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Moderating Effect of Industry 4.0 on the Performance of Enterprises in the Constrains Related to COVID-19 in the Perception of Employees in Slovakia

Zdenka Gyurák Babeľová, Natália Vraňaková and Augustín Stareček *

Faculty of Material Science and Technology in Trnava, Institute of Industrial Engineering and Management, Slovak University of Technology in Bratislava, Ulica Jána Bottu č. 2781/25, 917 24 Trnava, Slovakia
* Correspondence: augustin.starecek@stuba.sk

Abstract: Organizational performance, as well as the performance of industrial enterprises, is affected by changes caused by technological progress and the overall societal situation. Industry 4.0 affords the transformation of the industrial economy to the digital economy. In addition to the mentioned important technological initiative, the organizational performance is determined by the pandemic situation related to the disease COVID-19, which shook the economy of many countries. Society-wide measures accelerated the implementation of Industry 4.0 elements in the management of organizations. The main aim of the presented research was to examine the employees' perception of the impact of the Industry 4.0 implementation (digitalization) on the enterprise's performance during the COVID-19 pandemic. The results confirmed that employees in various job positions perceive that Industry 4.0 positively affected the organization's performance during the pandemic. The employees themselves contribute significantly to the enterprise's performance, but their performance is limited by the number of tasks that the employer can assign to them during pandemic measures. Enterprise performance will be subsequently reflected in the financial condition, which is limiting for many areas of human resource management. Notably, satisfaction with compensation is an area that is a significant predictor of perceived corporate performance. The results also showed that the pandemic had a negatively perceived impact on employee compensation. For the sustainable management of human resources, the perception of remuneration by employees and the appropriate remuneration itself is an important challenge regarding the relationship between employees and the organization.

Keywords: COVID-19; disadvantaged employees; human resource management; Industry 4.0; organizational performance; rewards

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1. Introduction

Industry 4.0 offers not only technical breakthroughs, but also diverse opportunities and benefits such as highly adaptive, flexible, and customized mass production, real-time coordination of value streams, their optimization, and a reduction in the cost of production complexity. In addition, Industry 4.0 enables the creation and emergence of new service and business models (Kumar and Nayyar 2020). The options for implementing Industry 4.0 vary between countries depending on the level of mastery of applying related technologies (Nasution 2020). From a long-term perspective, there is a significant increase in the importance and interest in process automation and innovation in companies in Slovakia, and also information engineering (Papula et al. 2019).

Industry 4.0 changes business strategies, business models, value and supply chains, processes, products, required skills and relationships with stakeholders, and creates new opportunities and spaces for improvements that need to be managed to have a positive impact on business and society as a whole (Büchi et al. 2020).

Industry 4.0 has a positive impact on the organizational performance (Calış Duman and Akdemir 2021) and is also beneficial in achieving business sustainability (Gupta et al.

2021). Although Industry 4.0 offers many possibilities, it is difficult for the management in the manufacturing industry to implement strategies that take advantage of the possibilities of using the collected data. The challenge is getting the returns on investment that are needed on a large scale to adapt their business models or respond to customer churn and reduce customer churn rates (Zeenea 2021). Other expected benefits from the implementation of Industry 4.0 include improved product customization, optimization of automation equipment, increased energy efficiency, improved product quality, improved decision-making process, reduced operating costs, increased productivity, increased employee safety, creation of new business models, reduced time to launch the product on the market, improvement of sustainability, improvement of control processes, reduction of work demands and demandingness, and compensation of the lack of qualified labour force (Dalenogare et al. 2018).

A key aspect of Industry 4.0 is the social aspect, which includes employees (El Hamdi et al. 2019). New knowledge and skills are required (Ras et al. 2017), which must be acquired through effective training depending on the job position (Gallo and Santolamazza 2021). For sustainability and transformation in Industry 4.0, education is a fundamental factor in order for job candidates or current employees to acquire the required competencies (Vetiska et al. 2021). There is a strong relationship between human beings and Industry 4.0 or human beings and organizations. If Industry 4.0 will be effective worldwide, it can be assumed that there will be a complete change in the structure of human resources in the organization, but also in the social and business life of people. Although operational processes will largely be carried out by robots and machines, through Industry 4.0 there will be extraordinary revolutions in the capabilities of people (Ortiz et al. 2020). The use of advanced and modern technologies will facilitate manual work from the point of view of ergonomics and safety, some job positions will be significantly affected by the implementation of modern technologies, but more technical knowledge will also be required, which presents new challenges for engineering and operational employees (Neumann et al. 2021). The goal is to develop increasingly advanced technologies that support employees, increasing their physical and mental receptivity without causing additional stress or physical and psychological problems (Valentina et al. 2021). A positive relationship between performance indicators and Industry 4.0 was also proven in terms of operational flexibility of production, agility and responsiveness of production, complexity of production, quality of production, customer satisfaction, sustainable production, robustness of production, production costs, production time, production productivity, production reliability, profitability production, and inventory in the supply chain (Bueno et al. 2020).

The latest technologies based on the Internet, using social networking tools and mobile technologies, have not only enabled individuals to interact and create experiences, but have also given businesses and consumers unprecedented opportunities to connect (Neuhofer et al. 2015). The use of digital technologies enables businesses to increase their economic sustainability. Businesses that obtain accurate information in real time can have a competitive advantage. In Industry 4.0, the adoption of digital technologies supports efficient and effective decision-making. A digitally equipped technological structure will thus be a necessity for businesses to ensure performance (Y. Li et al. 2020). The elements of Industry 4.0 represent the introduction of new technologies with the aim to improve business processes and to facilitate the work of employees, which may have contributed to better managing the situation associated with the COVID-19 pandemic (Narayanamurthy and Tortorella 2021).

The pandemic had a strong impact on the field of human resource management (Yas et al. 2020) and it was particularly difficult for this area (Collings et al. 2021), when managers were forced to help employees adapt and cope with radical changes occurring in the work environment. For example, employees who previously spent all or most of their time in work at the workplace had to quickly adapt to remote work. This fact can result in socio-psychological, physical, and technical consequences for employees who try to adapt to a drastically changed work environment without adequate preparation and training.

(Carnevale and Hatak 2020). It is necessary to monitor and investigate individual aspects aimed at revealing the determinants of work performance, while these data can help in the study of family and socio-professional effects of the COVID-19 pandemic on employees (Mgammal and Al-Matari 2021). The pandemic has accelerated digital transformation, changed work roles, and led to an urgent need for frequent and high-quality communication between managers and employees (J.-Y. Li et al. 2021). In order to effectively manage human resources in the virtual workplace, it is necessary to first arrange and explain the new reality, then maintain a common culture and strengthen the perception of the leader's credibility, upgrade communication procedures, and improve techniques for employee awareness in the virtual space, support leadership among team members, and create and periodically conduct an employee audit in order to verify whether the employees are identified with the organization's values (Newman and Ford 2021). Human resource management makes a significant contribution by introducing human resources processes, training employees not only in the skills that are currently needed, but also in the development of skills needed in the future in the event of a change in circumstances. Human resource management should focus on issues in the personnel development program. On the other hand, however, crisis management dictates organizations to reduce the cost of training and development activities, and therefore it is important to find the right balance between reducing costs due to the recession and developing employees. Otherwise, it is impossible to achieve efficiency and effectiveness (Gigauri 2020). During the outbreak of the COVID-19 pandemic, employee performance management was limited or even absent due to the complexities and obstacles associated with the pandemic (Aguinis and Burgi-Tian 2021), while employers cannot distinguish the contribution of employees in the interest of further career growth (Sadhna et al. 2020; Zhong et al. 2021).

Organizational performance is not only influenced by the capability and maturity of its processes (Paulova et al. 2009; Papula et al. 2014; Sujová and Marcineková 2015; Simanová and Gejdoš 2019) but also the performance of its employees (Delaney and Huselid 1996; Brewster et al. 2016; Závadský et al. 2019). Employees deserve to be adequately rewarded for their job efforts. There is a general opinion that remuneration should be dependent on job performance. It is reasoned that people will be motivated to perform better at work if they believe that their efforts will lead to a desired reward. That means that what is available and can be used to reward an individual's work outcomes and to motivate individual effort and performance is a monetary reward (Koubek 2002). Remuneration of employees is largely dependent on the nature of the work performed (employee's job position), but it is also significantly influenced by the level of work performance. A frequent problem can be the perception of employee remuneration for the achieved job performance, which results from the subjective perception of the employee. If employees feel that they have much more work than their colleagues, or feel that their efforts are not adequately rewarded, this causes them stress (Notelaers et al. 2019). However, the pandemic situation limited several areas of human resource management, and the restrictions were also related to the ability to control the performance of employees. In addition, the overall economic situation of the organization also affects the organization's decisions on compensation (Joniaková et al. 2016). COVID-19 has brought a new type and scale of challenges to businesses. Management of organizations had to take various measures to manage the crisis (Kraus et al. 2020). COVID-19 also had a significant impact on employee compensation (ILO-OECD 2020; Eurofund Europa 2021). Remuneration of employees does not only affect their income, which is reflected in the purchasing power of the population. In addition to defining a certain economic status, it has a significant impact on employee motivation (Hidi 2016), their satisfaction (Phillips et al. 2017; Baporikar 2021), and a sense of security in the fair allocation of rewards (Nyameh 2013). Employees contribute to the creation of a competitive advantage with their performance (Dobre 2013) and performance of their organizations (Manzoor 2012; Lorincová et al. 2019). The performance of the organization will be reflected in its financial results. Employees have the opportunity to perceive the economic situation of the organization, especially in terms of what conditions the organization creates for them

for their work and how it rewards them. Employee compensation is therefore an important factor that affects how employees perceive the organization's performance and are willing to contribute with their work efforts to the organization's performance.

2. Materials and Methods

Based on the stated theoretical background, previous research, own experience, partial studies, and case studies from enterprises, the authors of the paper proposed the theoretical research framework shown in Figure 1, formulated the research aim, proposed the research design, and formulated research questions and research hypotheses.

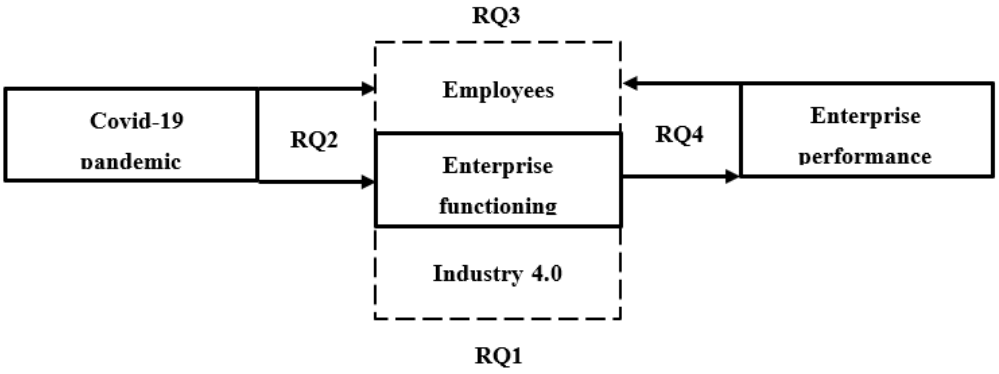

Figure 1. Research framework of the mutual relationship between employee performance and enterprise performance, taking into account the impact of external factors (COVID-19) and internal factors (implementation of Industry 4.0) affecting performance (own elaboration).

Figure 1 shows the relationships between the investigated variables. Individual researched areas are shown as RQ1 (Research question), RQ2, RQ3, and RQ4, which symbolize defined research questions, formulated by the authors to ascertain the research problem. The dashed lines show that the enterprise represents a technical but also a social system. Successful interactions between the individual components of these socio-technical subsystems create the performance of the enterprise.

2.1. Main Aim of the Research, Research Questions (RQs), and Research Hypotheses (RHs)

The following part of the paper contains the definition of the main aim of the research and the main aim of the paper. Furthermore, it contains the formulation of defined research questions (RQs) and the definition of research hypotheses (RHs). It also includes a description of the collection tool and the method of obtained data processing. The last part is focused on a description of the research sample.

The main aim of the paper is to present the results of research focused on the impact of the implementation of Industry 4.0 as perceived by respondents during the COVID-19 pandemic in Slovakia.

The main aim of the presented research was to examine the employees' perception of the impact of the Industry 4.0 implementation (digitalization) on their and the enterprise's performance during the COVID-19 pandemic.

Research questions (RQs):

RQ1: In the opinion of the respondents, how did the implementation of Industry 4.0 areas affect the functioning of the enterprise during the COVID-19 pandemic?

RQ2: What is the difference in the perception of respondents and their workload during the COVID-19 pandemic?

RQ3: How do the respondents perceive job threats due to the implementation of Industry 4.0?

RQ4: How does respondents' satisfaction with remuneration affect their perception of enterprise performance?

Research hypotheses (RHs):

RH1: The implementation of Industry 4.0 during the COVID-19 pandemic had a positive effect on the performance of the organization, regardless of the sector of the economy.

RH2: The job position the employee works in has no influence on the perception of job threats due to the introduction of Industry 4.0.

In order to collect the required data, qualitative research was chosen. Persons with awareness of industrial engineering were selected as the respondents of the research.

2.2. Data Collection and Methods of Analysis

The data were collected as part of the research task of the VEGA project: Identification of priorities for sustainable human resources management with respect to disadvantaged employees in the context of Industry 4.0. The questionnaire method of data collection was used for data collection. The questionnaire was distributed electronically through an electronic form and physically in paper form at the same time. Data collection took place from 01.05.2020 to 31.05.2021. In total, 311 respondents filled out the questionnaire, with 287 questionnaires completely and correctly completed.

The collected data were processed using MS Excel. After the initial data processing through descriptive statistics, the data were further processed in the statistical program IBM SPSS 23.0 (Statistical Package for the Social Sciences). Tables of absolute frequencies, cross tables, pie diagrams, and histograms of frequencies, as well as higher statistical methods such as correlation analysis, were used as an output of the data analysis and processing of the results of the defined research questions and research hypotheses. The Spearman's rho correlation test was used to evaluate the set research questions, which is suitable for both continuous and discrete ordinal variables (Lehman et al. 2005). Spearman's rho (Fredricks and Nelsen 2007) is one of the most frequently used non-parametric statistical tests for the degree of association for two random variables. In terms of dependence attributes, Spearman's is a measure of average quadrant dependence (Nelsen 1992). For the above-mentioned reason, the Spearman's rho correlation coefficient was used.

2.3. Description of the Research Sample

The research questionnaire was distributed within industrial enterprises operating in Slovakia. Based on the SK-NACE classification, all respondents were classified into 17 groups according to the industry in which the enterprise operates. The largest group consisted of employees from the Automotive industry 65 respondents (22.65%), Engineering 35 (12.19%), Manufacturing and others 25 (08.71%), Transport and logistics 23 (08.01%), Electrical engineering 20 (6.97%), Information Technology 16 (05.57%), Food Industry 13 (04.53%), Construction 13 (04.53%), Metallurgy 11 (03.83%), Development and Testing 9 (03.14%), Chemistry and Plastics 7 (2.44%), Design and Engineering 7 (02.44%), Energy and Mining 6 (02.09%), Telecommunications 6 (02.09%), Agriculture and forestry 1 (00.35%). There were 8 respondents without an answer (02.79%). Others (E-shop, others, economy, finance and banking, public administration, healthcare, psychology, third sector, social services) 22 (07.67%).

Another analysis, which was intended for the characteristics of the research sample, focused on the job position held by the respondents in industrial enterprises at the time of filling out the questionnaire. In Table 1, we can see the answers of the respondents.

Table 1. Respondents' job position (own elaboration).

Job Position	Absolute Frequency	Relative Frequency [%]
Manufacturing job position	31	10.7
Administrative job position	95	33.1
Specialist job position	57	19.9
Managerial job position	39	13.6
Alternative employment	62	21.6
Uncategorized	3	1.1
∑ Sum	287	100.00

It follows from Table 1 above that the largest group consists of employees who held an administrative job position (33.1%), and the second largest group is employees in an alternative employment relationship. An alternative employment relationship must be understood as an employment relationship that is not a typical employment relationship between an employee and an employer, but an employment relationship concluded on the basis of independent contractor agreements. The conclusion of any of the agreements (in Slovakia there are three different types—employment agreement, agreement to perform work, agreement on part-time student work) is conditional on the fulfilment of legal conditions. This group consists of 21.6% of respondents. The third largest group are employees of industrial enterprises who work in specialist positions (19.9%). The least numerous groups are respondents who stated that they were working on other than the offered answer options, with the mentioned group comprising 1.1% of the answers (3 respondents).

Table 2 contains data on the characteristics of the research sample, which is the gender of the respondents. Table 2 below shows the absolute and relative frequency of the proportion of male and female respondents.

Table 2. Respondents by gender (own elaboration).

Gender	Absolute Frequency	Relative Frequency [%]
Male	136	47.4
Female	151	52.6
∑ Sum	287	100.00

Table 2 shows that 47.4% (136 respondents) were male and 52.6% (151 respondents) were female. The stated fact can be considered positive in view of the evaluation of the defined research questions and research hypotheses.

3. Results and Discussion

The following part of the paper is focused on the evaluation of research questions (RQs) and the evaluation of research hypotheses (RHs).

RQ1: In the opinion of the respondents, how did the implementation of Industry 4.0 areas affect the functioning of the enterprise during the COVID-19 pandemic? For the evaluation of RQ1, the respondents' answers from the research questionnaire were compared. Table 3 shows the respondents' answers on how the introduction of Industry 4.0 elements affected the functioning of organizations.

Table 3. The level of support for Industry 4.0 elements and organization management (own elaboration).

Option	Absolute Frequency	Relative Frequency [%]
Achieves better productivity and results	212	73.8
Achieves the same productivity and results	46	16.0
Achieves lower productivity and results	10	3.4
Enterprise received sufficient support from the state, the government of the Slovak Republic	9	3.1
Enterprise has existential problems	6	2.1
I cannot assess, the organization has not implemented Industry 4.0 elements	4	1.6
∑ Sum	287	100.00

Based on the descriptive processing of the results shown in Table 3, we can conclude that the majority of respondents 212 (73.8%) thought that the introduction of Industry 4.0 elements had a positive impact on the productivity of the organization. The second most common answer was that organizations achieve the same productivity as before the introduction of Industry 4.0 elements, with a total of 46 respondents (16.0%).

The functioning of organizations is influenced by several factors from the internal and external environment. The COVID-19 pandemic was a factor that dramatically affected the functioning of organizations

Table 4 shows the responses of the respondents to how they perceive the fact whether the introduced Industry 4.0 elements helped the organization to cope with the pandemic situation related to the COVID-19 disease.

Table 4. Coping with a pandemic situation using Industry 4.0 elements (own elaboration).

Option	Absolute Frequency	Relative Frequency [%]
Yes, positively	124	43.2
Yes, negative	9	3.1
No	35	12.2
I do not know	119	41.5
∑ Sum	287	100.00

The results in Table 4 showed that employees of industrial enterprises positively perceive how the introduced elements of Industry 4.0 in their enterprises made it possible to manage the pandemic situation (43.2%). Only 12.2% (35 respondents) think that the introduced elements of Industry 4.0 did not help to manage the COVID-19 pandemic. The second largest group of answers was the answer 'I don't know', which was chosen by up to 41.5% of respondents.

Based on the evaluation of the first research question (RQ1), we can conclude that the implementation of the elements has a positive effect not only on the productivity of organizations, but also on the management of the pandemic situation related to the COVID-19 disease. The industrial revolution Industry 4.0 is therefore important due to the introduction of new technologies that have facilitated business activities and thus mitigated the consequences and impacts of the global pandemic (Narayanamurthy and Tortorella 2021; Raišienė et al. 2020). Additionally, other research confirmed that in the long term, increasing digital skills can bring benefits not only to organizations but also to the national economy, for example, in creating greater resilience of the economy in times of crisis or pandemic (Stofkova et al. 2022).

RQ2: What is the difference in the perception of respondents (employees) and their workload during the COVID-19 pandemic?

For the needs of evaluating the second research question (RQ2), we asked respondents about their perception of workload during the COVID-19 pandemic. A total of 107 (37.6%) respondents answered that they had less workload resulting from their work duties. This was followed by 99 respondents (34.5%) who marked the answer that they had the same work as before (resulting from their work duties). The smallest group of respondents was created by respondents who indicated the answer of more work resulting from their work duties, 81 respondents (28.2%) indicated mentioned option. For a detailed analysis, the authors of the paper carried out a partial analysis, which was aimed at comparing the answers according to the respondents' job position. The results can be seen in Table 5.

Table 5. Workload assessment by job position (own elaboration).

Option	Less Work Resulting from Work Duties [%]	Same Work as before (Resulting from Work Duties) [%]	More Work than before (Resulting from Work Duties) [%]	∑ Sum [%]
Manufacturing job position	61.2	19.4	19.4	100.00
Administrative job position	31.5	43.2	25.3	100.00
Specialist job position	26.3	31.6	42.1	100.00
Managerial job position	30.8	33.3	35.9	100.00
Alternative employment	46.8	32.3	20.9	100.00
Uncategorized	33.3	66.7	0.00	100.00
∑ Sum [%]	229.9	226.5	143.6	—

It follows from Table 5 that administrative employees and other job classifications had more work resulting from their work duties. Conversely, production employees and people working on the basis of alternative employment relationships had less work resulting from their work duties. The option that they have more work resulting from their work duties was mentioned by the respondents in the specialist and managerial job positions.

Based on a partial analysis of the answers, we can conclude that the pandemic situation mostly affected the possibility of assigning work tasks to production employees and people working on the basis of alternative employment relationships who were at home without work during the pandemic. The impossibility of performing work tasks to the full extent was also influenced by the fact that companies had to revaluate methods of determining rewards, and the negative impact was also reflected in the remuneration of employees (Eurofund Europa 2021; SHRM.ORG 2021). On the contrary, administrative employees and other job categories performed work from home, which had a negative impact on their mental health (Carnevale and Hatak 2020; Mgammal and Al-Matari 2021).

RQ3: How do the respondents perceive job threats due to the implementation of Industry 4.0? It is clear from the answers of the respondents that they perceive manufacturing job positions as the most threatened. Two hundred respondents, which represents 69.5%, identified manufacturing employees as most at risk. Managerial positions (18% of respondents) and specialist positions (19% of respondents) were considered to be the least threatened job positions. The results are shown in Table 6.

For the given answers (Table 6), the respondents had the opportunity to state the reason why they consider the job position, which they identified as threatened by the impact of the introduction of Industry 4.0, to be disadvantaged. Overall, 211 out of 287 respondents (71%) provided an explanation. The biggest part, 96 respondents (45.6%), considered the indicated job positions to be at risk due to robotization and automation. The findings from our questionnaire are supported by research (Richnák 2022), according to which up to 51.7% of companies will eliminate jobs and 44.8% will partially eliminate jobs. At the same time, the author came to the conclusion that companies will move employees to departments and positions that will not be fully digitized. Overall, 41 respondents (19.5%) stated that these positions to be unnecessary and redundant. Surprisingly, 31 respondents

(14.7%) considered education, retraining, and adaptation as the reason for disadvantage. It can be said that employee education and knowledge sharing become a necessity in organizations not only in connection with the implementation of Industry 4.0. Managers and human resources specialists must focus on emphasizing the continuous development of all employees and knowledge transfer with continuous feedback in all organizations (Vrabcová et al. 2022; Miško et al. 2022). Other respondents identified the increase in administrative duties, psychological factors (distrust, increased pressure, overwhelm), and the need for higher productivity or the impossibility of a home office as the reason.

Table 6. Job positions perceived as threatened by the impact of Industry 4.0 implementation (own elaboration).

Threatened Job Positions	Absolute Frequency	Relative Frequency [%]
Manufacturing job positions	200	69.5
Administrative job positions	37	12.7
Specialist job positions	19	6.4
Managerial job positions	18	6.2
No job positions	10	4.0
Older employees	1	0.4
Operational employees	1	0.4
All employees	1	0.4
∑ Sum	287	100.00

RQ4: How does respondents' satisfaction with remuneration affect their perception of enterprise performance? As part of the evaluation of the third research question, the data of the questionnaire were processed, specifically from the part focused on the assessment of satisfaction with the components of remuneration, which was affected by the COVID-19 pandemic. We can see the results of the evaluation within the framework of positive and negative influence in Figure 2.

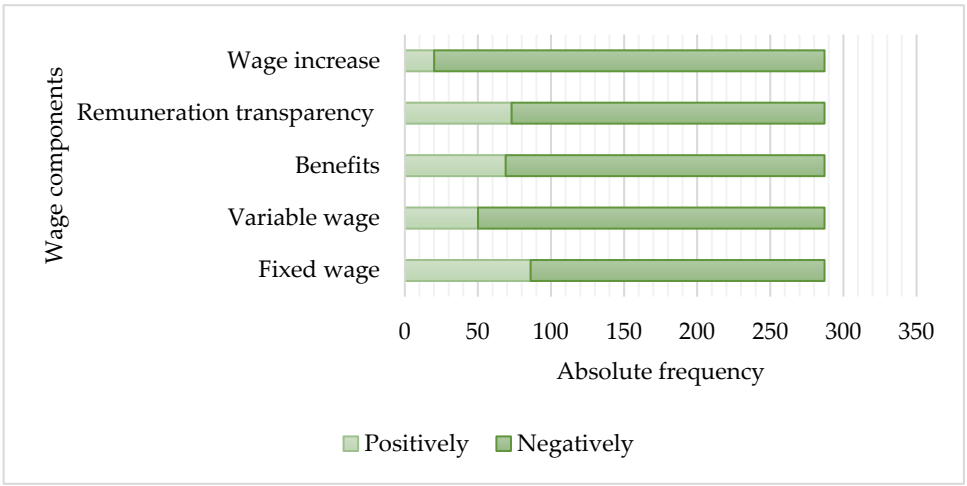

Figure 2. Evaluation of satisfaction with remuneration components (own elaboration).

Based on Figure 2, according to respondents, all components of remuneration were negatively affected by the impact of the COVID-19 pandemic. Wage growth and variable wages were most negatively affected.

The second part of the third research question analysis related to the perceived influence of satisfaction with remuneration on the perception of enterprise performance, according to the job position of the respondents, is in Table 7 below.

Table 7. Perceived impact of satisfaction with remuneration on perception of enterprise performance—by job position (own elaboration).

Option	Significantly [%]	Partially [%]	No at All [%]	I Do Not Know [%]	∑ Sum [%]
Manufacturing job position	51.61	32.26	3.23	12.90	100.00
Administrative job position	56.04	34.07	1.10	8.79	100.00
Specialist job position	59.02	27.86	4.92	8.20	100.00
Managerial job position	64.10	25.64	0.00	10.26	100.00
Alternative employment	55.38	33.85	3.08	7.69	100.00
Uncategorized	66.67	33.33	0.00	0.00	100.00
∑ Sum [%]	352.82	187.01	12.33	47.84	—

From the results shown in Table 7, it is clear that perceived satisfaction with remuneration and organizational performance has a significant relationship. Regardless of the job classification of the respondents, it was shown that all respondents think that remuneration has a significant impact on the performance of the organization.

Based on the research model shown in Figure 1, a two-way relationship can be observed between employee performance and enterprise performance. The performance of the people who work in the organization has a significant impact on the performance of the organization (Delaney and Huselid 1996; Brewster et al. 2016; Závadský et al. 2019). The performance of the enterprise will be subsequently, with a certain time delay, reflected in the financial results and indicators (Fibírová and Šoljaková 2005; Wagner 2009). If, in the sense of socially responsible entrepreneurship, the improvement of financial results is reflected in the compensation of employees, a positive perception of the enterprise's performance has a motivational character for employees, because they feel involved and interested in the enterprise's results, which is reflected in their work engagement. However, it depends on the priorities of the enterprise's management and whether these funds are invested in employees or improving processes or technologies, e.g., implementation of Industry 4.0 elements.

Research hypotheses (RH):

The implementation of Industry 4.0 can have a different scope or character. The rate and scope of implementation may vary depending on the possibilities and demands of individual sectors of the economy. Therefore, when formulating the first hypothesis, we focused on whether the positive or negative impact of the 4.0 implementation is perceived differently in relation to different sectors of the economy.

RH1: The implementation of Industry 4.0 during the COVID-19 pandemic had a positive effect on the performance of the organization, regardless of the sector of the economy. The results of testing the first research hypothesis can be seen in Table 8.

Table 8. Test Spearman's rho (own elaboration).

Spearman's Rho		If an Enterprise Had Implemented Industry 4.0 Elements, Did It Affect Managing the Pandemic Situation?	What Industry Does Enterprise Operate in?
If an enterprise had implemented Industry 4.0 elements, did it affect managing the pandemic situation?	Correlation Coefficient	-	0.105
	Sig. (2-tailed)	-	0.076
	N	287	287
What industry does enterprise operate in?	Correlation Coefficient	0.105	-
	Sig. (2-tailed)	0.076	-
	N	287	287

The result of the Spearman's rho test showed (Table 8) that there is a very weak to negligible relationship (r = 0.105) between the industry in which the enterprise operates and the elements of Industry 4.0 and their impact on coping with the COVID-19 pandemic. Considering the results of the hypothesis testing, we can conclude that the industry in which the enterprise operates has no influence on the perception of the impact of the implementation of Industry 4.0 elements on coping with the situation and limitations associated with COVID-19. The implementation of Industry 4.0 has an impact not only on the performance of business processes and the performance of people working in the enterprise, but also on the employees themselves. Despite the fact that the elements of Industry 4.0 are supposed to improve and facilitate the work of employees, new technologies place new demands on employees that they may not be able to handle, and also automation may threaten or replace some jobs. With the second formulated research hypothesis, we examined whether the perception of disadvantaged or threatened job positions affects whether the person holds this job position himself.

RH2: The job positions the employee works in have no influence on the perception of job threats due to the introduction of Industry 4.0. The evaluation of the second defined research hypothesis is in Table 9.

Table 9. Test Spearman's rho (own elaboration).

Spearman's Rho		Which Category of Employees Do You Perceive as the Most Negatively Affected (Disadvantaged) Employees in Connection with Industry 4.0?	What Position Do You Work in?
Which category of employees do you perceive as the most negatively affected (disadvantaged) employees in connection with Industry 4.0?	Correlation Coefficient	-	0.076
	Sig. (2-tailed)	-	0.200
	N	287	287
What position do you work in?	Correlation Coefficient	0.076	-
	Sig. (2-tailed)	0.200	-
	N	287	287

From the results shown in Table 9, it is clear that there is no relationship between the currently held job position and the perception of negatively affected job positions due to the introduction of Industry 4.0.

4. Conclusions

The results of the presented research proved that Industry 4.0 has a positive effect on the productivity and performance of the organization, regardless of the sector of the economy. The elements of Industry 4.0 help to handle not only situations associated with a lack of manpower, e.g., during seasonal fluctuations, but also during unexpected restrictions and the impossibility of performing work at the workplace. However, the results indicated that some job positions may be disadvantaged by the impact of the implementation of Industry 4.0 elements. The perception of threatened job positions was not influenced by the job position held by the person who assessed this threat. The research also showed that the workload of employees during the COVID-19 pandemic varied depending on the job position held. From these differences in the amount of work and workload, the question of the mechanisms for assigning compensation and remuneration for work arises. Satisfaction with individual components of remuneration affects overall job satisfaction, and thus the willingness to exert effort in the performance of work tasks. In addition, satisfaction with compensation affects how employees perceive organizational performance. This perception of organizational performance can have a positive or negative effect on turnover or an employee's intentions to look for a new job.

4.1. Recommendations for the Practice

The results showed that the elements of Industry 4.0 help employees to facilitate their work and to cope with the situation associated with the COVID-19 pandemic. Business management should look for possibilities for the implementation or expansion of Industry 4.0 elements that have proven themselves. Since this implementation can bring various technical and financial challenges, it is necessary to monitor and use opportunities to facilitate their implementation. In the period of the coming crisis, it is important that organizations also focus on the constant identification of priorities in the field of employee remuneration. For managers, it is necessary to know which forms of remuneration employees prefer, because satisfaction with remuneration is one of the prerequisites for employee performance. Only on the basis of reliable information can they choose suitable compensation mechanisms that correspond to the needs of employees. Therefore, it is important that enterprises have appropriately developed performance measurement systems, so that through appropriately chosen systems of key performance indicators, they have available information providing a picture of the correctness of the measures taken. High-performing organizations can weather turbulent times, so tracking performance and the metrics that enable it are existentially important to the future of organizations.

4.2. Limits of the Research and Future Research

One of the limitations was the size of the research sample. A larger research sample could allow for more extensive analyses. The pandemic situation also affected the possibilities of the questionnaire distribution, especially the possibilities of physical distribution. Another limit is the different way organizations are managed. Each organization had an individual approach to measures that were not prescribed by law, which caused a different view of how to manage the situation associated with the COVID-19 pandemic. The presented research is also limited by geographical location, the adopted legislative measures, and support from the state during the pandemic or regarding the implementation of Industry 4.0, which is different in various states. Research has shown that the area of compensation is very irritable for employees. It is in the interest of organizations and society as a whole that business managers have the tools in their hands to ensure that employees are fairly and adequately compensated for the work they do. Further research will focus on which forms or mechanisms of support from the state, associations, or organizations help to ensure adequate remuneration for employees and a fair redistribution of the created values.

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References

Aguinis, Herman, and Jing Burgi-Tian. 2021. Measuring Performance during Crises and beyond: The Performance Promoter Score. *Business Horizons* 64: 149–60. [CrossRef] [PubMed]

Baporikar, Neeta. 2021. Effect of Reward on Motivation and Job Satisfaction. *International Journal of Applied Management Sciences and Engineering (IJAMSE)* 8: 12–51. [CrossRef]

Brewster, Chris, Paul N. Gooderham, and Wolfgang Mayrhofer. 2016. Human resource management: The promise, the performance, the consequences. *Journal of Organizational Effectiveness: People and Performance* 3: 181–90. [CrossRef]

Büchi, Giacomo, Monica Cugno, and Rebecca Castagnoli. 2020. Smart Factory Performance and Industry 4.0. *Technological Forecasting and Social Change* 150: 119790. [CrossRef]

Bueno, Adauto, Moacir Godinho Filho, and Alejandro G. Frank. 2020. Smart Production Planning and Control in the Industry 4.0 Context: A Systematic Literature Review. *Computers & Industrial Engineering* 149: 106774. [CrossRef]

Calış Duman, Meral, and Bunyamin Akdemir. 2021. A Study to Determine the Effects of Industry 4.0 Technology Components on Organizational Performance. *Technological Forecasting and Social Change* 167: 120615. [CrossRef]

Carnevale, Joel B., and Isabella Hatak. 2020. Employee Adjustment and Well-Being in the Era of COVID-19: Implications for Human Resource Management. *Journal of Business Research* 116: 183–87. [CrossRef]

Collings, David G., John McMackin, Anthony J. Nyberg, and Patrick M. Wright. 2021. Strategic Human Resource Management and COVID-19: Emerging Challenges and Research Opportunities. *Journal of Management Studies* 58: 1378–82. [CrossRef]

Dalenogare, Lucas Santos, Guilherme Brittes Benitez, Néstor Fabián Ayala, and Alejandro Germán Frank. 2018. The Expected Contribution of Industry 4.0 Technologies for Industrial Performance. *International Journal of Production Economics* 204: 383–94. [CrossRef]

Delaney, John T., and Mark Huselid. 1996. The Impact of Human Resource Practices on Perceptions Organizational Performance. *Academy of Management Journal* 39: 949–69. [CrossRef]

Dobre, Ovidiu Iliuta. 2013. Employee motivation and organizational performance. *Review of Applied Socio-Economic Research* 5: 53–60.

El Hamdi, Sarah, Abdellah Abouabdellah, and Mustapha Oudani. 2019. Industry 4.0: Fundamentals and Main Challenges. Paper presented at the V 2019 International Colloquium on Logistics and Supply Chain Management (LOGISTIQUA), Paris, France, June 12–14; pp. 1–5. [CrossRef]

Eurofund Europa. 2021. Available online: https://www.eurofound.europa.eu/publications/article/2021/impact-of-the-covid-19-crisis-on-wages-and-wage-setting (accessed on 10 September 2022).

Fibírová, Jana, and Libuše Šoljaková. 2005. *Hodnotové nástroje řízení a měření výkonnosti podniku*. Praha: ASPI.

Fredricks, Gregory A., and Roger B. Nelsen. 2007. On the Relationship between Spearman's Rho and Kendall's Tau for Pairs of Continuous Random Variables. *Journal of Statistical Planning and Inference* 137: 2143–50. [CrossRef]

Gallo, Tommaso, and Annalisa Santolamazza. 2021. Industry 4.0 and Human Factor: How Is Technology Changing the Role of the Maintenance Operator? Procedia Computer Science. Paper presented at the 2nd International Conference on Industry 4.0 and Smart Manufacturing (ISM 2020), Virtual Event, November 23–25; vol. 180, pp. 388–93. [CrossRef]

Gigauri, Iza. 2020. Influence of COVID-19 Crisis on Human Resource Management and Companies' Response: The Expert Study. *International Journal of Management Science and Business Administration* 6: 15–24. [CrossRef]

Gupta, Himanshu, Ashwani Kumar, and Pratibha Wasan. 2021. Industry 4.0, Cleaner Production and Circular Economy: An Integrative Framework for Evaluating Ethical and Sustainable Business Performance of Manufacturing Organizations. *Journal of Cleaner Production* 295: 126253. [CrossRef]

Hidi, Suzanne. 2016. Revisiting the Role of Rewards in Motivation and Learning: Implications of Neuroscientific Research. *Educational Psychology Review* 28: 61–93. [CrossRef]

ILO-OECD. 2020. Available online: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_756331.pdf (accessed on 12 September 2022).

Joniaková, Zuzana, Rudolf Gálik, Jana Blštáková, and Natália Tarišková. 2016. *Riadenie ľudských zdrojov. Ekonómia*. Bratislava: Wolters Kluwer.

Koubek, Josef. 2002. *Řízení lidských zdrojů: Základy moderní personalistiky*. 3. vyd. Praha: Management Press.

Kraus, Sascha, Thomas Clauss, Matthias Breier, Johanna Gast, Alessandro Zardini, and Victor Tiberius. 2020. The economics of COVID-19: Initial empirical evidence on how family firms in five European countries cope with the corona crisis. *International Journal of Entrepreneurial Behavior & Research* 26: 1067–92. [CrossRef]

Kumar, Akshi, and Anand Nayyar. 2020. *Si3-Industry: A Sustainable, Intelligent, Innovative, Internet-of-Things Industry. V A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development, Anand Nayyar a Akshi Kumar*. Advances in Science, Technology & Innovation. Cham: Springer International Publishing, pp. 1–21. [CrossRef]

Lehman, Ann, Norm O'Rourke, Larry Hatcher, and Edward J. Stepanski. 2005. *JMP for Basic Univariate and Multivariate Statistics: A Step-by-Step Guide*, 1st ed. Cary: SAS Institute. ISBN 978-1-59047-576-8.

Li, Jo-Yun, Ruoyu Sun, Weiting Tao, and Yeunjae Lee. 2021. Employee Coping with Organizational Change in the Face of a Pandemic: The Role of Transparent Internal Communication. *Public Relations Review* 47: 101984. [CrossRef]

Li, Ying, Jing Dai, and Li Cui. 2020. The Impact of Digital Technologies on Economic and Environmental Performance in the Context of Industry 4.0: A Moderated Mediation Model. *International Journal of Production Economics* 229: 107777. [CrossRef]

Lorincová, Silvia, Peter Štarchoň, Dagmar Weberová, Miloš Hitka, and Martina Lipoldová. 2019. Employee Motivation as a Tool to Achieve Sustainability of Business Processes. *Sustainability* 11: 3509. [CrossRef]
Manzoor, Quratul-Ain. 2012. Impact of Employees Motivation on Organizational Effectiveness. *Business Management and Strategy* 3: 1–12. [CrossRef]
Mgammal, Mahfoudh Hussein, and Ebrahim Mohammed Al-Matari. 2021. Survey Data of Coronavirus (COVID-19) Thought Concern, Employees' Work Performance, Employees Background, Feeling about Job, Work Motivation, Job Satisfaction, Psychological State of Mind and Family Commitment in Two Middle East Countries. *Data in Brief* 34: 106661. [CrossRef] [PubMed]
Miško, Dávid, Zuzana Birknerová, Eva Benková, and Ivana Ondrijová. 2022. Elimination of cognitive distortions by business managers through a coaching approach. *Polish Journal of Management Studies* 25: 242–253. [CrossRef]
Narayanamurthy, Gopalakrishnan, and Guilherme Tortorella. 2021. Impact of COVID-19 Outbreak on Employee Performance—Moderating Role of Industry 4.0 Base Technologies. *International Journal of Production Economics* 234: 108075. [CrossRef]
Nasution, Mahyuddin K. M. 2020. Industry 4.0. *IOP Conference Series: Materials Science and Engineering* 1003: 012145. [CrossRef]
Nelsen, R.B. 1992. On Measures of Association as Measures of Positive Dependence. *Statistics and Probability Letters* 14: 269–74. [CrossRef]
Neuhofer, Barbara, Dimitrios Buhalis, and Adele Ladkin. 2015. Smart Technologies for Personalized Experiences: A Case Study in the Hospitality Domain. *Electronic Markets* 25: 243–54. [CrossRef]
Neumann, W. Patrick, Sven Winkelhaus, Eric H. Grosse, and Christoph H. Glock. 2021. Industry 4.0 and the Human Factor—A Systems Framework and Analysis Methodology for Successful Development. *International Journal of Production Economics* 233: 107992. [CrossRef]
Newman, Sean A., and Robert C. Ford. 2021. Five Steps to Leading Your Team in the Virtual COVID-19 Workplace. *Organizational Dynamics, Virtual Teams* 50: 100802. [CrossRef]
Notelaers, Guy, Maria Törnroos, and Denise Salin. 2019. Effort-Reward Imbalance: A Risk Factor for Exposure to Workplace Bullying. *Frontiers in Psychology* 10: 386. [CrossRef]
Nyameh, Jerome. 2013. Application of the Maslow's hierarchy of need theory; impacts and implications on organizational culture, human resource and employee's performance. *International Journal of Business and Management Invention* 2: 39–45.
Ortiz, Jesús Hamilton, William Gutierrez Marroquin, Leonardo Zambrano Cifuentes, Jesús Hamilton Ortiz, William Gutierrez Marroquin, and Leonardo Zambrano Cifuentes. 2020. *Industry 4.0: Current Status and Future Trends. Industry 4.0—Current Status and Future Trends*. London: IntechOpen. [CrossRef]
Papula, Ján, Lucia Kohnová, Zuzana Papulová, and Michael Suchoba. 2019. *Industry 4.0: Preparation of Slovak Companies, the Comparative Study. V Smart Technology Trends in Industrial and Business Management, zostavil Dagmar Cagáňová, Michal Balog, Lucia Knapčíková, Jakub Soviar, a Serkan Mezarcıöz*. EAI/Springer Innovations in Communication and Computing. Cham: Springer International Publishing, pp. 103–14. [CrossRef]
Papula, Ján, Zuzana Papulová, and Andrea Oborilova. 2014. *Procesný manažment: Ucelený pohľad na koncepciu procesného manažmentu*. Bratislava: Kartprint.
Paulova, Iveta, Marta Kucerova, and Miroslava Mlkva. 2009. The application of process approach in quality management in terms of Slovak Republic. Paper presented at the Annals of DAAAM & Proceedings, Vienna, Austria, November 25–28.
Phillips, Holly, Ivana Bogdanich, Kristen Carter, Jacob Holler, Trisha Smith, Erin H. Ticehurst, and Molly Wascher. 2017. Commentary: Exploring Novel Approaches to Staff Rewards and Recognition. *Hospital Pharmacy* 52: 729–31. [CrossRef] [PubMed]
Raišienė, Agota Giedrė, Violeta Rapuano, Kristina Varkulevičiūtė, and Katarína Stachová. 2020. Working from Home—Who Is Happy? A Survey of Lithuania's Employees during the COVID-19 Quarantine Period. *Sustainability* 12: 5332. [CrossRef]
Ras, Eric, Fridolin Wild, Christoph Stahl, and Alexandre Baudet. 2017. Bridging the Skills Gap of Workers in Industry 4.0 by Human Performance Augmentation Tools: Challenges and Roadmap. Paper presented at the V 10th International Conference on PErvasive Technologies Related to Assistive Environments, PETRA '17, Island of Rhodes, Greece, June 21–23; New York: Association for Computing Machinery, pp. 428–32. [CrossRef]
Richnák, Patrik. 2022. Key Challenges and Opportunities of Industry 4.0 in Metallurgical Industry in Slovakia. *DANUBE* 13: 137–54.
Sadhna, Priyanka, Sahil Gupta, and Sanjay Rastogi. 2020. Key motivators for driving work performance amid COVID-19 in developing nations. *International Journal of Work Organisation and Emotion* 11: 105–19. [CrossRef]
SHRM.ORG. 2021. Available online: https://www.shrm.org/hr-today/news/all-things-work/pages/the-pandemic-alters-pay.aspx (accessed on 24 August 2022).
Simanová, Ľubica, and Pavol Gejdoš. 2019. Application of Selected Methods and Approaches for Improvement of Processes and Their Use in Practice in Companies of Wood Processing Industry in Slovakia. *Management Systems in Production Engineering* 27: 162–65. [CrossRef]
Stofkova, Jana, Adela Poliakova, Katarina Repkova Stofkova, Peter Malega, Matej Krejnus, Vladimira Binasova, and Naqibullah Daneshjo. 2022. Digital Skills as a Significant Factor of Human Resources Development. *Sustainability* 14: 13117. [CrossRef]
Sujová, Andrea, and Katarína Marcineková. 2015. Improvement of Business Processes—A Research Study in Wood-Processing Companies of Slovakia. Paper presented at the Procedia Economics and Finance, International Scientific Conference: Business Economics and Management (BEM2015), Zvolen, Slovakia, October 15–16; vol. 34, pp. 296–302. [CrossRef]

Valentina, Di Pasquale, De Simone Valentina, Miranda Salvatore, and Riemma Stefano. 2021. Smart Operators: How Industry 4.0 Is Affecting the Worker's Performance in Manufacturing Contexts. Procedia Computer Science.Paper presented at the 2nd International Conference on Industry 4.0 and Smart Manufacturing (ISM 2020), Virtual Event, November 23–25; vol. 180, pp. 958–67. [CrossRef]

Vetiska, Jan, Michal Holub, Petr Blecha, Frantisek Bradac, Jakub Brazina, Vaclav Stanek, Jiri Kroupa, and Zdenek Tuma. 2021. Industry 4.0 in Educational Process. In *V Digital Conversion on the Way to Industry 4.0, zostavil Numan M. Durakbasa a M. Güneş Gençyılmaz*. Lecture Notes in Mechanical Engineering. Cham: Springer International Publishing, pp. 324–32. [CrossRef]

Vrabcová, Pavla, Hana Urbancová, Gabriela Rokosová, and Lenka Holečková. 2022. An Individual Approach to Employees as a Key Success and Sustainability of an Organization: Quality and Functional Age Strategy. *TEM Journal* 11: 1952–57. [CrossRef]

Wagner, Jaroslav. 2009. *Měření výkonnosti: Jak měřit, vyhodnocovat a využívat informace o podnikové výkonnosti*. Prosperita firmy. Praha: GRADA Publishing.

Yas, Harith, Alanoud Bandar Alsaud, Afnan Alsharm, Ahmed Alkaabi, and Ayesha AlAdeedi. 2020. The Impact of COVID-19 on Supply Chain and Human Resource Management Practices and Future Marketing. *International Journal of Supply Chain Management* 9: 1681–85.

Závadský, Ján, Veronika Korenková, Zuzana Závadská, Jaroslava Kadárová, and David Tuček. 2019. Competences in the quality management system evaluation based on the most worldwide used key performance indicators. *Quality—Access to Success* 20: 29–41.

Zeenea. 2021. Available online: https://zeenea.com/wp-content/uploads/Unlock-data-for-the-manufacturing-industry-US.pdf?utm_medium=email&_hsmi=104559609&_hsenc=p2ANqtz-_usfaZ8Voj5DbkyzEVI0K7Magx3crOEnwJd_gj7xSGJAAtDVVqTbxfi_FvK4Ae2qyfn8g_jD1bH2SVTPIhqeEtMlvcVQ&utm_content=104559609&utm_source=hs_automation (accessed on 29 August 2022).

Zhong, Yifan, Yameng Li, Jian Ding, and Yiyi Liao. 2021. Risk Management: Exploring Emerging Human Resource Issues during the COVID-19 Pandemic. *Journal of Risk and Financial Management* 14: 228. [CrossRef]