Fit to Work in the Business Models of the Industry 4.0 Age

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Abstract: Global competition, the requirements of sustainable development, building an innovative economy or Industry 4.0 develop the need for changing or creating new legacy business models. Competencies adequate to new working possibilities play a significant role in these changes. The key role played here is the assessment of fit to work in the Industry 4.0. The purpose of the paper is to analyze fit to work in business models using the features and elements of Industry 4.0. There are specific antecedences identified for creating and changing business models in the aspect of implementing Industry 4.0, with particular attention paid to the meaning of competencies and their adaptation for the 4.0 requirements. Quantitative studies have been performed on a sample of 472 employees of Industry 4.0 in three countries: Germany, Poland and Slovakia. Theoretical and empirical considerations use the four-factor model differentiating the supplementary and complementary fit, organizational identification and satisfaction from work.

Keywords: fit to work; Industry 4.0; business models; competencies

1. Introduction

The dynamics of the surrounding, growing competition, progressing globalization or crisis situations that force organizations to change represent a challenge both for strategic and operational management. This leads to searching for, creating and implementing complex systems and business models now more than ever. It is expected that new business models will allow for generating (creating) value for a client and the growth of the company itself [1–3].

The business models include the concepts of creating value based on different kinds of sources, such as resources, innovative processes or competencies. We acknowledge that building new business models or changing legacy business models are affected by internal and external considerations. One important external factors affecting the concept of new or changing business models is the fourth industrial revolution, also known as Industry 4.0 [4–8].

This concept is variously defined; however, each definition underlines that the wide utilization of the digital economy (widely comprehended digitization) is the key component (foundation) [9,10]. Industry 4.0 involves the technological, process and organizational transformation of companies [11]. It is based on the advanced utilization of digital solutions and data resources and the goal is the mass customization of goods and services production as a response to the individualized needs of clients [12,13]. The implementation of digital solutions facilitates the operations of companies and the creation of new business models [14–16].

Together with new business models, the meaning of building new competencies and fit to work in new reality of Industry 4.0 is underlined. Industry 4.0 is a cumulative notion for the technical
innovations and the concept of the value chain organization that will revolutionize industrial production. Although it is intuitively associated with the operation of machines and modern technologies, one needs to remember its humanistic side and therefore a very important role played by people [17,18].

Within the developing business models based on Industry 4.0, there is a demand for new professions related to the programming, operation and control of machines and their integration in the production system. Participants in this revolution must fit to work and develop the ability to constantly learn and self-develop [19–21].

Based on studies, effective employees of Industry 4.0 will have to merge their knowledge of specific production process, e.g., work with robots or the reconfiguration of a machine with ICT skills, starting with basic (e.g., using spreadsheets and the operation of interfaces) to advanced (e.g., advanced programming and analyzing skills) skills [18,22–25].

Current studies on the competencies of the future clearly indicate the change of the current requirements of future jobs, where digital, cognitive and social competencies become crucial [17,26,27]. It is a step change in thinking about work, where interdisciplinarity, personal flexibility as well as project-based approaches to work will condition the fit to work [20,21,28–30].

Building the human–organization fit starts at the level of conformity between people and work. The said fit to work is a significant parameter related to the feeling of comfort and psychical wellness, and as a consequence the subjective evaluation of situation attractiveness. Adaptation to work has a meaning for the selection of a professional path, the direction and type of education, as well as the selection of an organization that represent the surrounding parameters, matching expectations. These expectations concern various aspects of future work, required knowledge and skills. The performed studies used the four-factor model of fit to work that considers supplementary and complementary fit, organizational identification and satisfaction gained from work [20]. How the individual predispositions are adequate to specific professions or jobs is analyzed in the literature from the competencies perspective [9,21,29–31].

The purpose of the paper is to analyze the fit to work in business models using the features and elements of Industry 4.0. The research problem is focused on the answer to the following question: how the competencies of companies whose business models are based on implementation of Industry 4.0 are fitted?

According to the logic adopted by the authors, the Industry 4.0 concept is outlined, followed by a description of business models together with their changes in the current concept, the fourth industrial revolution. Then, the selected approach to competencies and the future in the context of the empirically analyzed key variable, fit to work, are presented. Finally, the results of the studies of fitting to work of people employed at companies among the representatives of Industry 4.0 and representing new business models are shown. The study sample represents Poland, Slovakia and Germany.

2. Theoretical Background

2.1. Foundations of Industry 4.0

At the moment, we stand on the threshold of the fourth industrial revolution, also called Industry 4.0 [32]. This is a result and consequence of technological development [33,34]. Industry 4.0 means the integration of systems and the creation of networks that integrate employees as well as digitally controlled machines and devices using ICT programs and the Internet [35,36]. Industry 4.0 may be specified as a merge of technology and organization in the value-added chain [37]. It is based on smart, networked systems that are connected both with the processes inside a company and the networks creating the value. Therefore, it is possible to manage them in real time, from placing an order to the organization of distribution logistics [38–40]. Industry 4.0 consists of many mutually linked ICT technologies within companies, which is why they need to have highly computerized branches of the production industry [41]. The fourth-generation industry includes the whole value-added chain, starting at the stage of design and tests, through the organization itself, management and logistics,
to end at the distribution of the final goods. Thus, new business models and business strategies are necessary [15] that also include a new model of cooperation and the value-added chain, extended by business partners and clients, according to the concept of the “connected enterprise” [42,43].

In this new approach to the industry functioning concept, a wide application of technology and instruments of the digital economy [44,45] is necessary, among which the following are emphasized [6]:

- Advanced computing and connectivity, cloud computing, big data, and increase in real-time data.
- Data analytics leading to increased business intelligence.
- The Internet of Things, the ubiquitous connection of people, things, and machines.
- Cyber-physical systems that integrate the dynamics of the physical processes with those of the software and networking, exchange data with one another, access web services, and interact with people. This technology builds on embedded systems, computers and software embedded in devices.
- New ways to implement human–digital interfaces, such as touch screens, virtual reality, and augmented reality.
- Low cost automation, robotics, and 3D printing.
- Smart factory.
- Block chain.

The mentioned elements of the digital economy permit creating networks covering integrated digital, physical and human systems. These created “social networks” often provide hyper-connectivity, billions of connections between people, organizations, devices, data and processes resulting in the growing interdependence and cooperation of these elements [43]. It is expected that the networks of Industry 4.0 would enable the better flexibility of economic entities and other organizations [46]. They will provide better business interactions and more benefits for clients, employees and partners comparing to the traditional economy. They are the antecedences of creating and changing business models in many economy sectors [47].

2.2. Business Models in the Face of Industry 4.0 Development

The observed dynamics of the strategies and business models of organizations cover all sectors of the economy and are applied both to large organizations as well as small and medium enterprises. Business model changes are the expression of companies’ hunger for gaining competitive edge and the effectiveness of operations. Further, the flexibility and speed implementation of the 4.0 concept has strengthened the changes in business models, especially within the following scope [1,5,14,15,48]:

- Creating a value based on digital technologies;
- The option to create a unique combination of tangible and intangible resources as well as cyber–physical–human networks able to generate value;
- Treating the business model as a system of mutually dependent activities and processes strongly focused on creating value;
- Key competencies;
- Business activity architecture (technical, information, social) able to provide an organization with effectiveness through generating income.

Cognitive difficulties (definitions, structure) result from the multi-dimensional fact and interdisciplinary character of the business model that determines the study approach [49]. The development of studies on business models has resulted in many definitions and concepts [50–54]. In the context of the subject in question, we are focused on those where the creation of value is based, among other things, on changes in competencies or social potential. In this context, the business model may be treated as a system of resource configuration (including social ones) and mutually dependent activities focused on creating value. Generally, in business model concepts, three main dimensions are
emphasized: creating, supplying and capturing value [55–61]. The first dimension of creating value is related to the architecture of companies’ value and mechanisms that allow for creating value proposals. They are expressed in the organization of resources and processes. The second important dimension of the business model is the supply of value for a client, expressed via utility, emotional and social value. The third dimension describes how the method of organization converts the value supplied to clients into income and profits. One needs to underline here that Industry 4.0 strives toward innovations, to a large extent, which in turn allow for creating, supplying and capturing a unique value and competitive edge [62]. Innovations allow for creating value for clients (new products, new methods of client service) as well as value for stakeholders (environmental protection, new technologies, new value chains, the growth of effectiveness). The business models themselves may represent the organizational innovation important for competitiveness.

The evolution of business model changes based on the definition of the Osterwalder business model [57,63], the dimensions of value and theories describing the levels of innovation in the background of Industry 4.0 development, is presented by Ibarra et al. [28].

They have identified four stages of approaches to new business models based on radical innovations resulting from the implementation of the Industry 4.0 concept. The following stages of the business model changes covered [64]:

- **Internal and External Process Optimization**: this transformation represents an incremental innovation that optimizes the actual business without involving big changes. New enabling technologies are introduced solely to optimize the value creation architecture (key resources and activities) due to increasing efficiency and improving performance (reducing costs, time and failures, employee training, etc.) without addressing high risks.

- **Customer Interface Improvement**: this other incremental innovation is focused on value delivery (value proposition through product and service offering, customer segment, channels and customer relationship) improvement.

- **New Ecosystems and Value Networks**: this model proposes a radical innovation of the actual business model which follows the purpose of focusing on the core business (key or distinctive activities of the firm), sharing the uncertainty with other agents or achieving new required skills and resources from associates, due to the introduction of technologies such as Big Data, Cloud Computing, Augmented Reality or Virtual Reality. In this way, the focal firm’s value creation process is linked with the stakeholders’ processes.

- **New Business Models: Smart Products and Services**: this type proposes a completely new business model based on new technologies focused on Big Data, Cloud Computing, Intelligent Sensorization and Embedded Systems, among others, that offer innovative and smart goods and services. Thus, a disruptive innovation that provides the change of almost all the elements of the business model is needed.

As a result, features of the digital economy business model, appropriate for Industry 4.0, may be presented in synthetic form (see Table 1) [5,14,15,48,57,64,65]. It is worth pointing out the multidimensionality of the value proposal and differentiation of revenue types.
Table 1. Features of the digital economy business model proper for Industry 4.0.

| Business Model Attributes | Specification |
|---------------------------|---------------|
| **Platform type**         |               |
| Web-based platform        |               |
| Mobile app                |               |
| **Key activity**          |               |
| Value proposition         |               |
| Working product at competitive price | Guaranteed availability |
| Solution provider          | Full services, full operator |
| Product creation          | Do more to address the job |
| Long tail                 |               |
| **Value creation dimension** |               |
| Internal and External Process Optimization | - Product and resources traceability: more efficient production, logistics, quality control, inventory management and better maintenance |
| - Machine to machine: connect internal process/ connect internal process with suppliers’ process |
| - Employee training: work from any place at any time, greater and faster communication, knowledge exchange |
| - More transparent management: data-driven decision making; |
| **Stages of the business model** |               |
| Customer Interface Improvement | - Management of new touchpoints |
| - Data collection, monitoring and interpretation |
| - Development of new services |
| New Ecosystems and Value Networks | - Business infrastructure connected to key partners infrastructures |
| - Real-time information about production, inventories, sales, availability of personnel, etc. |
| New Business Models: Smart Products and Services | - New physical, human and intellectual resources are needed |
| **Value delivery dimension** |               |
| **Key value proposition** |               |
| Price/cost/efficiency      | Emotional value | Social value |
| Product                   | Service       |               |
| Digital                   | Offline       |               |
| Vertical                  | Horizontal    |               |
| Marketplace participants  |               |
| C2C                       | B2C           | B2B           |
| Customer segment           |               |
| Existing customer segment  | New customer segment | Multi-sided market |
| Geographic scope           |               |
| Global                    | Regional      | Local         |
Table 1. Cont.

| Business Model Attributes                  | Specification |
|--------------------------------------------|---------------|
| **Internal and External Process Optimization** | More flexible offers: individualized mass production, customization, etc. |
| **Customer Interface Improvement**         | Segmentation based on data analysis: greater knowledge of customers’ real needs based on data/social network, predictive personalized marketing |
| **Stages of the business model**           | More direct, closely, efficient and long-term relationships |
| **New Ecosystems and Value Networks**      | Improved digital sales: wide range of devices, coherence between channels, comprehensive customer experience, self-service channels that offered time and cost saving instant answers |
| **New Business Models: Smart Products and Services** | Better products that constantly collect information from customer, the environment and about its performance |
| **Value capture dimension**                | Innovation in associated services: predictive maintenance, activation of product upgrades, ordering spare parts, etc. |
| **Co-creation**                            | Co-creation: customers are part of the value creation process |
| **Direct relationship between the firm and the customers** | Direct relationship between the firm and the customers |

| Key revenue stream | Commissions | Subscriptions | Advertising | Service sales |
|--------------------|-------------|---------------|-------------|---------------|
| **Pricing mechanism** | Fixed pricing | Market pricing | Differentiated pricing |
| **Price discrimination** | Feature based | Location based | Quantity based | None/other |

| Revenue model | Seals | Licensing | Revenue sharing | Premium | Physical | Rent/lease | Usage based | Subscription fee |
|---------------|-------|-----------|-----------------|---------|----------|------------|-------------|------------------|
| **Internal and External Process Optimization** | Cost optimization due to more efficient process and use of resources |
| **Customer Interface Improvement** | Cost saving |
| **Stages of the business model** | New revenue streams: dynamic pricing, pay-per-use-online payment, etc. |
| **New Ecosystems and Value Networks** | Potential increase in value capture due to cost reduction for all stakeholders |
| **New Business Models: Smart Products and Services** | New revenue model: dynamic pricing, pay-per-use, performance-based revenues, etc. |
The presented synthetic review of the business model subject at the background of Industry 4.0 points to a very significant meaning of the employees’ competencies. The companies under digital transformation will search for employees who have developed digital and technical, cognitive and social competencies. In the opinion of many authors [17,66,67], competencies that differentiate the work of a man from the work of information systems, robots or artificial intelligence are of special importance. They can be called the competencies of the future.

2.3. Competencies within Business Models Characteristic for the 4.0 Economy

The literature on the subject includes many approaches to the issue of the competencies of the future. The legacy competencies characterized as competencies of the future and included in Industry 4.0 development, are usually divided by researchers to a few groups. Usually, this division covers three basic groups [9,10,12,13,17,22,23]:

- Digital and technical: these are so-called hard competencies. Digital competencies that are not limited only to programming or data analysis but cover a wide range of skills are especially important: from digital solutions of problems to knowledge from among the privacy and cybersecurity scope.
- Cognitive: also called thinking competencies. This is a very wide concept that covers both creativity and logic reasoning and solving complex problems. First and foremost, these skills are to assist in preparing for the changes brought by Industry 4.0 from the cognitive perspective.
- Social: assumes contact with another person, it is based on teamwork and considers people management. Artificial intelligence is not able to replace us in this sector. Competencies in this group include, among other things: effective cooperation within a group, leadership and entrepreneurship and emotional intelligence.

Wide analysis of competencies in relation to the development of Industry 4.0 and new business models is presented by F. Hecklau M. Galeitzke, S. Flachs, H. Kohlb [27]. However, despite the significant value which is the level of specificity, this division does not deviate from the below and above presented ones. The authors have presented four groups of key competencies differentiated in the concept of Industry 4.0: technical, methodological, social and personal.

Based on the aggregated study results, it follows that the competencies of the future may also be divided using the following typology [20,24–27]:

1. Specialist competencies related to cybernation, belonging to the foundation of Industry 4.0: (1) additive technologies, (2) cybersecurity, (3) autonomous robots, (4) augmented reality, (5) the processing of big data sets, (6) computing cloud, (7) the simulation and visualization of processes, (8) the integration of processes, (9) the industrial Internet of Things, (10) the evaluation of technology and products.

2. Managerial competencies related to management: (1) self and team management; (2) labeling and creating own image; (3) financial management, budgeting, controlling; (4) civil and commercial law, tax procedures; (5) financial and management accounting; (6) business strategies and managerial projects; (7) new projects in management; (8) modern management, methods of business studies and advisory skills; (9) psychology of work, organization and management; (10) public relations (PR), marketing and media; (11) managerial economy (macro and micro); (12) management of human resources and their tools; (13) managerial, leadership and entrepreneurship skills training; (14) quantitative methods and business statistics; (15) ethics, risk management and business decisions; (16) changing management in the context of social and technological progress.

3. Psychosocial competencies, included in the so called soft competencies: (1) personal flexibility, (2) interdisciplinarity.

In order to evaluate candidates and employees for the 4.0 work, except the option to consider competencies and experience, in the authors’ opinion, study of the fit to work is crucial because the fit is manifested by features related to specific skills, experience or professional knowledge. Adaptation to
an organization is related to personal features and adherence to values. The perceived initial fit to work by candidates affects the decision and interests in a given job and organization. The feeling of fit to work is one of the criteria, except the evaluation of one’s own potential, of competencies, the selection of employment and shapes further attitudes towards an employer and place of work \[20,24–31,71\].

2.4. Fit to Work in the 4.0 Organizations

Studies concerning human–organization fit show that this structure is important for keeping an employee in a company, his/her attitudes and behaviors, and important from the perspective of functioning effectiveness of a person and the whole organization.

Muchinsky and Monahan (1987) \[68\] have introduced the terms “supplementary fit” and “complementary fit” in relation to the human–organization relationship. Supplementary fit means similarity within the scope of the goals, value and standards of an employee and organization—an “apple–apple” type fit. However, complementary fit means the mutual complementation of missing but necessary elements in the characteristics of an employee and organization; it is the tuning of organization requirements towards an employee to his/her abilities to cope with such requirements and expectations of an individual towards organization and options to satisfy them—a “plug-socket” type fit \[20\].

Under conditions of low fit to work, the costs of staying within the environment are high and there is an urge to leave. With high level of fit, there are positive emotions and satisfaction from staying within the environment, as well as motivation to maintain the current situation. The studied relations of fit with satisfaction from work and engagement, organizational relationship and taking positively valued actions, first and foremost performing tasks, have led to revealing another two dimensions of the fit, organizational identification and satisfaction from work, that at the same time are perceived as the most important components of attitudes towards an organization. Satisfaction from work is an emotional relationship towards the employing organization, the tasks carried out at work and other aspects of the professional and social functioning within the work environment. Organizational commitment is the feeling of a relationship between an employee and organization, first and foremost expressed by the will to stay as a part of it and to work in its favor. To sum up, the four-factor model of fit is adopted according to Czarnota-Bojarska \[20\].

3. Methodology of the Study

The studies were performed in late 2019 and early 2020 among employees of production companies included among the representatives of Industry 4.0. The employees represent large companies whose business models are based on the implementation of the Industry 4.0 concept. The companies (18 in total) where the studies were performed operate in the automotive sector or cooperate with it. The examined companies declare that they have been implementing Industry 4.0 assumptions for at least three years. These declarations are included in the strategies of the examined companies. The companies adapt to specific markets; however, a significant part of their operations is based on network cooperation with business partners. Additionally the study covered companies that, according to the concept of Industry 4.0, endow the existence of intelligent systems that are cross-linked—vertically connected with other processes within the enterprise and horizontally associated with value-creating networks, including external partners (customers, suppliers, competitors and other entities). Each of the surveyed enterprises uses these relations equally to improve the process of creating, delivering and capturing value. Within the scope of initial studies, the companies underlined that the key barriers in implementing Industry 4.0 are as follows: missing properly qualified specialists (35%), missing competencies of the personnel within the scope of new technologies (23%), uncertainty concerning return on investment (21%), the fear of data security (21%), the costs of adaptation to standards assuring interoperability (21%), the necessity to change business models (19%). It is emphasized that the most important competencies include: knowledge of foreign languages (35%), knowledge of new
technologies/ICT solutions (33%), the ability to specify priorities (31%), the ability to work in a team (25%), time management (25%) and the ability to analyze data (25%).

The quantitative and comparative studies have been performed in three neighboring countries, while keeping the homogeneity of the groups, in Poland, Slovakia and Germany. The selection of the countries was dictated by the reference group in the context of Poland the home country of the authors, where the longitudinal studies are performed, and the attempt to keep the same reference group according to the methodology of the social sciences, especially psychology and management studies. The selection of the countries resulted from the fact that all the examined companies have their branches or partners in these three countries. The empirical material presented in the paper represents a fragment of the studies performed by the authors within the scope of the longitudinal studies that are characterized with a few points in time. The presented material represents the first point in time.

The study was of an explorational nature and tried to answer the key study problem, i.e., how the competencies of companies whose business models are based on implementation of Industry 4.0 are fitted? In order to learn more about the fitting, two study questions were detailed:

1. Are there any relationships between the selected sociodemographic variables (age, seniority in a given position, seniority in general) and the fit to work (understood based on four factors, i.e., complementary fit, supplementary fit, organizational identification, satisfaction from work) in organizations that implement business models based on the concept of Industry 4.0.

2. Are there any differences within the scope of the same components of fit to work in organizations where the business models are based on the implementation of Industry 4.0 concepts, considering the following countries: Poland, Slovakia and Germany.

3.1. Description of the Study Tools

A questionnaire for measuring the subjective fit between a human and organization developed by Joanna Czarnota-Bojarska [20] was used to measure the fit to work. This is a diagnostic tool that is the proprietary diagnostic method described by the author in her book. The author gave her consent to use the said method. This is a validated psychological test. Below, you will find a list of questions together with the content of factor loadings after rotation. The obtained results have been analyzed using the Maximum Likelihood method with Varimax rotation. The initial analysis has shown the separation of three factors; however, the third one obtained an Eigenvalue value of 1.15. The decision was made to rotate the factors. In total, and after rotation, they explained 60.17% of the whole variation. The questions that referred to the complementary fit have obtained higher factor loadings on the first factor and the questions that referred to the supplementary fit on the second factor (see Appendix A) [20].

The questionnaire consisted of 47 test items, providing four factors: (1) supplementary fit, related to the conformity of the values, goals and standards of an individual and organization (16 statements, e.g., “I am required to provide as much as I can give”); (2) complementary fit that identifies conformity between the capacities of an employee and the requirements put before him/her by an organization and between his/her needs and the organization resources (18 statements, e.g., “I fit to my organization”); (3) organizational identification related to the identification of a social group created by the organization (13 statements, e.g., “I think that the organization is important to me”); (4) satisfaction from work. The persons under examinations choose an attitude towards the statements using a six-grade scale of answers (1—definitely do not agree; 6—strongly agree).

The result in each of the scales is calculated as a mean of the test items composing the scale. The higher the results in each of the scales, the better fit within a given scope.

During the current studies, the questionnaire was characterized with high reliability (α of Cronbach for individual scales was 0.97 for supplementary fit; 0.95 for complementary fit; for the conformity of expectations of an organization towards an employee and its capacities and expectations of an individual towards an organization and capacities for their satisfaction by an organization were 0.91 and 0.911, respectively; within our own studies 0.93; 0.89; 0.89, respectively).
3.2. Study Sample

The test included 472 persons working in Industry 4.0 within automated production (working with the 4.0 technology, e.g., with cooperating and industrial robots, 3D printers, programmers). They were employed in large companies (\(n = 248\) in Poland, \(n = 146\) in Germany, \(n = 78\) in Slovakia). The first study group was selected based on homogeneous fit in three countries for inter-group comparative purposes. The companies characterized with the automation of the production lines and the study sample performed all the aforementioned professions. The average age of the persons was 30.16 years of age (standard deviation (SD) = 12.15). Their general seniority was 18.75 years (SD = 12.08) and the seniority on a given function was in average 10.38 (SD = 9.68). The average age and seniority in each of the three groups is presented in Table 2. All persons under examination were informed about the goals of the study and agreed to participate in it.

Table 2. The variables fit to work in the Industry 4.0 organizations: descriptive statistics and Pearson’s linear correlation factors between the variables.

|                  | Alpha | M    | Me   | SD    | 1   | 2   | 3   | 4   | 5   | 6   |
|------------------|-------|------|------|-------|-----|-----|-----|-----|-----|-----|
| 1. Age           | -     | 30.16| 24.00| 12.15 | -   |     |     |     |     |     |
| 2. General seniority | -    | 18.75| 19.00| 12.08 | 0.84 *** | -   |     |     |     |     |
| 3. Seniority on a given function | -    | 10.38| 7.00  | 9.68  | 0.63 *** | 0.66 *** | -   |     |     |     |
| 4. Complementary fit | 0.94 | 3.35 | 3.50  | 0.82  | 0.21 ** | 0.18 | 0.14 | -   |     |     |
| 5. Supplementary fit | 0.80 | 3.11 | 3.17  | 0.56  | 0.14 *  | 0.06  | 0.06  | 0.87 *** | -   |     |
| 6. Organizational identification | 0.92 | 3.33 | 3.54  | 0.85  | 0.24 *** | 0.24 * | 0.23  | 0.91 *** | 0.83 *** | - |
| 7. Satisfaction    | 0.69  | 3.33 | 3.67  | 0.89  | 0.21 ** | 0.14  | 0.24  | 0.74 *** | 0.69 *** | 0.81 *** |

* \(p < 0.05\); ** \(p < 0.01\); *** \(p < 0.001\).

4. Results of the Studies

Table 2 presents the descriptive statistics concerning age, seniority and fit to work within the group under examination together with correlations between variables.

The analysis has shown that there is a weak, positive, statistically important relationship between age and complementary fit \((r = 0.21; \ p = 0.002)\), supplementary fit \((r = 0.14; \ p = 0.037)\), organizational identification \((r = 0.24; \ p < 0.001)\) and satisfaction from work \((r = 0.21; \ p = 0.001)\). This means that, together with higher age, there was better complementary and supplementary fit to work, better organizational identification and better satisfaction from work.

General seniority was however weakly and positively related to organizational identification \((r = 0.24; \ p = 0.019)\). This means that persons with higher general seniority characterized by higher level of organizational identification.

Then, the individual dimensions of fitting to work were compared using ANOVA variance analysis for the individual three study groups from three countries, Slovakia, Germany and Poland. Due to the missing satisfaction of the sphericity assumption \((W = 0.59; \chi^2 [5] = 247.43; \ p < 0.001)\), a correction of the degrees of freedom and Huynh–Feldt correction \((\varepsilon = 0.76)\) were applied.

The analysis shows statistically important, small differences between the results within the scope of individual components: \(F(2.30; \ 195.60) = 43.32; \ p < 0.001\); \(\omega^2 = 0.02\). The differences between averages concerning individual fitting components are presented in Figure 1.
However, the results within all components were at the moderate level, the employees of the 4.0 organization obtained lower results within the scope of supplementary fit that was significantly lower than complementary fit ($t = 11.73; p_{bon} < 0.001; d = 0.54$), organizational identification ($t = 9.69; p_{bon} < 0.001; d = 0.45$) and satisfaction from work ($t = 7.39; p_{bon} < 0.001; d = 0.34$). At the same time, within the studied group, the levels of complementary fit, organizational identification and satisfaction were similar.

There were also significant differences between the three individual study samples within the scope of complementary fit: $F(2; 182.97) = 128.22; p < 0.001; \omega^2 = 0.35$; supplementary fit: $F(2; 469) = 93.79; p < 0.001; \omega^2 = 0.28$; organizational identification: $F(2; 18.30) = 111.81; p < 0.001; \omega^2 = 0.32$; and satisfaction from work: $F(2; 469) = 42.20; p < 0.001; \omega^2 = 0.15$. The differences between the groups are given in Figure 2.

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**Figure 1.** Differences within the scope of components of fitting to work in the 4.0 organizations.

**Figure 2.** Differences within the scope of components of fitting to work in the Industry 4.0 organizations: differences between the measurements (Group 1—Poland, Group 2—Slovakia, Group 3—Germany).
Even though the results within all the components were at a moderate level regardless of the country of the study, employees of Polish 4.0 organizations obtained consequently higher results for all components of fitting to work compared to employees from Slovakia and Germany.

5. Discussion

Based on the studies of fitting to work and Industry 4.0 organizations, among employees representing professions and companies included among Industry 4.0, the results show that the age of the persons under examination coexists with complementary and supplementary fit to work, higher organizational identification, and a higher level of satisfaction from work in favor of more mature employees, which allows us to debunk a myth that young persons from digital generations are best suited for Industry 4.0 work [9,10,12,13]. The result is interesting because it assumes, in the practical implications, that older staff can be effectively retrained from manual production to production that uses new technologies, which indirectly mitigates technological unemployment effects and affects investing in acquiring competencies in the future in Industry 4.0 business models when going through the process of digital transformation. On the other hand, this may suggest that the process of building the competencies of the future is based on the first stage of approaching to new business models, i.e., the stage of internal and external process optimization. The results concerning the dependency of persons with higher general seniority characterized by higher level of organizational identification are also important. This may relate to reaching out for mechanisms of the better utilization of resources and costs optimization to a high extent [30,31].

Small differences were obtained between the results within the scope of individual components of fitting to work in Industry 4.0, as well as the results at a moderate level: employees of the 4.0 organizations obtained lower results within the scope of supplementary fit that were noticeably lower than complementary fit. At the same time, within the studied group, the levels of complementary fit, organizational identification and satisfaction were similar. Therefore, a generalized evaluation of the moderate level of fit to 4.0 works within the studied companies is possible, i.e., the competencies possessed at the beginning, necessary to perform new works. This allows asking questions concerning the comprehension of the new business models structure. If the optimization of resources utilization is a task that has been performed for many years, the vision of values based on new streams, new physical resources, and relations with other entities is not completely understandable, as it derives from lower results within the complementary fit [26–28].

Significant differences between the three individual study samples are observed within the scope of complementary fit, supplementary fit, organizational identification and satisfaction from work. Although the results within all components were at a moderate level regardless of the country of the study, employees of Polish 4.0 organizations obtained consequently higher results for all components of fitting to work comparing to employees from Slovakia and Germany, which points to directions of further studies that consider the social identity of the examined persons.

6. Conclusions

New business models based on Industry 4.0 assume, like in the case of the previous industrial revolutions, the change of employees’ competencies. The creation of the competencies of the future is emphasized here, because fourth-generation industry is a term that goes beyond the adaptation of digital technologies by companies. It covers the various utilizations of these technologies and the integration of data in order to improve business processes, new forms of employment, new leadership, new skills. The studies have shown that fitting to work within the scope of business model development is at moderate level and the supplementary fit, responsible for vision, strategy and value at the lowest level (compared to other ones). This allows for making a hypothesis that the stage of approaching the new business models has just started. The question is how much time the companies need to apply new models? This is especially important in cases when the studies covered large international and innovative companies.
The presented results are the first stage of the performed studies designed as longitudinal studies, measuring the increase of the completing and change in the fit to work using annual intervals. In the light of the obtained results, the assumed direction of the studies focused on companies whose business models are based on the implementation of the Industry 4.0 concept is found to be justified [30,31,69].

The legitimacy of further studies results from some limitations. One of them is the selection of large companies where the Industry 4.0 concept is a strategic necessity. In the future, the selection of companies should be oriented at small and medium-sized enterprises (SMEs) as networks of supply chains. Industry 4.0 assumes that interaction will be possible not only between machines, and machines and people, but between all the previously independent stages of production. Therefore, they will not be optimized separately, like today, but interdependently. Another limitation is the missing reference points and the option to compare the study results. The study concerning the fit to work at companies implementing the Industry 4.0 concept based on the four components complementary fit, supplementary fit, organizational identification, satisfaction from work are performed for the first time. As mentioned, they will be continued at annual intervals. Another limitation is the selection of countries for the study and the number of people included in the study. The assumption that these companies work in all three mentioned countries was used. It would be interesting to compare individual companies operating in different countries using the proportional selection of the study sample. Another limitation is the selection of companies that are focused on automotive industry. Within this scope, there will be further longitudinal studies performed; however, the results of the studies should be the basis for the analysis of this problem in other sectors of the economy.

An important direction highlighted in the literature on the subject, in the context of sustainable development, is to conduct comparative research on a wider scale, taking into account cultural differences. This requires an increase in the number of samples representing countries in all continents. Many authors also recommend focusing on the interaction between individual and social factors and the inclusion of mediators and moderators in empirical analyses [70–74].

To sum up, future studies should involve the continuation of the present study, together with the consequent widening of the study problem by the stages of the business model development of the Industry 4.0 era and new sectors of the economy.

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**Appendix A**

Questions included in the questionnaire of the subjective feeling of human–organization fit. The second column includes the value of factor loadings after rotation [3] (pp. 46, 47 and 77).

| Question included in the questionnaire of the subjective feeling of human–organization fit | Factor Loading |
|----------------------------------|---------------|
| My competencies/skills are useful for the company | 0.876 |
| I do not tell anyone that I am an employer of the company® | 0.854 |
| I respect my coworkers | 0.827 |
| My work contributes to the company’s success | 0.824 |
| I am ashamed that I work for the company® | 0.824 |
| Question included in the questionnaire of the subjective feeling of human–organization fit | Factor Loading |
|---|---|
| I like the people I work with | 0.821 |
| My work is important for the company | 0.811 |
| I feel bad in the organization® | 0.754 |
| I feel needed in the organizations | 0.668 |
| I know what the company expects of me | 0.668 |
| I think negative about my organization® | 0.635 |
| I am not afraid to express my opinions in the organization | 0.612 |
| I fit to my organization | 0.603 |
| My character matches the organization expectations | 0.595 |
| I do not feel discriminated against in the organization for any reason | 0.575 |
| I do not have to hide any features of my character at work | 0.550 |
| Work at the company is a challenge for me | 0.545 |
| I can be myself at the company | 0.541 |
| The company provides me proper working conditions | 0.629 |
| I am at the place where I should be | 0.615 |
| They expect of me as much as I can give | 0.487 |
| I feel comfortable with the scope of my duties | 0.510 |
| Work at the company matches my capabilities | 0.489 |
| I feel that the company takes care of me | 0.670 |
| The company values my work | 0.731 |
| The company satisfies my expectations concerning conditions and place of work | 0.643 |
| I feel appreciated at the company | 0.753 |
| I feel that I develop at the company | 0.731 |
| I feel good with the company’s operating principles | 0.706 |
| Work time at the company does not affect my personal plans | 0.389 |
| The organization satisfies my development needs | 0.795 |
| I feel fairly rewarded | 0.702 |
| I feel that I have sufficient impact on the company’s operations | 0.598 |
| Work at the company does not have a bad influence | 0.496 |
| I identify with the organization | 0.838 |
| I am proud that I belong to the organization | 0.812 |
| I feel strongly related with the company | 0.801 |
| I perceive success of the company as my own | 0.780 |
| I think of myself as of the organization member | 0.763 |
| Question included in the questionnaire of the subjective feeling of human–organization fit | Factor Loading |
|-----------------------------------------------|----------------|
| Things important for the company are important for me | 0.748 |
| It gives me pleasure when someone praises the company | 0.738 |
| I think that the organization is important to me | 0.723 |
| When talking about the company I use “we” rather than them | 0.716 |
| I relate my future with the company | 0.670 |
| I feel offended when someone criticizes my company | 0.657 |
| I feel company’s failures as my own | 0.606 |
| Members of the company have greater influence on me than other people | 0.222 |

®—rotated scale of answers

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