational culture that supports the circulation of knowledge.
- What are the standards and values that are preferred by knowledge workers and the actual standards and values that create an organizational culture focused on knowledge transfer?
- Is there an organizational culture supporting knowledge exchange in the organizations with which the surveyed specialists are associated?
- What actions should be taken so that the organizational cultures of energy enterprises evolve towards efficient and effective knowledge transmission of IT gold collars?

In conducted research a mixed (quantitative and qualitative) approach was used [154], as well as triangulation. Qualitative and quantitative research was combined to grasp the relationships between the obtained results [155,156] by focusing on a specific group of respondents [157], i.e., IT intellectual employees of the energy sector in Poland. The main objective was achieved through a subject literature search, environmental consultations (IT specialists) and targeted surveys.

A three-stage research procedure was performed that included the conceptualization phase, the concept verification phase, and the in-depth research phase. Each phase corresponded to respective research tasks and was supported by appropriate research techniques to achieve the main objective of scheduled inferences (Table 1).

Table 1. Research procedure—stages, tools, goals.

Phase of the Research Procedure and the Research Method	Goal	Research Techniques
PHASE 1:		
Conceptualization phase - qualitative research	To indicate standards that support knowledge transfer among cognitarians	Critical analysis of the literature
	To identify levels and layers of organizational culture oriented on efficient specialists knowledge exchange	Case study
	To pinpoint groups of knowledge actors that participate in professional knowledge flow	Expert consultations Semi-structured individual interview
MILESTONE: Formulating preliminary research hypotheses.		
PHASE 2:		
Concept verification phase - qualitative research	To adjust the components of the organizational culture oriented on knowledge transfer to the conditions of the IT solutions specificity in the energy sector, as well as to the mental models and the language of IT cognitarians	FGIO (Online Focus Group Interview)
MILESTONES: Formulating final research hypotheses and developing a research questionnaire that includes the identified components of the theoretical construct.		
PHASE 3:		
In-depth research phase - quantitative research	To verify in practice components of organizational culture supporting knowledge transfer among cognitarians	CAWI (computer-assisted web interview)
	To grasp values and norms regarding organizational culture supportive knowledge exchange appropriate for professionals	CATI (computer-assisted telephone interview) T-test
	To formulate managerial directions for creating organizational culture supportive specialists knowledge diffusion	Pearson's correlation coefficient
MILESTONES: Verification of hypotheses and formulation of managerial directions for designing organizational culture oriented on knowledge exchange among cognitarians.		

The procedure for acquiring data consisted of the following stages. In the first stage, an individual, semi-structured, direct interview was adopted, and the research tool was the interview scenario. As part of the next stage of empirical research, focus group interviews (FGI) were run—one focus per type of knowledge transfer participants group (a. between professionals, b. between specialists and other employees, c. between knowledge workers and external stakeholders). In the last stage, quantitative research was carried out using the computer-assisted telephone interview (CATI) and computer-assisted web interview (CAWI) methods.

As a result, quantitative research was prepared to test the research hypotheses. The study questionnaire included 33 questions and was built on a 7-point Likert scale. In 2020 and 2021, 284 research inquiries were sent to selected and targeted respondents. Ultimately, 155 fully completed surveys were collected. The characteristics of the research sample is shown in Table 2.

The respondents met the criteria for knowledge workers. They fit into the classification of intellectuals proposed by M.I. Reed (1996) [73], E.N. Wolff (2006) [74], and I. Brinkley (2006) [158], or met the guidelines formulated by R. Maruta (2012) [159]. These are individuals who are professionally active as IT managers, IT professionals, and IT consultants. They have high skills confirmed by formal education or appropriate certificates, and perform tasks that require expert knowledge, advanced interpersonal skills, especially communication. Moreover, they operate in two dimensions, real and virtual; therefore, they use advanced technologies in their daily work [75,159].

Table 2. Respondent characteristics.

Demographic Characteristic	Frequency	(%)
Gender		
Female	16	10.32
Male	139	89.68
Age, date of birth, employee generation		
55–41; 1965–1979; Generation X	85	54.84
40–31; 1980–1989; Generation Y	35	22.58
30<; 1990–; Generation Z	35	22.58
Education/Qualification		
secondary school	1	0.65
bachelor's degree	13	8.39
higher education/degree	141	90.96
Education profile		
IT	71	45.81
engineering	61	39.35
economics and administration	23	14.84
Total years of employment		
3–5	26	16.77
6–10	22	14.19
11–15	13	8.39
16–20	59	38.07
21–25	31	20.00
26–30	4	2.58
Total number of jobs		
1–3	54	34.83
4–6	99	63.87
7–9	1	0.65
10>	1	0.65
Tenure in present organization		
<2 years	20	12.90
3–5 years	91	58.71
6–10 years	26	16.77
11–15 years	13	8.39
16–20 years	4	2.58
21–25 years	1	0.65
Job title/position titles		
IT Specialist	72	46.45
IT Manager	40	25.81
IT Director	43	27.74
Current form of employment		
permanent employment contract	86	55.48
managerial contract	27	17.42
contract of commission	19	12.26
self-employed	17	10.97
fixed-term contract	6	3.87

The interviewed knowledge workers (10.32% women, 89.68% men) have higher education (87.75%) and a degree mainly in IT (45.81%), engineering (39.35%), or economics and administration (14.84%). They belong to three generations of employees: X (54.84%), Y (22.58%), and Z (22.58%). Most of them, with average seniority of 17 years, hold a stable and established professional position in the organization (46.45% specialists, 25.81% managers, and 27.74% directors). They are generally hired under a permanent employment contract (55.28%). Other identified forms of employment included managerial contract (17.42%), commission contract (12.26%), self-employment (10.94%), and fixed-term contract (3.87%). They are basically the stakeholders of the largest companies in the Polish energy sector (e.g., Grupa Kapitałowa PGE, GK Tauron, GK Enea, EDF, and GK Energa).

To investigate the direction and strength of the relationship between examined variables Pearson's linear correlation coefficient was used [160]. To verify the hypothesis about the existence of differences in average assessment component of organizational culture oriented on professional knowledge transfer between generations t-test was applied. The null hypothesis assumes that the mean values of the variables studied are the same for different generations. ($H_0 : \mu_1 = \mu_2$). The alternative hypothesis, in turn, assumes the existence of differences between the mean values of the studied variables ($H_1 : \mu_1 \neq \mu_2$). If the result of Student's t-test is significant at $p < 0.05$, the null hypothesis should be rejected in favor of the alternative hypothesis.

To ensure that the assumption of equality of the compared groups was met, it was decided to combine two less numerous groups of generations, i.e., Generations Y and Z. Equality of variance was checked with the Levene test [160].

4. Research Results

Research inferences conducted in the form of a critical analysis of the subject literature and direct semi-structured and online focus group (FIGO) interviews were identified and subjected to further empirical exploration.

It was decided that the full use of the organizational culture's structure, as seen by E. Schein [97], was difficult or even impossible to study because of the properties of the basic assumptions. They are essentially invisible and unconscious; therefore, the analyzed layers fit more into the middle and topmost levels of E. Schein's hierarchy concept.

The formula for the structure of organizational culture presented in the study by HK Rampersad in 2013 [116] is closest to the proposed concept of verifying the components of the knowledge transfer-oriented organizational culture. It states that the core of organizational culture can be distinguished as its hidden layer as assumptions, unwritten rules, expectations, and cultural practices, as well as the visible layer, e.g., company mission, history, myths, or rituals (Table 3). As a consequence, it was ascertained to validate all identified components, excluding the basic assumptions, as invisible elements, of which members of a given organizational culture are not aware, and therefore are the most difficult to measure and identify, and able to change only over a long period of time.

In the case of norms and values, or the core of the organizational culture focused on the diffusion of professional knowledge among intellectuals, the cult of knowledge sharing, characteristic of IT cognitarians, is evident (97.14% of indications). This result confirms the core activity of professionals, in which the foundation is not so much concentration on knowledge as a value in itself (90.48% of indications), but on participation in processes involving knowledge, according to the continuous learning approach (94.29% of indications). To carry out these activities effectively and efficiently among knowledge workers, full trust between knowledge transfer participants is necessary, as emphasized by respondents (95.24%). Orientation on permanent development of specialist knowledge resources is reflected by cultural practices indicated by intellectuals. These are understood as defined attitudes, mainly in the form of openness to new solutions and relationships (94.29% of indications), high positive personal commitment (93.33%), as well as communication and mutual interactions (92.38%).

Table 3. The identified components of the organizational culture supporting the knowledge transfer of IT professionals in the energy sector and their place in the well-known concepts of organizational culture components.

Component of Organizational Culture Supporting Professional Knowledge Transfer	The Levels of Organizational Culture According to E. Schein [98]	Layers of Organizational Culture as Described by H. Doorewaard and W. de Nijs [117,161]	
Development and application of common mental models	Artifacts	Cultural practices —the visible layer including rituals	
Openness to new solutions and relationships			
Communication and mutual interactions			
High positive personal commitment			
Leaving the space of spontaneous and informal events and behaviors			
Intensification of direct contacts			
Knowledge as the dominant resource conviction	Values and norms (values)	The core —the hidden layer including expectations, assumptions, unwritten rules	
Continuous learning at the individual, team, organization, and network level			
Full confidence/high level trust			
Necessary variety			
Naturally elected leaders			
Knowledge sharing as a value			
Seeking and triggering constructive criticism	Basic assumptions (assumed values)		
Knowledge			
Innovations			
Trust			
Initiative			

In general, in the case of the knowledge flow between intellectual workers, the respondents assessed the identified components of the organizational culture supporting the circulation of their knowledge as significant. The indications between the individual components of the core and cultural practices ranged from 76.19% (intensification of direct contacts) to 97.14% (knowledge sharing as a value). The lowest importance of direct contacts and the requirement to intensify them can be explained by the specificity of knowledge-based work, in which employees carry out their tasks often outside the organization, and using advanced technologies. Furthermore, the time of the study (2020) is the time of the COVID-19 pandemic, in which the possibilities of direct contact were significantly limited.

The respondents presented a clearly different position on the importance of defined components of organizational culture oriented toward the exchange of professional knowledge, according to the flow of knowledge between gold collars and the personnel of the companies for which they work. In relation to this knowledge circulation plateau, the indications obtained had significantly lower values, ranging from 19.05% (development and use of common mental models) to 77.14% (knowledge as the dominant resource). Treating knowledge as a key resource determining the position of an enterprise is common for every dimension of knowledge transfer. Similarly, knowledge sharing is important and the value of this knowledge diffusion sub-process is appreciated by specialists within each of the identified directions of its circulation (43.81%). Therefore, trust (41.90%) remains necessary in this context. As in the case of the dispersion of knowledge between intellectual workers, the canon of cultural practices creates a triad: high positive personal commitment (44.78% of responses), openness to new solutions and relationships (41.90%), and communication and mutual interactions (37.14%). However, it should be emphasized that the number of indications is much lower than in the previous dimension of knowledge diffusion.

Intermediate results between the analyzed results were obtained with regard to knowledge migration between IT cognitarians and external cooperators (between 17.14%: naturally elected leaders and 86.67%: high positive personal commitment). In this situation, the indications for cultural practices, i.e., the visible layer, are higher than those regarding the core, which is an understandable result. Relations with external stakeholders are assessed from the perspective of their visible manifestations, which is why the highest

number of indications was given to activities: personal high positive commitment (86.67%), communication and mutual interactions (83.81%), and openness to new solutions and relationships (82.86%). Regarding the hidden layer, with respect to knowledge exchange with external partners, respondents indicated the importance of trust (81.90%), the philosophy of knowledge as the dominant resource (80.95%), and the idea of the necessary diversity (70.48%). Professionals are therefore focused on the exchange of various types of knowledge from outside their parent organization, while adopting protectionist attitudes (knowledge sharing as a value were indicated only in 36.19% of responses).

At the same time, groups and directions of knowledge flow were identified between the participants of the knowledge transfer process from the IT units in the energy sector. Due to the character of knowledge-based work (high autonomy, and broad personal network connections determining the high level of individual relational capital of IT professionals), as well as the conditions of the IT sector, whose representatives are IT knowledge workers in the energy sector (high level of personal network connections and multidimensionality of multilateral inter-organizational connections), the following dimensions of knowledge diffusion and knowledge actor groups were identified: a) knowledge transfer between specialists within a specific organization (internal), b) knowledge exchange between professionals related to a company and other employees of this company (internal), and c) knowledge flow between knowledge workers and representatives of partner organizations (external) (Table 4).

Table 4. Assessment of the importance of the components constituting the organizational culture oriented on circulating specialist knowledge in various groups of knowledge exchange agents.

Component of Organizational Culture Supporting Professional Knowledge Transfer	Between Specialists	Professionals and the Staff	Key Employees and Business Partners
Development and application of common mental models (mindsets)	86.67%	19.05%	14.29%
Openness to new solutions and relationships	94.29%	41.90%	82.86%
Communication and mutual interactions	92.38%	37.14%	83.81%
High positive personal commitment	93.33%	44.76%	86.67%
Leaving the space of spontaneous and informal events and behaviors	80.95%	23.81%	74.29%
Intensification of direct contacts	76.19%	20.95%	33.33%
Knowledge as the dominant resource conviction	90.48%	77.14%	80.95%
Continuous learning at the individual, team, organization and network level	94.29%	30.48%	36.19%
Full confidence/high level trust	95.24%	41.90%	81.90%
Necessary variety	80.95%	20.95%	70.48%
Naturally elected leaders	85.71%	21.90%	17.14%
Knowledge sharing as a value	97.14%	43.81%	36.19%
Seeking and triggering constructive criticism	79.05%	21.90%	10.48%

Moreover, it was decided to adopt the convention of interpreting knowledge diffusion as a continuous process consisting of the following sub-processes: knowledge acquisition, knowledge disclosure, knowledge dissemination, and knowledge sharing.

Upon analyzing the components of the organizational culture supporting professional knowledge transfer across its sub-processes, with regard to knowledge acquisition, no other higher correlations were found apart from the indication ‘knowledge as the dominant resource’ (0.4455). On the other hand, in the case of knowledge disclosure, moderate correlations occurred in conjunction with the indications: continuous learning at all levels (0.4552), full trust (0.4528), and the necessary diversity (0.4510). The necessary conditions for effective knowledge disclosure consisting of transferring knowledge to specific audiences are the development and application of common mental models (0.4317) and seeking

and triggering of constructive criticism (0.4290). The results therefore reflected the essence of this subprocess, which, in order to be effective, is mainly based on mutual interaction, understanding, and tolerance. The largest number of strong correlations occurred with regard to knowledge dissemination. Concerning cultural practices, the following results were obtained: openness to new solutions and relationships (0.5579), developing and validating common mental models (0.5102), as well as norms and values: full trust (0.5182), necessary diversity (0.5113), and seeking and triggering constructive criticism (0.4571). Individually, the strongest positive correlation was obtained for knowledge sharing and it concerned the value of high-level trust (0.6118). Regarding the core of organizational culture, a high correlation for this sub-process was also obtained for the necessary diversity (0.4446). On the other hand, cultural practices, and guidelines such as: openness to new solutions and relationships (0.5785) and developing and validating common mental models (0.4756). These results confirm the importance of the knowledge sharing sub-process for professionals, emphasizing their openness to the mutual exchange of diverse knowledge, unambiguously conditioned by high-level trust supported by common mental models seen as mindsets.

Particular attention was paid to the difficulties related to managing diversity regarding different organizational behaviors of knowledge workers representing various generations of employees, distinctly signaled especially by interviewed practitioners. The respondents emphasized a clear dissonance between the representatives of Generation X, who are currently performing managerial functions, mainly due to their professional experience, and the younger representatives of the cognitive system. Therefore, comparisons were made between Generations X, Y, and Z for three reasons.

Representatives of Generation X in IT support professionals in the Polish energy sector are currently the dominant group of gold collars, with the most desirable key competences in the industry [162]. Moreover, the literature on the subject emphasizes the fact that the actions and attitudes of employees representing Generation Y are significantly different from the organizational behaviors of older co-workers [163]. However, scholars tend to conclude that, generally, Generation Z and Y share common characteristics [164].

Subsequently, inference was made on the selected components constituting the organizational culture oriented at the flow of knowledge of intellectual workers in the knowledge transfer sub-processes (Table 5).

Next, it was investigated whether the perception of the significance of the selected components of the organizational culture supporting the transfer of cognitarian knowledge differs with regard to the generations of employees and groups of participants involved in the transfer of this knowledge. Therefore, the analysis was conducted among knowledge workers (Table 6), as well as between intellectual workers and other personnel of the organization for which the specialists work (Table 7), and between professionals and business partners of cooperating organizations (Table 8). Two comparative groups were constructed—Generation X, and Generations Y and Z.

By verifying the usefulness of the manifestations of the organizational culture supporting the transfer of knowledge of IT cognitarians in Polish energy sector in the perspective of their assessment by representatives of individual generations of employees and groups participating in the circulation of professional knowledge (Tables 6–8), some statistically significant data were obtained. The above statistically significant indications that predispose analyzes are as follows:

- In knowledge transfer between intellectual IT workers in the energy sector in Poland, there is intergenerational unanimity as to the importance of cultural practice in the form of communication and mutual interactions; although, representatives of the younger generations, i.e., cognitarians of generations Y and Z, attach greater importance to it.
- In general, in the case of knowledge exchange between intellectual workers and the personnel of their organizations, respondents representing Generations Y and Z assign greater importance to the individual components of the organizational culture focused

on the exchange of specialist knowledge. This could be due to the regularity that usually less experienced participants of specific knowledge transfer sub-processes act as knowledge receivers/seekers instead of gold collars of Generation X, who are essentially knowledge senders. Moreover, younger intellectuals are not yet confined to the hermetic circles of professionals and generally have a shorter power distance. The greatest dissonance occurs in categories that build the visible layer of organizational culture, i.e., the rule of high positive personal involvement, the principle of intensifying direct contacts, the guidelines for communicating and initiating mutual interactions, and the recommendation of openness to new solutions and relationships. It should also be emphasized that the representatives of the younger generations (Y and Z) value knowledge sharing higher, which could be suggested by older employees representing attitudes limiting the course of this subprocess. Similarly, representatives from IT cognitarians of generations Y and Z indicate continuous learning as slightly more important.

- Similar results concerning the discrepancy between the ranking of the components constituting the organizational culture supporting professional knowledge transfer were obtained with regard to knowledge exchange between specialists and external partners. The employees representing Generation X rate the components significance of all the indicated components slightly lower than their younger colleagues. The largest disproportions occur in the category of cultural practices, i.e., the principles of intensifying direct contacts, the rules of communication and mutual interactions, and the standard of high positive personal commitment. In terms of norms and values, discrepancies were identified in cultivating the value of knowledge sharing, which is viewed with a greater perspective by the representatives of Generation X, and the norms of continuous learning.

Ultimately, a set of standards was created that fit the practices or values and norms characteristic of business activity in the IT environment of energy sector in Poland. It was decided to verify to what extent the indicated standards describe enterprises and to what extent they meet the expectations of the professionals interviewed. Therefore, it was determined how much the actual rules deviate from the desired model solutions, in the opinion of the IT cognitarians of energy sector (Table 9).

Table 5. Pearson's correlation coefficient matrix for the variables of organizational culture oriented on professional knowledge exchange and knowledge transfer subprocesses.

Component of Organizational Culture Oriented on Professional Knowledge Transfer	Knowledge Acquisition	Knowledge Disclosure	Knowledge Dissemination	Knowledge Sharing
Development and application of common mental models	0.2439 *	0.4317 *	0.5102 *	0.4756 *
Openness to new solutions and relationships	0.2236 *	0.3835 *	0.5579 *	0.5785 *
Communication and mutual interactions	0.1047	0.2454 *	0.3499 *	0.3374 *
High positive personal commitment	0.0591	0.2680 *	0.2903 *	0.3533 *
Leaving the space of spontaneous and informal events and behaviors	0.0605	0.1864	0.2349 *	0.2463 *
Intensification of direct contacts	−0.3403 *	−0.1953 *	−0.2669 *	−0.2174 *
Knowledge as the dominant resource conviction	0.4455 *	0.3986 *	0.2934 *	0.3336 *
Continuous learning at the individual, team, organization, and network level	0.3683 *	0.4552 *	0.3701 *	0.3480 *
Full confidence/high level trust	0.3269 *	0.4528 *	0.5182 *	0.6118 *
Necessary variety	0.3817 *	0.4510 *	0.5113 *	0.4446 *
Naturally elected leaders	0.0907	0.3041 *	0.3544 *	0.3545 *
Knowledge sharing as a value	0.2601 *	0.3602 *	0.4268 *	0.3527 *
Seeking and triggering constructive criticism	0.2328 *	0.4290 *	0.4571 *	0.3811 *

* $p < 0.05$.

Table 6. T-test for variables of organizational culture oriented on professional knowledge exchange between IT knowledge workers within organization in terms of generations.

Component of Organizational Culture Oriented on Professional Knowledge Transfer	Mean for Generation X	Mean for Generations Y and Z	T	df	p	Significance
Development and application of common mental models (mindsets)	6.0128	6.2222	−1.2323	153	0.2206	-
Openness to new solutions and relationships	6.6410	6.8148	−1.0553	153	0.2937	-
Communication and mutual interactions	6.1282	6.4444	−2.0454	153	0.0434	**
High positive personal commitment	6.6667	6.8148	−1.0220	153	0.3092	-
Leaving the space of spontaneous and informal events and behaviors	5.9103	5.8889	0.1107	153	0.9121	-
Intensification of direct contacts	5.7949	6.0000	−1.0509	153	0.2958	-
Knowledge as the dominant resource conviction	6.6282	6.8889	−1.5441	153	0.1256	-
Continuous learning at the individual, team, organization, and network level	6.7692	6.8889	−1.0185	153	0.3108	-
Full confidence/high level trust	6.7821	6.7778	0.0300	153	0.9761	-
Necessary variety	6.4231	6.1111	1.1512	153	0.2523	-
Naturally elected leaders	6.0385	6.1111	−0.3959	153	0.6930	-
Knowledge sharing as a value	6.7436	6.9259	−1.2987	153	0.1970	-
Seeking and triggering constructive criticism	5.9231	6.1111	−0.9205	153	0.3595	-

** $p < 0.05$.**Table 7.** T-test for variables of organizational culture oriented on professional knowledge exchange between professionals and personnel in terms of generations.

Component of Organizational Culture Oriented on Professional Knowledge Transfer	Mean for Generation X	Mean for Generations Y and Z	T	df	p	Significance
Development and application of common mental models (mindsets)	4.8462	5.0741	−1.0573	153	0.2929	-
Openness to new solutions and relationships	4.8846	5.6667	−2.8647	153	0.0051	***
Communication and mutual interactions	4.3590	5.2222	−2.5295	153	0.0129	**
High positive personal commitment	4.5128	5.5556	−2.8417	153	0.0054	***
Leaving the space of spontaneous and informal events and behaviors	4.0770	4.6296	−1.7861	153	0.0770	*
Intensification of direct contacts	3.3077	4.1852	−2.2066	153	0.0296	**
Knowledge as the dominant resource conviction	5.5769	6.1481	−2.6437	153	0.0095	***
Continuous learning at the individual, team, organization, and network level	5.0897	5.7037	−2.9094	153	0.0044	***
Full confidence/high level trust	5.4103	6.0000	−2.3081	153	0.0230	**
Necessary variety	4.9231	5.0741	−0.6229	153	0.5347	-
Naturally elected leaders	4.9231	4.7778	0.5926	153	0.5548	-
Knowledge sharing as a value	4.8974	5.7037	−2.7877	153	0.0063	***
Seeking and triggering constructive criticism	4.7821	4.7037	0.2648	153	0.7917	-

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8. *T*-test for variables of organizational culture oriented on professional knowledge exchange between IT specialists and partners compared to generations.

Component of Organizational Culture Oriented on Professional Knowledge Transfer	Mean for Generation X	Mean for Generations Y and Z	T	df	<i>p</i>	Significance
Development and application of common mental models (mindsets)	4.7436	5.1111	−1.6743	153	0.0971	*
Openness to new solutions and relationships	5.6667	6.3704	−3.3414	153	0.0012	***
Communication and mutual interactions	5.6538	6.4074	−3.2932	153	0.0014	***
High positive personal commitment	5.7692	6.4444	−3.0611	153	0.0028	***
Leaving the space of spontaneous and informal events and behaviors	5.5000	5.8889	−1.5038	153	0.1357	-
Intensification of direct contacts	3.8205	5.3333	−4.3188	153	0.0000	***
Knowledge as the dominant resource conviction	5.6795	6.2593	−2.5337	153	0.0128	**
Continuous learning at the individual, team, organization, and network level	4.6410	5.6296	−3.5061	153	0.0007	***
Full confidence/high level trust	5.9744	6.2593	−1.4557	153	0.1485	-
Necessary variety	5.4231	5.6296	−0.6972	153	0.4873	-
Naturally elected leaders	4.7308	4.7778	−0.1780	153	0.8590	-
Knowledge sharing as a value	4.6154	5.7037	−3.8616	153	0.0002	***
Seeking and triggering constructive criticism	4.4744	4.5556	−0.2992	153	0.7654	-

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.**Table 9.** *T*-test for comparing the standards in force in energy companies aimed at knowledge transfer of and individual preferences of IT professionals.

Standards in the IT Sector	Mean as Is	Mean as It Should Be	T	df	<i>p</i>	Significance
Avoiding risk	3.1524	3.2571	−0.5383	308	0.5910	-
Belief, knowledge = power	4.4190	4.7429	−1.3773	308	0.1699	-
Rigid, highly hierarchical structure	3.3333	3.3905	−0.3379	308	0.7358	-
Looking for a scapegoat	2.4190	1.8762	4.1489	308	0.0000	***
Rigid division into organizational cells	2.7810	3.1238	−1.9507	308	0.0524	*
Inward orientation	2.8000	2.4190	2.3775	308	0.0183	**
Limited access to management	1.9619	1.6857	1.6650	308	0.0974	*
Focus on key employees	4.8857	5.3143	−2.7708	308	0.0061	***
“What’s in it for me?” attitude	2.9238	3.1048	−0.9302	308	0.3533	-
“This is not my responsibility” attitude	2.8286	2.7619	0.3501	308	0.7266	-
The belief that sharing knowledge is a value	5.9619	6.0571	−0.6276	308	0.5310	-
A flat, flexible organizational structure	5.3429	5.2857	0.3724	308	0.7100	-
Continuous training and education of employees	5.7238	6.0762	−2.6688	308	0.0082	***
Expert power	6.0571	5.6095	2.6041	308	0.0099	***
Informal communication	4.1143	4.7714	−2.8938	308	0.0042	***
Equally distributed responsibility	5.2381	5.3238	−0.5206	308	0.6032	-
The rule of shared responsibility	5.6000	5.9524	−2.4716	308	0.0143	**
Conduct based mainly on shared values	5.6286	6.1143	−3.4604	308	0.0007	***
Cross-functional teams	5.5524	5.1238	1.9248	308	0.0556	*
Customer orientation	6.3238	6.0381	2.0465	308	0.0420	**
Open door policy—free access to management	5.6286	5.5810	0.3266	308	0.7443	-
Equal opportunities for all employees	5.0762	6.0190	−7.4833	308	0.0000	***
The “What will our clients get out of it?” principle	5.6571	6.0095	−2.5867	308	0.0104	**
The “What can I do for you?” principle	5.6476	6.1048	−3.4314	308	0.0007	***
The sum of the values—the actual state and the expectations of cognitarians	109.0571	111.7429	−2.1432	308	0.0333	**

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

This was done on purpose, due to research limitations related to the analysis of the phenomenon of organizational culture in enterprises. To concentrate on the practical and managerial dimension of the research, and to make a significant contribution to the analyzes in these areas, the main goal was on providing ad hoc implementation guidelines for the IT divisions of the energy sector in Poland. The standards explored are an element of organizational culture that is subject to the most rapid modifications. On the other hand, in the case of a comprehensive organizational culture construct, supporting the transfer of professional knowledge and modeling it deliberately for the presented solution requires systemic actions taken over a long period of time, with results significantly deferred in time.

To complement the inferences made on modeling the organizational culture supporting the migration of knowledge of IT professionals in the energy sector in Poland, and to analyze and diagnose the degree of advancement of the existing organizational cultures of IT departments in energy companies in Poland in the orientation to the exchange of specialist knowledge, the standards selected as a result of the research conceptualization and concept verification phase were subject to quantitative tests. After conducting a series of in-depth semi-structured interviews and Focus Group Online Interview, a list of the most common standards that fit into cultural practices or artifacts was prepared, as well as the norms and values of organizational culture in force in Polish energy sector. These mechanisms were compared with the expectations of professionals to formulate guidelines that allow for the design of an organizational culture that is optimal for cognitarians and stimulates the diffusion of specialist knowledge. Thus, the status quo was compared against preferences regarding the application of certain rules (Table 9).

Ultimately, based on statistically significant data, practices inhibiting open specialist knowledge exchange, i.e., the philosophy of looking for a scapegoat were observed in enterprises, which is disapproved of by the surveyed knowledge workers. Such attitudes lead to the suppression of innovation and initiate conservative attitudes, limiting the high-risk tolerance and intrapreneurship, which is so important for intellectuals and innovative organizations.

The surveyed professionals are also disturbed by too much “inward” orientation and too intense “customer orientation”, which suggests focusing on external organizational relationships, mainly with business partners other than just customers. IT knowledge workers are aware of the prevailing tendencies to expand the existing boundaries of companies and the need to look for sources of competitiveness beyond their parent organizations. Consternation among respondents is caused by increased affirmation of expert authority. In what could be seen as surprising, their expectations demand equal opportunities for all employees (the most significant difference between the status quo and expectations).

Please note the subsequent discrepancies between the executed standards and the indicated needs of intellectuals. Their responses suggest shifting the emphasis to developing and supporting informal communication, promoting behavior mainly based on shared, clearly given values, applying the “What can I do for you” rule, focusing on key employees. An important issue is also greater respect for the principle of promoting the creation of added value for the client and the principle of shared responsibility.

Overall, with regard to the majority established, statistically significant standards and antipractices, the identified discrepancies between the status quo and the expectations of professionals are not significant. Moreover, when it comes to the guidelines limiting the circulation of knowledge, listed in the questionnaire as antipractices and control variables (e.g., avoiding risk, “this is not my responsibility” attitude), their applicability is noticeable, but not in a disturbing dimension. Their noticeable presence suggests the need to sensitize these standards and focus on their elimination.

5. Discussion and Conclusions

The study was aimed at creating and verifying the concept of organizational culture supporting the effective transfer of knowledge of the IT cognitarians of the energy sector. An attempt was made to analyze the individual components of organizational culture in

the diffusion of strategically valuable specialist knowledge from the perspective of the groups of knowledge agents and generational affiliation of employees involved in this process, as well as the subprocesses of knowledge transfer.

To formulate directives for ad hoc implementation, a set of standards determining the transfer of specialist knowledge was also created, containing both practices supporting the migration of gold-collar knowledge and curbing its exchange. As a result, the actual state of application of these guidelines was analyzed, and practical guidelines were derived on how to steer their development in terms of meeting the expectations of the surveyed professionals.

It has been found that IT knowledge workers interviewed consider the highlighted components of the knowledge-oriented organizational culture as accurately identified and important in the circulation of cognitive knowledge. Depending on the group of knowledge agents participating in knowledge exchange, the importance of these components varied (Tables 6–8). Thus, the H2 hypothesis was confirmed by quantitative tests. The highest weight of individual components was observed in the case of knowledge transfer between professionals, and the lowest in the flow of knowledge between knowledge workers and the personnel of their organization. Thus, the regularity that is characteristic of organizational culture as non-homogeneous was confirmed; different groups within the organization may have different cultures, called subcultures [108,165].

An advocate of treating organizational culture in such a way as the resultant of individual subcultures created by subgroups in the enterprise is M. Jo Hatch, who expressed this belief in her seminal book, *“Organization Theory: Modern, Symbolic, and Postmodern Perspective”* [165]. This assumption is especially true with regard to the transfer of knowledge, as confirmed in their research by L. Girdauskiene and A. Savanevičienė, in which they analyzed the impact of individual components of the culture of knowledge on the transfer of specific types of knowledge [108].

The investigation led to the emergence of the existing canon of components of the organizational culture oriented to knowledge transfer that is independent of the group of participants in the circulation of professional knowledge. It comprises the following norms and values: knowledge sharing, full trust, knowledge as the dominant resource, necessary diversity, and practices such as: openness to new solutions and relationships, personal positive commitment, communication, and mutual interactions [89,97,108].

These components were verified specifically for IT workers [97], creative knowledge workers [89], and knowledge workers in general [45]. Such elements are also consistent with the research results obtained by other researchers on the behavior of IT professionals, according to which the organizational culture optimal for these specialists is based on trust, tolerance of making mistakes, knowledge, cooperation, and free communication resulting in knowledge diffusion [166–168]. Additionally, they confirm the conclusions according to which the organizational culture designed in line with the expectations of professionals, and which has a positive and fundamental impact on their appropriate actions and attitudes in the field of voluntary transfer of their precious and unique knowledge [115]. Namely, they are consistent with the deductions of such norms and values as: risk taking, cooperation, personal freedom, challenges, trust, and driving; and determine the job satisfaction of knowledge workers [45]. They also remain in line with the findings of M.T. Lee et al. [116] that different levers of knowledge workers' motivation are more effective in appropriate organizational culture settings. Moreover, they confirm the conclusions of M.M. Shin et al. [169] on the existence of a relationship between ethical organizational culture and knowledge workers' innovativeness.

At the same time, the components that must be developed to achieve a comprehensive organizational culture oriented to the transfer of IT specialist knowledge in the Polish energy sector were captured. Especially in the context of knowledge exchange between intellectual workers and personnel, as well as external stakeholders; the component is continuous learning at the individual, team, organization, and network level. It has been proven that organizational learning affects the knowledge sharing process positively.

Similar to what was established in the research of M. Kordab et al. [107], which focused on the impact of organizational learning on the course of individual knowledge management sub-processes (knowledge acquisition, creation, storage, sharing, and application).

Taking into account the subprocesses of knowledge transfer among IT gold collars in the IT divisions of the energy sector, the strongest positive impact of the distinguished components of specialist knowledge-oriented organizational culture was confirmed for knowledge dissemination and knowledge sharing. M. Kordab et al. came to the same conclusions. They also found a strong positive relationship especially between organizational learning and knowledge sharing [107].

At the same time, knowledge dissemination and knowledge sharing positively affect openness to new solutions and relationships, development, and validity of common mental models. Moreover, knowledge dissemination and knowledge sharing are determined by the following norms and values: full trust and the necessary diversity. These observations are significant from the point of view of the importance of the knowledge dissemination subprocess. Since it is aimed at the free dissemination of knowledge among a wide group of recipients, it significantly contributes to the creation of organizational knowledge resources that are the basis of structural capital and, consequently, the intellectual capital of the enterprise. This is especially true in the area of knowledge circulation between cognitarians and the company's personnel. Therefore, such conclusions are of immeasurable practical importance for the managers of Polish energy companies. In turn, knowledge disclosure depends on the development and validity of common mental models and the following norms and values: continuous learning, full trust, and the necessary diversity. The obtained results confirmed the H1 hypothesis (Table 5) and supported the results of other researchers' explorations on the influence of organizational culture and trust on knowledge sharing (or, more broadly, the transfer of knowledge) in organizations [46,93,95,96,124]. This is especially so in findings that organizational culture influences knowledge transfer [96], particularly knowledge sharing [46,52,54,55], organizational learning [44], and conclusions that trust determines knowledge sharing [93], especially tacit [95,124], and retaining it in enterprises [71].

From the perspective of differences related to the generational affinity of employees (X, Y or Z), a general regularity has been observed, i.e., representatives of younger generations attach greater importance to individual components of the organizational culture oriented to knowledge transfer, especially in the context of knowledge migration between intellectuals and personnel and between gold collars and cooperators of their organization. Thus, the H3 hypothesis was empirically confirmed (Tables 6–8). Focusing on the overtones of the principle of high positive personal commitment, it is therefore important for the management, which usually belongs to Generation X, to adopt the right attitudes. Namely, they should demonstrate dedication, foster mutual commitment to knowledge transfer, cultivate team affirmation, and limit the egocentric attitudes of intellectual workers. They should also encourage intellectuals to treat personnel as an equal factor in the success of the organization. As a consequence, the intensification of direct contacts, which is more important for Generations Y and Z, will allow the expansion of closed, expert circles of trust to include younger knowledge workers and the organization's personnel, improving the transfer of professional knowledge. These findings are in line with the results obtained by S. Razzaq et al. [41] and I. Toth et al. [27], who also verified the determinants of knowledge workers' job engagement and organizational commitment.

Notable is the interpretation of the importance of knowledge sharing in the perspective of intergenerational comparisons and of knowledge circulation between knowledge workers and cooperators. Older cognitarians rate the importance of this element of the core of organizational culture much lower.

To sum up, the smallest intergenerational discrepancies occur basically in the invisible layer of norms and values of organizational culture that determine its core, regardless of the size of the organization and the number of participants involved in the circulation of knowledge. Due to the fact that organizational culture is difficult to change [91], a greater,

research-confirmed dissonance in the layer of visible cultural practices is a good predictor of the possibility of creating an organizational culture that supports knowledge diffusion among IT specialists. The chances of faster cultural changes in practices are greater because it is a sphere of explicit rules of conduct and articulated beliefs. Therefore, the level of meeting the expectations of intellectuals was analyzed with respect to the standards of organizational culture prevailing in their organizations. The inferences of other researchers also indicate that the organizational culture designed according to the expectations of knowledge workers positively influences their motivation and openness with regard to voluntary transfer of their knowledge [115,116]. Based on the results obtained (Table 9), the H4 hypothesis was confirmed and guidelines for the management of IT departments of energy companies in Poland were formulated to help design organizational cultures focused on knowledge exchange between cognitarians (Figure 2). The cultural community creates joint goals and aspirations, standardizing the organizational behavior of its members. It also enables quick, efficient, and unambiguous communication, and the participants in the organization interpret and evaluate the reality in a similar way.

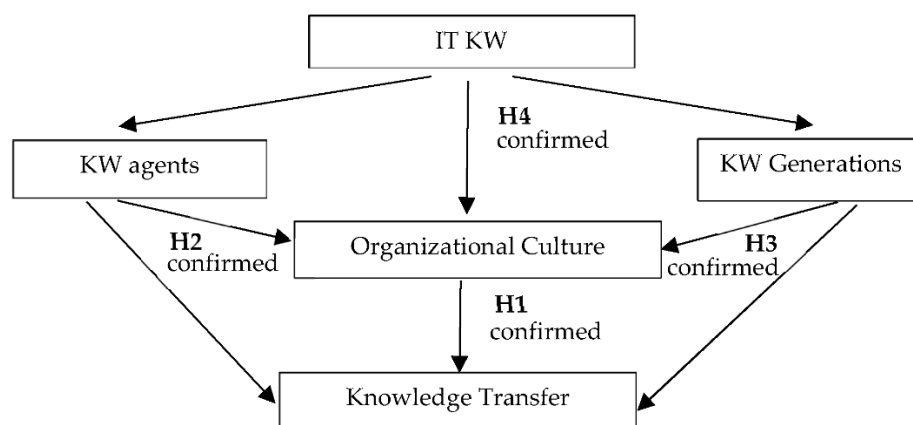


Figure 2. Verification of research hypotheses.

Based on the analyzes, it is recommended to make efforts to promote and, as a result, assimilate the value of continuous learning at all levels, especially in the transfer of knowledge between intellectuals and personnel, as well as cooperators. Moreover, it is suggested to affirm the necessary diversity, along with seeking and triggering constructive criticism as a standard (it is appreciated in the circulation of knowledge with external partners but ignored with regard to ordinary employees). These accents in the cultural core affect cultural practices, i.e., the development of common mental models, which is to be served by the intensification of direct contacts and enabling space for informal events and behavior. According to the expectations of professionals, the emphasis in the standards should be increased to ensure equal opportunities for all employees, promoting and enabling informal methods of communication, and emphasizing conduct based on shared values. Norms and values at their core are therefore the foundation of the designed culture.

Despite the above contribution of this paper, it should be acknowledged that presented results are based on certain assumptions, which could be nongeneric. The study of the correlation between individual components of organizational culture and the knowledge transfer subprocesses or of the t-test between organizational culture's elements and groups and generations of knowledge transfer participants confirmed the existence of only a few dependencies. Moreover, the analyzes showed that some of the results cannot be generalized to include the entire population of IT knowledge workers in Polish energy sector and that they can only be interpreted in the context of the verified group of respondents.

6. Limitations and Suggestions for Future Studies

The authors are fully aware of the limitations resulting from the present study. The presented research, due to its narrow character and limited scope, should be seen as pilot considerations. Additionally, the lack of identified unambiguous, strong correlations between the explored variables forces supplementary, more in-depth, complex, and comparative inferences. The research also does not identify the directions of the dependencies studied. A clear drawback of the research is that it is limited to intellectuals. In fact, they are more inferences dedicated to the IT cognitive subculture than to the exploration of organizational cultures of energy companies. The limitation of the research to the Polish market is justified cognitively; an immanent feature of organizational culture is its grounding also in, e.g., the national culture.

The research significantly contributes to the development of management sciences, especially knowledge and intellectual worker management as an emerging new profession. It fits into the interdisciplinary research on organizational behavior and has a utilitarian and international overtone, with particular application in Central and Eastern European countries and in IT sectors aspiring to the maturity phase. After all, the explored group of IT knowledge workers belongs to the IT sector rather than constitutes the specificity of the energy sector. It helps to solve the growing problem of the unique position of professionals in organizations as a hermetic cohort of individualists. It also helps overcome the difficulties of effective management of cohorts, focusing mainly on the committed diffusion of their knowledge and triggering attitudes of loyalty, dedication, and community in parent organizations in the context of designing organizational culture that is appropriate for knowledge workers. In the area of theoretical and cognitive contributions, they contribute an original concept of an organizational culture focused on the exchange of specialist knowledge, directly related to the framework for Industry 4.0, empirically verified in several dimensions, knowledge transfer subprocesses, groups of knowledge agents participating in its circulation, and the generational affiliation of knowledge workers. They provide precise management tips on how to shape an optimal culture that supports the diffusion of professional knowledge.

Thus, the research findings have significant implications for theory and practice. Firstly, they present an original concept of components constituting the organizational culture supporting the transfer of knowledge of IT professionals operating in the energy sector. The individual components relate to the three levels of organizational culture—basic assumptions (assumed values), norms and values (values), and artifacts. Secondly, in practical terms, they provide managers of IT specialists in energy companies, with concrete guidelines as to the importance of specific norms, values, and artifacts for the circulation of knowledge between particular groups of knowledge agents (between professionals, between specialists and staff, and between IT knowledge workers and business partners), from the perspective of individual generations of employees (generation X and generation Y and Z), and due to four sub-processes of knowledge transfer (knowledge acquisition, knowledge disclosure, knowledge dissemination, and knowledge sharing). Moreover, on the basis of the specific norms, values, and artifacts, they indicate how to shape an organizational culture adequate to the expectations of IT professionals and conducive to the engagement and commitment of IT knowledge employees in the process of diffusion of their unique and valuable knowledge.

Their definite advantage is the topicality and importance of the issues raised. They are in line with other research conducted by other prominent scholars [46,96,97,108,116,124,169]. In-depth and dedicated analyzes of the energy sector in Poland, in the lens of IT, are necessary and justified, not only from the perspective of the industry itself. They will be a reference for other segments of the national economy, which strive towards the knowledge economy and aspire to reach the stage of Industry 4.0.

At the same time, it is worth paying attention to the strong interdependence of the energy and IT sectors. IT creates a context for the development of the energy sector, but

it should also not be forgotten that IT is also a substantial consumer due to high energy consumption by crypto currencies and data centers, which are on the tremendous rise [151].

The above inferences outline further directions of research on intellectual workers. First, it is important to develop a concept for the management of IT knowledge workers in Poland. Its foundation could be an original, comprehensive research model of professional organizational behavior, covering the individual, group, and systemic levels of analysis. In addition, it should take into account the network activities and attitudes of stakeholders in modern enterprises, especially of intellectual workers who work for them. The activities of IT cognitarians in the context of knowledge exchange should be of key importance.

An inspiring direction of research is also leadership among knowledge workers. Managerial behaviors play a significant role in modeling the activities of knowledge workers which are desired from the organization's point of view, especially those related to organizational citizenship behavior of professionals [170], including committed participation in knowledge-sharing processes [77,171,172]. Knowledge-oriented leadership [173], tailored to the preferences of cognitive workers, is the foundation and driving force behind the activities and attitudes that are profitable for the organization. It is the main component of the organizational behavior model of knowledge workers of the future, both at the individual, group, and systemic levels [13,22]. Therefore, it must take the form of responsible leadership [172], in line with approaches that are more innovative, emerging, and collaborative [174], but mainly aimed at managerial and leadership support [175,176]. Therefore, the leadership of knowledge workers is an up-to-date, attractive, and important subject of research. The problem requires, first of all, developing or identifying a leadership model that will be a tailored leadership theory and will result in effective management of professionals [177]. Consequently, it should take into account a number of factors: the character of the knowledge-based economy, the characteristics of knowledge-based work, and of the professionals themselves. This includes their system of values, actions and attitudes, and preferences, as well as the economic sector in which the specialists operate. Therefore, it must be supplemented with a set of guidelines for managers; it should contain not only universal solutions, but also specific practical recommendations.

The conducted research may also take a broader comparative dimension. Inferences may be conducted against the background of entire organizations of the energy sector in the context of the already studied subculture of IT professionals. Comparisons can also be made in an inter-organizational perspective—due to the size of the actors constituting the networks of connections in the energy sector, and the type of activity conducted in the energy sector. In addition, it is possible to try to identify the characteristics of organizational behavior of IT cognitarians in general and in detail for particular industries. The results could initiate the identification of a specific group of organizational stakeholders—IT professionals, with peculiar and distinctive characteristics.

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