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### AGE AND THE ASSESSMENT OF THE IMPACT OF SELECTED ORGANISATIONAL FACTORS ON THE ADOPTION OF INNOVATIONS

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**Purpose:** The purpose of this research was to determine the relationship between the age of the respondents and their perception of the impact of selected organisational factors in terms of adoption of innovation.

**Design/methodology/approach**: In the study a proprietary survey questionnaire was used. Factors were selected for the questionnaire based on literature research, desk research, opinions of panel participants (experts), and pilot studies conducted in IT companies.

**Findings:** The age of the respondents influenced their perception of the influence of multiple factors at different stages of the innovation process in terms of adoption, as well as their assessment of the shape of this influence. Younger people tended to perceive the influence of individual factors more frequently than older people. At the same time, younger people tended to attribute less influence on the adoption of innovations to individual factors than older age groups (there was often a trend of gradual increase in the above-mentioned evaluations with the age of the respondents).

**Research limitations/implications**: The research presented in this article has some limitations. Firstly, it was conducted only in Poland, secondly only in the IT sector, and thirdly, the age of the respondents was considered in the context of their perception of the influence of only selected factors related to internal and external communication and organisational culture on the adoption of innovation.

**Practical implications:** Demonstrate the approach of diverse age groups of IT employees to the adaptation of innovations in the context of the impact that communication and organisational culture have on the different stages of this process. This will be helpful in verifying which factors need to be improved to have a greater impact on respondents' perception of the topic at hand.

**Social implications:** The results of the research show that companies should focus on creating a coherent communication system, familiar to all participants in the organisation, which will be an integral part of the organisational culture. Then there is a chance that the trend presented in

the research will change and increasingly younger employees will recognise the significant impact of both communication and the culture on the adoption of innovations.

**Originality/value:** Determine the relationship between the age of the respondents and their perception of the influence of various factors related to communication (both internal and external) and organisational culture on the adoption of innovations.

**Keywords:** innovation, adoption of innovation, communication, organisational culture. **Category of the paper:** Research paper.

#### 1. Introduction

The current huge competition in the market is an extremely important determinant directing the activities of enterprises not only to the implementation of innovative solutions in key areas of their business but also related adaptation processes. Enterprises that can undertake such challenges can efficiently and effectively operate on it (Litwa, 2017). As M. Romanowska emphasises, "innovation-mature enterprises carry out multifaceted, systematic activities, focused on many aspects of the company's functioning, and innovation activities are an important element of their development and competition strategies and an important factor of financial success" (Romanowska, 2016, p. 30). Thus, the introduction of new technologies into the organisational setting, for example, is a very positive aspect (Kuzior, Arefiev, Poberezhna, 2023), considering, among other things, digital technologies that are helpful in creating new business processes (Łobejko, 2020).

Business innovation "defined, among other things, as the ability of an organisation to develop projects and to implement and disseminate innovations, is largely determined by interorganisational relationships and networks of these relationships that form the relational potential of the organisation" (Zakrzewska-Bielawska, 2016, p. 4). According to E. Michalski, "it results from fierce competition on the market, continuous improvement of product quality, strong fluctuation of demand, needs, and preferences of buyers" (Michalski, 2014, p. 85). Innovation, in turn, is measured by the number of innovations implemented (Wojtowicz, Mikos, Karaś, 2018) as well as the benefits derived from them (Brzóska, Cierkosz, 2016).

Innovation (Baregheh, Rowley, Sambrook, 2009) can be defined as "an idea based on a new, valuable, and useful idea" (Dyduch, 2015, p. 19). They should also be equated with change (Altındağ, Kösedağı, 2015) or process or product improvement (Tohidi, Jabbari, 2012). They affect time, cost, and product savings (Kogabayev, Maziliauskas, 2017). Furthermore, innovations "mitigate climate change, support sustainable development, and promote social cohesion" (Gault, 2018, p. 617). A broad view of innovation implies creative changes that occur in technology, the social system, the economic structure, and even nature (Sopinska, Wachowiak, 2016). A narrow view of innovation, on the other hand, boils down to changes in manufacturing methods and products, based on new or hitherto unused knowledge (Sopińska, Wachowiak, 2016). It should be noted at this point that the basis for the creation of any innovation process is intellectual capital (Sokolowski, 2018) while the development of innovations should take place through direct cooperation of enterprises with both scientific and research and development units (Blazlak, 2016; Szuper, 2021).

In the literature on the subject, their diverse division is apparent. It is worth noting here technological innovations (which can include product and process innovations) and nontechnological innovations (which include organisational and marketing innovations) (Mazur-Wierzbicka, 2015). S. Lachiewicz, in turn, when conducting a literature review, draws attention to "innovations in the sphere of workplace organisation, structural innovations and those concerning organisational relations with the environment" (Lachiewicz, 2014, p. 155). Open eco-innovations are also becoming extremely important (Siwiec et al., 2025).

When analysing the concept of innovation, one should not forget the key issue of its adaptation to the organisation, especially as this process is crucial for the survival of the company (van Oorschot, Hofman, Halman, 2018). Therefore, it is important to prepare for it well, also considering the "reluctance of employees to change" mentioned by J. Ober (Ober, 2022, p. 54). This can be overcome with an emphasis on building a stable and innovative organisational culture of which a coherent and extensive communication system will be an integral part. This is also pointed out by F. Mroczko, stating that "the importance of culture and pro-innovation climate is important, as these two categories determine the creative capabilities of an organisation" (Mroczko, 2016, p. 27).

Given these considerations, the aim of this research was to determine the relationship between the age of the respondents and their perception of the impact of various factors related to internal communication, external communication, and the company's organisational culture in terms of innovation adoption and to assess the shape of this impact.

#### 2. Materials and Methods

The study used a proprietary questionnaire developed specifically for this work. The survey was conducted between January and June 2019. The present analysis assessed the relationship between the sociodemographic factor of the respondents' age and the respondents' perceptions of the influence of various factors related to internal communication, external communication, and the company's organisational culture in terms of innovation adoption, as well as their assessment of the shape of this influence. This was to verify whether the personal characteristic of the respondents, such as age, was relevant to their opinions on the influence of the factors mentioned above at different moments of innovation adoption.

When comparing the different age groups of the respondents in terms of perceived influence of individual factors on the adoption of innovations, the nonparametric Mann-Whitney U-test was used, and Glass's rank biserial correlation coefficient ( $r_g$ ) was used as a measure of effect size, respectively. For comparisons of the groups in terms of assessing the shape of the effect of individual factors on innovation adoption, the nonparametric Spearman rank order correlation was used.

A total of 400 people participated in the survey, from 310 companies, including 72 women  $(M_{Age} = 32.02; SD_{Age} = 9.83)$  and 328 men  $(M_{Age} = 29.28; SD_{Age} = 9.86)$ . The significant male predominance is related to the characteristics of the IT industry in Poland, where more men than women are employed, especially in the case of programmer positions. The survey questionnaire was distributed by email, in the form of separate links to complete the survey for each company, through the interankiety.pl programme.

In estimating the minimum sample size, the sample size formula for qualitative characteristics (with a finite sample) was applied (Mynarski, 2000):

$$n = \frac{p(p-1)}{\frac{E^2}{t_{\alpha}^2} + \frac{p(p-1)}{N}}$$

where:

p – the size of the estimated fraction with the distinguished feature,

E – the permissible maximum error of the estimate of proportion p,

N- the size of the general population,

 $t_{\alpha}$  – number of standard deviations to be read from the normal distribution table for the confidence level 1 –  $\alpha$  (Mynarski, 2000).

Thus, the minimum sample size was estimated to be 300 companies and 383 employees.

#### 3. Results and Discussion

# **3.1.** Age and perceptions of the impact of individual factors related to internal communication on the adoption of innovations

The impact of training and meetings on improving internal communication at the initiation stage of an innovation in terms of its subsequent adoption was perceived by the majority of respondents in each age group; however, when analysing the percentage distributions of such cases, it can be observed that among younger age groups in total, the above-mentioned impact was perceived more frequently (18-24 years: 90.17%; 25-34 years: 77.88%) than among older ones (45-54 years: 62.50%; over 54 years: 90.00%). These differences were shown to be statistically significant, as shown by analysis with the Mann-Whitney U-test, Z = -3.64;

p < 0.001;  $r_g = -0.27$ . There were no significant differences between the aforementioned groups in terms of perceiving the influence of the aforementioned factor at the following two stages.

Perception of the impact of good employee relations at the innovation initiation stage in terms of subsequent adoption was also collectively more prevalent among younger age groups (18-24 years: 92.49%; 25-34 years: 72.57%) compared to older ones (45-54 years: 50.00%; over 54 years: 80.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, Z = -6.1; p < 0.001;  $r_g = -0.42$ . For the two subsequent stages of the innovation process, there were no differences between groups in assessing the impact of the factor.

The situation was analogous to another factor related to internal communication, i.e. improving internal communication by adapting its tools. The influence of the aforementioned factor at the innovation initiation stage in terms of its subsequent adoption was perceived by the majority of respondents in each group. However, taking into account the exact percentage distributions of such cases, it can be observed that among the younger age groups in total, the influence mentioned above was perceived more frequently (18-24 years: 93.06%; 25-34 years: 75.22%) than among the older age groups (45-54 years: 54.17%; over 54 years: 80.00%). As shown by the analysis of the Mann-Whitney U-test, these differences are statistically significant, Z = -5.42; p < 0.001;  $r_g = -0.40$ . There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor at the following two stages.

On the other hand, perceiving the influence of the factor of providing access to information at any stage of the innovation process (i.e. the innovation initiation stage, the stage of deciding to adopt the innovation, and the innovation implementation stage) did not differ, as the Mann-Whitney U-test analysis showed, statistically significantly between the different age groups of respondents. The vast majority of respondents or all of the above groups perceived the influence of the above factor at each stage.

There were also no differences between the age groups of the respondents in terms of the perceived impact of ensuring a rapid flow of information at any stage of the innovation process in terms of subsequent adoption. An overwhelming majority of respondents or all of the age groups perceived the above-mentioned impact. The Mann-Whitney U-test analysis showed no statistically significant intergroup differences in this respect.

In addition, analysis using the Mann-Whitney U-test showed no statistically significant differences between the age groups of respondents in terms of perceiving the impact of obtaining the necessary information at any of the stages of the innovation process (i.e. the innovation initiation stage, the innovation adoption decision stage, and the innovation implementation stage) in terms of subsequent adoption. An overwhelming majority of respondents in the above groups or all perceived the impact of the above factor at each stage.

On the contrary, perceiving the impact of knowledge sharing within a team or organisation at the innovation initiation stage in terms of subsequent adoption was more common among younger age groups (18-24 years: 95.38%; 25-34 years: 76.11%) compared to older ones (45-54 years: 70.83%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, Z = -5.19; p < 0.001;  $r_g = -0.40$ . For the next two stages of the innovation process, there were no differences between groups in the assessment of the impact of the factor mentioned above (Table 1).

#### Table 1.

Knowledge sharing within the team/							Age						
		18-24 years (n = 173)		25-3 (n	84 years = 113)	35	-44 years (n = 80)	45	-54 years (n = 24)	y (	Over 54 ears old (n = 10)	Mann- Whitney U-test	Glass's r <sub>g</sub>
organisat	IOII	n	%	n	%	n	%	n	%	n	%		
Innovation	Yes	165	95,38%	86	76,11%	53	66,25%	17	70,83%	10	100,00%	7 - 5.10	-0,40
initiation stage	Not	8	4,62%	27	23,89%	27	33,75%	7	29,17%	0	0,00%	p < 0,001	
Stage of	Yes	169	97,69%	108	95,58%	79	98,75%	23	95,83%	10	100,00%		0,00
decision to adopt innovations	Not	4	2,31%	5	4,42%	1	1,25%	1	4,17%	0	0,00%	Z = 0,01; p = 0,996	
Innovation	Yes	171	98,84%	111	98,23%	80	100,00%	24	100,00%	10	100,00%	7 = 0.72	
implement ation phase	Not	2	1,16%	2	1,77%	0	0,00%	0	0,00%	0	0,00%	p = 0,73, p = 0,481	0,21

Relationship between respondents' age and perceived impact of knowledge sharing within a team or organisation on the adoption of an innovation at different stages of its introduction

The vast majority or all of the respondents perceived obtaining a large amount of information at each stage of the innovation process in terms of influencing adoption, regardless of age. Analysis with the Mann-Whitney U-test did not show statistically significant differences between groups in this respect at any stage of innovation introduction.

Also, perceiving the influence of the factor of clear and effective communication of information at any stage of the innovation process (i.e. the stage of innovation initiation, the stage of decision to adopt the innovation and the stage of innovation implementation) did not differ, as the Mann-Whitney U-test analysis showed, statistically significantly between the different age groups of respondents. The vast majority of respondents or all of the above groups perceived the influence of the above factor at each stage.

However, the majority of respondents from each age group perceived the impact of superior communication skills at the innovation initiation stage in terms of subsequent adoption. However, when analysing the percentage distributions of the aforementioned cases, it can be noted that among the younger age groups in total, the influence mentioned above was perceived more frequently (18-24 years: 91.91%; 25-34 years: 75.22%) than among the older age groups (45-54 years: 66.67%; over 54 years: 90.00%). These differences were shown to be statistically significant, as shown by analysis with the Mann-Whitney U-test, Z = -4.3; p < 0.001;  $r_g = -0.32$ .

There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor at the following two stages.

The same was true for the communication skills of the other employees of the company, where the majority of the respondents perceived the influence of the aforementioned factor in the innovation initiation stage in terms of its subsequent adoption. However, taking into account the exact percentage distributions of such cases, it can be observed that among younger age groups in total, the influence mentioned above was perceived slightly less frequently (18-24 years: 88.44%; 25-34 years: 73.45%) than among older ones (45-54 years: 62.50%; over 54 years: 100.00%). As the analysis with the Mann-Whitney U-test showed, these differences are statistically significant, Z = -3.58; p < 0.001;  $r_g = -0.25$ . For the next two stages of the innovation process, there were no intergroup differences in the assessment of the impact of the aforementioned factor.

Furthermore, perceiving the impact of the flattening of the organisational structure at the innovation initiation stage in terms of subsequent adoption was more common among younger age groups (18-24 years: 96.53%; 25-34 years: 75.22%) compared to older ones (45-54 years: 58.33%; over 54 years: 90.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, Z = -5.33; p < 0.001;  $r_g = -0.42$ . For the next two stages of the innovation process, there were no intergroup differences in the assessment of the impact of the above-mentioned factor.

## **3.2.** Age and perceived impact of individual external communication factors on the adoption of innovations

The age groups surveyed differed in their perceptions of the impact of shaping and maintaining a good corporate image at each stage of the innovation process in terms of adoption. When analysing the share of people perceiving the above-mentioned influence in individual age groups, it can be noted that among younger age groups, the influence of the above-mentioned factor was perceived more frequently, compared to older ones, both at the stage of innovation initiation (the innovation initiation stage) and at the stage of innovation adoption stage. The analysis of the proportion of people perceiving the above-mentioned impact by age group shows that younger age groups were more likely to perceive the impact of the above-mentioned factor compared to older age groups, both at the stage of initiating an innovation (groups aged up to 34: 88.44% and 65.49%, groups aged 45 and over: 50.00% and 100.00%) and at the stage of implementing an innovation (groups aged up to 34: 88.44% and 65.49%, groups aged up to 34: 89.60% and 69.03%, groups aged 45 and over: 54.17% and 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant (innovation initiation stage: Z = -4.88; p < 0.001;  $r_g = -0.32$ ; Innovation adoption decision stage: Z = -4.99; p < 0.001;  $r_g = -0.33$ ; Innovation implementation stage: Z = -4.82; p < 0.001;  $r_g = -0.33$ ) (Table 2).

<b>CI</b>							Age						
Shaping and maintaining a good corporate image		18-24 years (n = 173)		25-3 (n	84 years = 113)	35-4 (n	14 years = 80)	45-5 (n	54 years = 24)	C yea	over 54 rs old (n = 10)	Mann- Whitney U-test	Glass's r <sub>g</sub>
		n	%	n	%	n	%	n	%	n	%		
Innovation	Yes	153	88,44%	74	65,49%	49	61,25%	12	50,00%	10	100,00%	7 - 1.99	
initiation stage	Not	20	11,56%	39	34,51%	31	38,75%	12	50,00%	0	0,00%	Z − -4,88, p < 0,001	-0,32
Stage of	Yes	154	89,02%	76	67,26%	49	61,25%	12	50,00%	10	100,00%		
decision to adopt innova- tions	Not	19	10,98%	37	32,74%	31	38,75%	12	50,00%	0	0,00%	Z = -4,99; p < 0,001	-0,33
Innovation	Yes	155	89,60%	78	69,03%	50	62,50%	13	54,17%	10	100,00%	7 - 4.82	
implement	Not	18	10,40%	35	30,97%	30	37,50%	11	45,83%	0	0,00%	z = -4,82, p < 0,001	-0,33

#### Table 2.

ation stage

Relationship between the age of the respondents and the perception of the impact of shaping and maintaining a good corporate image on the adoption of innovations at different stages of their introduction

There were also differences between the age groups in terms of perceiving the impact of information on the company's mission and achievements presented to customers and suppliers at each stage of the innovation process in terms of adoption. In terms of the proportion of people perceiving the above-mentioned impact by age group, it can be noted that the younger age groups were more likely to perceive the impact of the above-mentioned factor compared to the older ones, both at the stage of the innovation process and at the stage of its adoption. In terms of the proportion of people perceiving the above-mentioned impact by age group, it can be noted that younger age groups were more likely to perceive the impact of the above-mentioned factor compared to the noted that younger age groups were more likely to perceive the impact of the above-mentioned factor compared to older age groups, both at the innovation initiation stage (groups up to 34 years of age: 89.60% and 65.49%, groups aged 45 and over: 50.00% and 80.00%) and at the innovation implementation stage (groups up to 34 years of age: 90.17% and 65.50%, groups aged 45 and over: 50.00% and 80.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant (innovation initiation stage: Z = -4.95; p < 0.001;  $r_g = -0.33$ ; Innovation adoption decision stage: Z = -5.43; p < 0.001;  $r_g = -0.37$ ; Innovation implementation stage: Z = -5.09; p < 0.001;  $r_g = -0.34$ )

Furthermore, perceiving the impact of a good relationship between company and/or service representatives and customers at the stage of the decision to adopt an innovation in terms of subsequent adoption was less frequent overall among younger age groups (18-24 years: 91.33%; 25-34 years: 95.58%) compared to older ones (45-54 years: 91.67%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, Z = 1.99; p < 0.05;  $r_g = 0.25$ . For the other stages of the innovation process, there were no differences between groups in the assessment of the impact of the factor mentioned above.

In contrast, there were no differences between the age groups of respondents in terms of perceiving the impact of identifying customers' requirements and needs for products and services at any stage of the innovation process in terms of subsequent adoption. An overwhelming majority of respondents or all of the age groups perceived the above-mentioned impact. The Mann-Whitney U-test analysis showed no statistically significant intergroup differences in this respect.

Furthermore, perceiving the influence of the factor of analysing and interpreting public opinion about the company and its products or services at any stage of the innovation process (i.e. the innovation initiation stage, the stage of deciding to adopt the innovation, and the stage of implementing the innovation) did not differ - as shown by the Mann-Whitney U-test analysis - statistically significantly between the different age groups of respondents. The overwhelming majority of respondents from the above groups perceived the influence of the above factor at each stage.

# **3.3.** Age and perceived impact of individual organisational culture factors on innovation adoption

Analysis using the Mann-Whitney U-test revealed statistically significant differences between the age groups of respondents in terms of perceived giving employees the opportunity to question existing solutions at the innovation implementation stage with a view to their subsequent adoption. It turned out that among younger age groups, the influence mentioned above was perceived less frequently (18-24 years: 95.38%; 25-34 years: 99.12%) compared to older age groups (45-54 years: 100.00%; over 54 years: 100.00%), and these differences are statistically significant, Z = 2.08; p < 0.05;  $r_g = 0.39$ . For the first two stages of the innovation implementation process, there were no differences between groups in the assessment of the influence of the factor mentioned above (Table 3).

#### Table 3.

Relationship between age of the respondents and perceived impact of giving employees the opportunity to challenge existing solutions on adoption of innovation at different stages of its introduction

Giving							Age						
employees the opportunity to challenge		18-24 years (n = 173)		2 y (n -	5-34 rears = 113)	35 (	-44 years (n = 80)	45	5-54 years (n = 24)	y (	Over 54 ears old (n = 10)	Mann- Whitney	Glass's rg
existing arrangeme	g ents	n	%	n	%	n	%	n	%	n	%	0-test	
Innovation	Yes	169	97,69%	110	97,35%	80	100,00%	23	95,83%	10	100,00%	7 - 0.58	
initiation stage	Not	4	2,31%	3	2,65%	0	0,00%	1	4,17%	0	0,00%	p = 0,569	0,12
Stage of	Yes	167	96,53%	109	96,46%	80	100,00%	24	100,00%	10	100,00%		
decision to adopt innovations	Not	6	3,47%	4	3,54%	0	0,00%	0	0,00%	0	0,00%	Z = 1,56; p = 0,12	0,29
Innovation	Yes	165	95,38%	112	99,12%	79	98,75%	24	100,00%	10	100,00%	7 = 2.08	
implement ation phase	Not	8	4,62%	1	0,88%	1	1,25%	0	0,00%	0	0,00%	p < 0.05	0,39

Differences were also observed between age groups in terms of perceiving the impact of ergonomics of the workplace, this time at each stage of the innovation process in terms of adoption. When analysing the share of people perceiving the above-mentioned impact in individual age groups, it can be noted that among younger age groups, the impact of the above-mentioned factor was perceived more frequently than among older ones, both at the stage of innovation initiation (groups of one or two) and at the stage of innovation adoption. The analysis of the proportion of people perceiving the above-mentioned impact by age group shows that younger age groups were more likely to perceive the impact of the above-mentioned factor compared to older age groups, both at the innovation initiation stage (groups under 34: 89.60% and 64.60%, groups aged 45 and over: 50.00% and 80.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant (innovation initiation stage: Z = -5.14; p < 0.001;  $r_g = -0.34$ ; Innovation adoption decision stage: Z = -4.9; p < 0.001;  $r_g = -0.32$ ; Innovation implementation stage: Z = -5.29; p < 0.001;  $r_g = -0.35$ ).

Perception of the impact of the company's creation of favourable conditions for the development of employees' competencies at the innovation initiation stage in terms of subsequent adoption was slightly less common among younger age groups (18-24 years: 95.38%; 25-34 years: 87.61%) compared to older age groups (45-54 years: 83.33%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, Z = -3.29; p < 0.001;  $r_g = -0.31$ . For the next two stages of the innovation process, there were no intergroup differences in the assessment of the impact of the above-mentioned factor.

Analysis using the Mann-Whitney U-test also revealed statistically significant differences between the age groups of the respondents in terms of perceived autonomy provision to employees at the innovation initiation stage in terms of subsequent adoption. It turned out that among the younger age groups, the influence mentioned above was perceived less frequently (18-24 years: 94.22%; 25-34 years: 81.42%) compared to the older ones (45-54 years: 79.17%; over 54 years: 100.00%), and these differences are statistically significant, Z = -3.61; p < 0.001;  $r_g = -0.30$ . For the two subsequent stages of the innovation process, there were no differences between groups in the assessment of the influence of the factor mentioned above.

The age groups studied differed in terms of perceiving the influence of a sense of shared ownership and control over one's own work at the innovation initiation stage in terms of adoption. Analysing the proportion of people perceiving the influence mentioned above in the different age groups, it can be seen that the younger age groups were more likely to perceive the influence of the mentioned factor (18-24 years: 94.80%; 25-34 years: 80.53%) compared to the older ones (45-54 years: 66.67%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, Z = -4.48; p < 0.001;

 $r_g = -0.36$ . For the next two stages of the innovation process, there were no differences between groups in the assessment of the impact of the aforementioned factor.

An analogous situation was in the case of encouraging employees to continue learning. The influence of the aforementioned factor at the innovation initiation stage in terms of subsequent adoption was perceived by most or all respondents in each group. However, taking into account the exact percentage distributions of such cases, it can be observed that among younger age groups in total, the influence mentioned above was perceived more frequently (18-24 years: 95.95%; 25-34 years: 82.30%) than among older age groups (45-54 years: 66.67%; over 54 years: 100.00%). As shown by analysis with the Mann-Whitney U-test, these differences are statistically significant, Z = -4.32; p < 0.001;  $r_g = -0.37$ . There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor at the following two stages.

In contrast, perceiving the influence of the factor of freedom to experiment and take risks at work at any stage of the innovation process (i.e., the innovation initiation stage, the stage of deciding to adopt an innovation, and the innovation implementation stage) did not differ as the Mann-Whitney U-test analysis showed - statistically significantly between the different age groups of respondents. The overwhelming majority of the respondents from the above groups or all perceived the influence of the above factor at each stage.

However, the analysis of the Mann-Whitney U-test showed statistically significant differences between the age groups of the respondents in terms of perceived knowledge exchange between different company departments at the initial stage of innovation in terms of subsequent adoption. It turned out that among the younger age groups, the influence mentioned above was perceived less frequently (18-24 years: 95.95%; 25-34 years: 78.76%) compared to the older ones (45-54 years: 66.67%; over 54 years: 100.00%), and these differences are statistically significant, Z = -4.94; p < 0.001;  $r_g = -0.40$ . In the case of the two subsequent stages of the innovation process, no differences between groups were observed in the evaluation of the influence of the aforementioned factor.

Perception of the impact of a shared commitment towards the implementation of a specific project was also slightly less frequent at the innovation initiation stage in terms of subsequent adoption among younger age groups (18-24 years: 92.49%; 25-34 years: 69.03%) compared to older age groups (45-54 years: 62.50%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, Z = -5.07; p < 0.001;  $r_g = -0.36$ . For the next two stages of the innovation process, there were no differences between groups in assessing the impact of the factor mentioned above.

The age groups surveyed also differed in their perceptions of the impact of managers' promotion of the values of dialogue, collaboration, and partnership at the innovation initiation stage in terms of adoption. Analysing the proportion of those perceiving the above-mentioned influence by age group, it can be seen that among younger age groups, the influence of the above-mentioned factor was slightly more frequently perceived (18-24 years: 92.49%;

25-34 years: 75.22%) compared to older age groups (45-54 years: 70.83%; over 54 years: 90.00%). Analysis by Mann-Whitney U-test showed that these differences were statistically significant, Z = -4.85; p < 0.001;  $r_g = -0.35$ . There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor in the following two stages.

Differences were also observed between age groups in terms of the perceived impact of encouraging employees to discuss the ideas of others at the first stage of innovation initiation in terms of adoption. As can be inferred from the percentage distribution of those perceiving the above-mentioned influence by age group, the younger age groups were more likely to perceive the influence of the above-mentioned factor (18-24 years: 98.28%; 25-34 years: 84.07%) compared to older age groups (45-54 years: 75.00%; over 54 years: 100.00%). As shown by analysis with the Mann-Whitney U-test, these differences are statistically significant, Z = -5.07; p < 0.001;  $r_g = -0.46$ . There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor at the next two stages.

Analysis with the Mann-Whitney U-test also showed statistically significant differences between the age groups of the respondents in terms of perceiving regular brainstorming at the implementation stage of an innovation in terms of its subsequent adoption. It turned out that among the younger age groups, the influence mentioned above was perceived less frequently (18-24 years: 97.11%; 25-34 years: 87.61%) compared to the older ones (45-54 years: 70.83%; over 54 years: 100.00%), and these differences are statistically significant, Z = -4.12; p < 0.001;  $r_g = -0.40$ . For the two earlier stages of the innovation implementation process, there were no differences between groups in the assessment of the influence of the factor mentioned above.

However, there were no differences between the age groups of the respondents in terms of perceived impact of openness to new solutions and flexibility in solving problems at any stage of the innovation process in terms of subsequent adoption. An overwhelming majority of the respondents or all age groups perceived the above-mentioned impact. The Mann-Whitney U-test analysis did not show statistically significant differences between groups in this respect.

In contrast, perceiving the influence of mutual trust within a team or organisation at the initiation stage of an innovation in terms of its subsequent adoption was more common among younger age groups (18-24 years: 93.64%; 25-34 years: 72.57%) compared to older age groups (45-54 years: 54.17%; over 54 years: 90.00%). Analysis with the Mann-Whitney U-test showed that these differences are statistically significant, Z = -5.62; p < 0.001;  $r_g = -0.40$ . There were no significant differences between the aforementioned groups in terms of perceived impact of the aforementioned factor at the next two stages.

Furthermore, differences were observed between age groups in terms of perceiving the impact of appropriate appreciation and motivation of employees, this time at each stage of the innovation process in terms of adoption. When analysing the share of those perceiving the above-mentioned influence in the different age groups, it can be noted that among the younger

age groups, the influence of the above-mentioned factor was perceived slightly less frequently compared to the older ones, both at the innovation initiation stage and at the innovation adoption stage. When analysing the share of people perceiving the above-mentioned influence by age group, it can be noted that among younger age groups, the influence of the above-mentioned factor was perceived slightly less frequently than among older ones, both at the stage of initiating the innovation (groups aged up to 34: 95.38% and 98.23%, groups aged 45 and over: 100.00% and 100.00%) and at the stage of implementing the innovation (groups aged up to 34: 94.80% and 98.23%, groups aged 45 and over: 100.00% and 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant (Innovation initiation stage: Z = 2.35; p < 0.05;  $r_g = 0.44$ ; Innovation adoption decision stage: Z = 2.73; p < 0.01;  $r_g = 0.43$ ; Innovation implementation stage: Z = 2.44; p < 0.01;  $r_g = -0.45$ ).

# **3.4.** Age and shape assessment of the influence of individual factors related to internal communication on the adoption of innovations

The evaluation of the shape of the impact of training and meetings on improving internal communication at the innovation adoption decision stage and the implementation stage in terms of innovation adoption was significantly related to the age of the respondents. It turned out that the older the respondents, the greater the influence they attributed to the above mentioned factor, both at the stage of the decision to adopt the innovation (18-24 years: M = 3.75; SD = 0.88; older than 54 years: M = 4.5; SD = 0.76) and its implementation (18-24 years: M = 3.9; SD = 0.93; older than 54 years: M = 4.33; SD = 0.71). These correlations proved to be statistically significant (stage of decision to adopt the innovation: R = 0.15; t(N-2) = 2.85; p < 0.01; implementation stage: R = 0.12; t(N-2) = 2.24; p < 0.05). There was no significant relationship between age and impact shape rating of the factor mentioned above in the innovation initiation stage.

There was also a relationship between the age of the respondents and their assessment of the shape of the impact of good employee relations at the two stages of the innovation process in terms of subsequent adoption. In the case of the stage of the decision to adopt the innovation, it can be noted that the impacts ratings of the aforementioned factor increased with age, but there was no simple trend here. The youngest age groups (18-24 years: M = 4; SD = 0.8 and 25-34 years: M = 3.93; SD = 0.86) attributed the lowest impact to the aforementioned factor; a slightly higher impact was observed in the two older age groups (35-44 years: M = 4.15; SD = 0.72 and 45-54 years: M = 4.1; SD = 0.91), while the oldest age group, viz. over 54 years of age, rated the influence of the aforementioned factor as the highest (M = 4.75; SD = 0.46). On the other hand, in the stage of innovation implementation, there was a simple tendency for ratings of the influence of the above factor to increase with the age of the respondents (18-24 years: M = 4.09; SD = 0.79; older than 54 years: M = 4.67; SD = 0.5). These correlations were found to be statistically significant (stage of decision to adopt the innovation: R = 0.1; t(N-2) = 1.96; p < 0.05; implementation stage: R = 0.13; t(N-2) = 2.62; p < 0.01). In the case of

the first stage of the innovation process, there was no significant relationship between age and the evaluation of the shape of the impact of the above-mentioned factor.

Age was also important in terms of assessing the impact of improving internal communication by adapting its tools at the stage of the decision to adopt an innovation and the stage of implementation in terms of adoption. The older the respondents, the greater the impact they attributed to the above-mentioned factor (with a slight deviation in the 45-54-year group), both at the decision-making stage of innovation adoption (18-24 years: M = 3.87; SD = 0.83; over 54 years: M = 4.63; SD = 0.52) and at the implementation stage (18-24 years: M = 3.94; SD = 0.87; over 54 years: M = 4.75; SD = 0.46). These correlations were found to be statistically significant (stage of decision to adopt the innovation: R = 0.13; t(N-2) = 2.6; p < 0.01; implementation stage: R = 0.15; t(N-2) = 2.84; p < 0.01). There was no significant relationship between age and the assessment of the shape of the impact of the aforementioned factor at the initiation stage of innovation (Table 4).

#### Table 4.

Relationship between the age of the respondents and the shape rating of the impact of improving internal communication by adapting its tools on the adoption of innovations at different stages of its introduction

Improving			Descript	ive stat	istics				
internal communication	Age	Mean ± Standard	Median	Min.	Confi inte	dence rval	Stand	Spearman rank order	
by adapting its tools		deviation	[Q25 - Q75]	- Max.	-95%	+95%	error.	correlation	
Innovation initiation stage	18-24 years $(n = 161)$	3,96 ± 0,79	4 [4 - 4]	1 - 5	3,83	4,08	0,06		
	25-34 years (n = 85)	$3,79 \pm 0,77$	4 [3 - 4]	2 - 5	3,62	3,95	0,08	D = 0.01	
	35-44 years (n = 55)	3,93 ± 0,81	4 [3 - 5]	2 - 5	3,71	4,15	0,11	R = -0.01; t(N-2) =	
	45-54 years (n = 13)	$4 \pm 0,71$	4 [4 - 4]	3 - 5	3,57	4,43	0,20	p = 0.21, p = 0.837	
	Over 54 years old (n = 8)	4,5 ± 0,53	4,5 [4 - 5]	4 - 5	4,05	4,95	0,19		
	18-24 years (n = 163)	3,87±0,83	4 [3 - 4]	1 - 5	3,74	4,00	0,07		
	25-34 years (n = 108)	3,97 ± 0,81	4 [4 - 5]	1 - 5	3,82	4,13	0,08		
Stage of decision to adopt innovations	35-44 years (n = 76)	$4,08 \pm 0,93$	4 [3 - 5]	1 - 5	3,87	4,29	0,11	R = 0,13; t(N-2) = 2.6; p < 0,01	
	45-54 years (n = 20)	$4,05 \pm 0,83$	4 [4 - 5]	2 - 5	3,66	4,44	0,18		
	Over 54 years old (n = 8)	4,63 ± 0,52	5 [4 - 5]	4 - 5	4,19	5,06	0,18		

Innovation Implementation Stage	18-24 years (n = 163)	$3,94 \pm 0,87$	4 [3 - 5]	1 - 5	3,80	4,07	0,07	
	25-34 years (n = 109)	4 ± 0,85	4 [4 - 5]	2 - 5	3,84	4,16	0,08	R = 0.15
	35-44 years (n = 76)	4,21 ± 0,81	4 [4 - 5]	3 - 5	4,03	4,39	0,09	t(N-2) = 2.84
	45-54 years (n = 20)	4,15 ± 0,99	4 [4 - 5]	2 - 5	3,69	4,61	0,22	p < 0,01
	Over $54$ years of age $(n = 8)$	4,75 ± 0,46	5 [4,5 - 5]	4 - 5	4,36	5,14	0,16	

Cont. table 4.

There was also a relationship between the age of the respondents and their assessment of the shape of the impact of providing access to information at each stage of the innovation process in terms of adoption. At the innovation initiation stage, it appeared that the older the respondents were, the greater the influence they attributed to the above-mentioned factor (18-24 years: M = 3.78; SD = 1.06; over 54 years: M = 4.4; SD = 0.97). In the case of the stage of the decision to adopt the innovation, there was a gradual increase in the influence ratings of the above factor with age among respondents aged up to 54 years (18-24 years: M = 3.67; SD = 0.98; 45-54 years: M = 4.33; SD = 0.97). On the contrary, at the innovation implementation stage, those up to 34 years of age attributed less influence to the above mentioned factor (18-24 years: M = 3.72; SD = 0.98 and 25-34 years: M = 3.89; SD = 1.14) than those older than them (from M = 4; SD = 1.05 in the group over 54 years to M = 4.14; SD = 1.02 in the group 35-44 years). The correlations were found to be statistically significant (innovation initiation stage: R = 0.13; t(N-2) = 2.63; p < 0.01; innovation adoption decision stage: R = 0.18; t(N-2) = 3.52; p < 0.001; implementation stage: R = 0.16; t(N-2) = 3.27; p < 0.01).

Assessments of the shape of the impact of ensuring a rapid flow of information at each stage of the innovation process in terms of innovation adoption were significantly related to the age of the respondents. In the case of the innovation initiation stage, it can be seen that the impact rating of the aforementioned factor increased with age, but there was no simple trend here. The youngest age group, i.e. 18-24 years (M = 4.09; SD = 0.83), attributed the lowest impact to the aforementioned factor, while a slightly higher impact was observed in the two older age groups (25-34 years: M = 4.33; SD = 0.91 and 35-44 years: M = 4.24; SD = 0.9), while the two oldest age groups rated the impact of the aforementioned factor highest (45-54 years: M = 4.67; SD = 0.66 and older than 54 years: M = 4.5; SD = 0.53). In contrast, in the next two stages, the older the respondents were, the greater the influence they attributed to the aforementioned factor (with a slight deviation in the 35-44-year group at the stage of the decision to adopt the innovation), both at the stage of the decision to adopt the innovation (18-24 years: M = 4.25; SD = 0.83; over 54 years: M = 4.7; SD = 0.48) and its implementation (18-24 years: M = 4.25; SD = 0.79; over 54 years: M = 4.7; SD = 0.48). These correlations were found to be statistically significant (innovation initiation stage: R = 0.18; t(N-2) = 3.5; p < 0.001; innovation adoption

decision stage: R = 0.17; t(N-2) = 3.36; p < 0.001; implementation stage: R = 0.14; t(N-2) = 2.83; p < 0.01).

Age was also important in terms of assessing the impact of obtaining the necessary information at each stage of the innovation process in terms of adoption. It turned out that the older the respondents were, the greater the impact they attributed to the above-mentioned factor (with a slight deviation in the 35-44 age group at the innovation implementation stage), both at the innovation initiation stage (18-24 years: M = 4.09; SD = 0.92; over 54 years: M = 4.7; SD = 0.48), and the decision to adopt it (18-24 years: M = 4.15; SD = 0.83; over 54 years: M = 4.9; SD = 0.32), and its implementation (18-24 years: M = 4.11; SD = 0.92; over 54 years: M = 4.8; SD = 0.42). The correlations were statistically significant (innovation initiation stage: R = 0.17; t(N-2) = 3.46; p < 0.001; innovation adoption decision stage: R = 0.18; t(N-2) = 3.64; p < 0.001; implementation stage: R = 0.21; t(N-2) = 4.22; p < 0.001).

However, there was no relationship between age and the shape of the impact of knowledge sharing within the team or the organisation at particular stages of innovation introduction on its adoption. Ratings of the impact of the aforementioned factor were at a similar level between age groups and the correlations between the aforementioned variables were not statistically significant at any stage of the innovation process.

There was a correlation between age and shape rating of the impact of obtaining a lot of information at each stage of the innovation process in terms of adoption. Among those aged up to 54 years, less and less influence was attributed to the factor mentioned above with increasing age. This was true both at the stage of initiating the innovation (18-24 years: M = 3.68; SD = 1.19; 45-54 years: M = 2.87; SD = 1.29), deciding to adopt it (18-24 years: M = 3.78; SD = 1.05; 45-54 years: M = 2.91; SD = 1.15) and implementing it (18-24 years: M = 3.8; SD = 1.07; 45-54 years: M = 2.54; SD = 1.25). The oldest age group (more than 54 years) attributed more influence to the above-mentioned factor for each of the above-mentioned stages than all other groups. These correlations were found to be statistically significant (innovation initiation stage: R = -0.19; t(N-2) = -3.76; p < 0.001; innovation adoption decision stage: R = -0.23; t(N-2) = -4.63; p < 0.001; implementation stage: R = -0.25; t(N-2) = -5.02; p < 0.001).

The assessment of the shape of the impact of clear and effective communication at each stage of the innovation process in terms of innovation adoption was significantly related to the age of the respondents. In the case of the innovation initiation stage, the youngest people (18-24 years) attributed less influence to the above-mentioned factor (M = 4.24; SD = 0.82) compared to the older age groups (from M = 4.4; SD = 0.7 in the group above 54 years to M = 4.48; SD = 0.67 in the group 45-54 years). At the next stage, among those aged up to 54 years, an increasing influence was attributed to the aforementioned factor with increasing age (18-24 years: M = 4.28; SD = 0.78; 45-54 years: M = 4.67; SD = 0.64). In contrast, at the final stage of innovation, the older the respondents were, the more influence they attributed to the aforementioned factor (with a slight deviation in the 35-44 years group) (18-24 years:

M = 4.32; SD = 0.81; over 54 years: M = 4.6; SD = 0.52). These correlations were found to be statistically significant (innovation initiation stage: R = 0.1; t(N-2) = 1.98; p < 0.05; innovation adoption decision stage: R = 0.1; t(N-2) = 2.07; p < 0.05; implementation stage: R = 0.11; t(N-2) = 2.16; p < 0.05).

In contrast, supervisors' communication skills were similarly rated in terms of their impact on innovation adoption at each stage of the innovation process, regardless of age. Correlations between the aforementioned ratings at each stage (i.e. the innovation initiation stage, the innovation adoption decision stage and the innovation implementation stage) and age were found to be statistically insignificant.

There was also no correlation between age and shape rating of impact of communication skills of other employees of the company in different stages of adoption of innovation. Ratings of the impact of the aforementioned factor were at a similar level across age groups, and correlations between the aforementioned factors were not statistically significant at any stage of the innovation process.

In contrast, the evaluation of the shape of the impact of the flattening of the organisational structure at the two stages of the innovation process in terms of innovation adoption was significantly related to the age of the respondents. Among those up to 54 years old, as age increased, more influence was attributed to the factor mentioned above at the stage of the decision to adopt the innovation (18-24 years: M = 3.56; SD = 1.01; 45-54 years: M = 4.63; SD = 0.65) and at the stage of its implementation (18-24 years: M = 3.59; SD = 1.04; 45-54 years: M = 4.58; SD = 0.83). These correlations were found to be statistically significant (innovation adoption decision stage: R = 0.25; t(N-2) = 5.1; p < 0.001; innovation implementation stage: R = 0.2; t(N-2) = 4.12; p < 0.001). There was no correlation between age and the assessment of the shape of the impact of the aforementioned factor in the innovation initiation stage.

### **3.5.** Age and shape assessment of the influence of individual external communication factors on the adoption of innovations

Shaping and maintaining a good corporate image was rated similarly across age groups in terms of its impact on innovation adoption at each stage of the innovation process. Correlations between the aforementioned ratings at individual stages (i.e. innovation initiation stage, innovation adoption decision stage, and innovation implementation stage) and age proved to be statistically insignificant.

The impact of information about the company's mission and achievements presented to customers and suppliers was also rated similarly across age groups for each stage of the innovation process. There was no statistically significant relationship between the above variables at any stage.

In contrast, the assessment of the shape of the influence of good relations between company and/or service representatives and customers at each stage of the innovation process in terms of innovation adoption was significantly related to the age of the respondents. It turned out that among those up to 54 years old, with increasing age, an increasing influence was attributed to the above-mentioned factor in the innovation initiation stage (18-24 years: M = 4.02; SD = 0.85; 45-54 years: M = 4.38; SD = 1.07) and the stage of the decision to adopt the innovation (18-24 years: M = 4.1; SD = 0.81; 45-54 years: M = 4.41; SD = 0.7). On the contrary, at the final stage of innovation adoption, the youngest (18-24 years) attributed less influence to the aforementioned factor (M = 4.09; SD = 0.84) compared to the older age groups (from M = 4.29; SD = 0.89 in the 35-44 year group to M = 4.5; SD = 0.8 in the 45-54 year group). The correlations were found to be statistically significant (innovation initiation stage: R = 0.17; t(N-2) = 3.28; p < 0.01; innovation adoption decision stage: R = 0.15; t(N-2) = 2.89; p < 0.01; implementation stage: R = 0.15; t(N-2) = 2.86; p < 0.01) (Table 5).

#### Table 5.

Relationship between the age of the respondents and their assessment of the shape of the impact of good relations between company and/or service representatives and customers on the adoption of innovations at different stages of their introduction

Good relations			Descr	iptive sta	tistics				
between company and/or service	Age	Mean ±	Median	Min	Confie inter	dence rval	Stand	Spearman rank order	
representatives and customers		deviation Q75] Max95		-95%	+95%	error.	correlation		
Innovation initiation stage	18-24 years (n = 158)	$4,02 \pm 0,85$	4 [3 - 5]	1 - 5	3,89	4,15	0,07		
	25-34 years (n = 110)	$4,25 \pm 0,92$	4 [4 - 5]	1 - 5	4,07	4,42	0,09		
	35-44 years (n = 77)	$4,26 \pm 0,94$	5 [3 - 5]	1 - 5	4,05	4,47	0,11	R = 0,17; t(N-2) = $3.28$ ;	
	45-54 years (n = 21)	4,38 ± 1,07	5 [4 - 5]	1 - 5	3,89	4,87	0,23	p < 0,01	
	Over 54 years old (n = 10)	4,3 ± 0,67	4 [4 - 5]	3 - 5	3,82	4,78	0,21		
	18-24 years (n = 158)	4,1 ± 0,81	4 [4 - 5]	1 - 5	3,97	4,23	0,06		
	25-34 years (n = 108)	$4,25 \pm 0,87$	4 [4 - 5]	1 - 5	4,08	4,42	0,08		
Stage of decision to adopt	35-44 years (n = 79)	$4,32 \pm 0,87$	5 [4 - 5]	2 - 5	4,12	4,51	0,10	R = 0.15; t(N-2) = 2.89;	
innovations	45-54 years (n = 22)	$4,41 \pm 0,85$	5 [4 - 5]	2 - 5	4,03	4,79	0,18	p < 0,01	
	Over 54 years old (n = 10)	4,4 ± 0,7	4,5 [4 - 5]	3 - 5	3,90	4,90	0,22		

Innovation implementation phase	18-24 years (n = 159)	$4,09 \pm 0,84$	4 [4 - 5]	1 - 5	3,96	4,22	0,07	
	25-34 years (n = 108)	$4,3 \pm 0,82$	4,5 [4 - 5]	2 - 5	4,14	4,45	0,08	
	35-44 years (n = 79)	$4,29 \pm 0,89$	5 [4 - 5]	2 - 5	4,09	4,49	0,10	R = 0.15; t(N-2) = 2.86;
	45-54 years (n = 22)	$4,5 \pm 0,8$	5 [4 - 5]	3 - 5	4,14	4,86	0,17	p < 0,01
	Over 54 years old (n = 10)	4,3 ± 0,67	4 [4 - 5]	3 - 5	3,82	4,78	0,21	

Cont. table 5.

Age was also important in terms of assessing the impact of identifying customers' requirements and needs for products and services at the two stages of the innovation process in terms of adoption. It turned out that the older the respondents were, the more influence they attributed to the above-mentioned factor, at the stage of the decision to adopt the innovation (18-24 years: M = 4.12; SD = 0.88; above 54 years: M = 4.5; SD = 0.71) and its implementation (18-24 years: M = 4.02; SD = 0.89; above 54 years: M = 4.6; SD = 0.7) (with a slight deviation in the 35-44 years group at the last stage). The correlations were statistically significant (stage of decision to adopt the innovation: R = 0.15; t(N-2) = 2.96; p < 0.01; implementation stage: R = 0.17; t(N-2) = 3.45; p < 0.001). For the innovation initiation stage, there was no significant relationship between the above variables.

There was also a relationship between the age of the respondents and the evaluation of the shape of the impact of the analysis and the interpretation of public opinion about the company and its products or services at the stage of the decision to adopt the innovation in the context of its subsequent adoption. The youngest subjects (18-24 years) attributed less influence to the factor mentioned above (M = 3.89; SD = 0.86) compared to the older age groups (from M = 4; SD = 0.87 in the 54-year-old group to M = 4.11; SD = 0.97 in the 35-44-year group), and this correlation was statistically significant, R = 0.11; t(N-2) = 2.11; p < 0.05. For the other two stages, there was no significant association of the assessment of the impact of the aforementioned factor with the age of the subjects.

# **3.6.** Age versus shape assessment of the impact of individual organisational culture factors on innovation adoption

Assessing the shape of the impact of giving employees the opportunity to question existing solutions in the two stages of the innovation process in terms of innovation adoption was significantly related to the age of the respondents. It turned out that among those up to 54 years of age, as they grew older, more and more influence was attributed to the above-mentioned factor in the innovation initiation stage (18-24 years: M = 3.73; SD = 1.13; 45-54 years: M = 4.17; SD = 1.34). In contrast, at the final stage of innovation initiation, the older the respondents were, the less influence they attributed to the aforementioned factor (18-24 years: M = 3.61; SD = 1.09; over 54 years: M = 2.9; SD = 1.45). These correlations were shown to be

statistically significant (innovation initiation stage: R = 0.16; t(N-2) = 3.11; p < 0.01; implementation stage: R = -0.2; t(N-2) = -3.93; p < 0.001). There was no statistically significant relationship between the aforementioned variables for the innovation adoption decision stage (Table 6).

#### Table 6.

Relationship between the age of the respondents and the shape rating of the impact of giving employees the opportunity to question existing solutions on the adoption of innovation at different stages of its introduction

Giving employees				<b>C</b>						
the opportunity to challenge existing	Age	Mean ± Standard	Median [Q25 -	Min. -	Confi inte	dence rval	Stand	rank-order		
arrangements		deviation	Q75]	Max.	-95%	+95%	error.	correlation		
	18-24 years (n = 169)	3,73 ± 1,13	4 [3 - 5]	1 - 5	3,56	3,91	0,09			
Innovation initiation stage	25-34 years (n = 110)	3,96 ± 1,24	4 [3 - 5]	1 - 5	3,73	4,20	0,12			
	35-44 years (n = 80)	4,08 ± 1,11	4,5 [3 - 5]	1 - 5	3,83	4,32	0,12	R = 0.16; t(N-2) = 3.11;		
	45-54 years (n = 23)	4,17 ± 1,34	5 [3 - 5]	1 - 5	3,60	4,75	0,28	p < 0,01		
	Over 54 years old (n = 10)	3,9 ± 1,1	4 [4 - 4]	1 - 5	3,11	4,69	0,35			
	18-24 years $(n = 167)$	3,69 ± 1,08	4 [3 - 5]	1 - 5	3,52	3,85	0,08	R = -0.03; t(N-2) = 0.54;		
	25-34 years (n = 109)	3,71 ± 1,07	4 [3 - 4]	1 - 5	3,50	3,91	0,10			
Stage of the decision to adopt	35-44 years (n = 80)	3,66 ± 1,03	4 [3 - 4]	1 - 5	3,43	3,89	0,12			
innovations	45-54 years (n = 24)	3,54 ± 1,22	4 [3 - 4]	1 - 5	3,03	4,05	0,25	p = 0,59		
	Over 54 years old (n = 10)	3,4 ± 1,07	4 [3 - 4]	1 - 4	2,63	4,17	0,34			
	18-24 years old (n = 165)	3,61 ± 1,09	4 [3 - 4]	1 - 5	3,45	3,78	0,08			
Innovation	25-34 years (n = 112)	3,29 ± 1,16	3 [2 - 4]	1 - 5	3,08	3,51	0,11	R = -0,2;		
Implementation	35-44 years (n = 79)	3,13 ± 1,09	3 [2 - 4]	1 - 5	2,88	3,37	0,12	t(N-2) = -3.93; p < 0,001		
Phase	45-54 years (n = 24)	3,04 ± 1,3	3 [2 - 4]	1 - 5	2,49	3,59	0,27			
	Over 54 years of age $(n = 10)$	2,9 ± 1,45	3 [2 - 4]	1 - 5	1,86	3,94	0,46			

The ergonomics of the workstations was rated similarly across age groups in terms of its impact on the adoption of innovation at each stage of the innovation process. Correlations between the aforementioned ratings at the different stages (i.e., the innovation initiation stage, the innovation adoption decision stage and the innovation implementation stage) and age were found to be statistically insignificant.

In addition, the shape of the impact of the company's creation of favourable conditions for the development of employees' competencies was also rated similarly across age groups for each stage of the innovation process. There was no statistically significant relationship between the aforementioned variables at any stage.

On the other hand, there was a correlation between the age of the respondents and the assessment of the shape of the impact of providing autonomy to employees at the decision stage of adopting an innovation in the context of its subsequent adoption. The youngest subjects (18-24 years) attributed less influence to the factor mentioned above (M = 3.37; SD = 1.04) compared to the older age groups (from M = 3.59; SD = 1.14 in the 45-54-year group to M = 4.8; SD = 1.14 in the group over 54 years), and this correlation was statistically significant, R = 0.16; t(N-2) = 3.2; p < 0.01. For the other two stages, there was no significant association of the evaluation of the impact of the aforementioned factor with the age of the subjects.

In contrast, there was no relationship between age and ratings of the shape of the impact of a sense of shared ownership and control over one's own work at the different stages of innovation adoption. Ratings of the impact of the aforementioned factor were at similar levels across age groups, and correlations between the aforementioned variables were not statistically significant at any stage of the innovation process.

Encouragement of employees to continue learning was also rated similarly between age groups in terms of its impact on the adoption of innovation at each stage of the innovation process. Correlations between the aforementioned ratings at each stage (i.e., innovation initiation stage, innovation adoption decision stage and innovation implementation stage) and age were found to be statistically insignificant.

Assessing the shape of the influence of freedom to experiment and take risks at work at the innovation initiation stage in terms of adoption of innovation was significantly related to the age of the respondents. It turned out that among those up to 54 years of age, an increasing influence was attributed to the above-mentioned factor with increasing age (18-24 years: M = 3.77; SD = 1.02; 45-54 years: M = 4.05; SD = 1.05). This correlation was statistically significant, R = 0.11; t(N-2) = 2.11; p < 0.05. For the other two stages, there was no significant association between the above-mentioned variables.

There was also a correlation between the age of the respondents and the evaluation of the shape of the impact of knowledge exchange between the different departments of the company in the decision-making stage and the implementation stage in terms of adoption of the innovation. In the case of the first of the above-mentioned stages, there was no simple trend. The lowest ratings for the impact of the aforementioned factor were assigned by those in the 45-54 age groups (M = 3.96; SD = 0.95) and the 18-24 age groups (M = 4.01; SD = 0.83), while the highest ratings were assigned by those in the 35-44 age groups (M = 4.28; SD = 0.73) and more than 54 age groups (M = 4.4; SD = 0.7). On the other hand, at the innovation implementation stage, it can be noted that younger people attributed less influence to the above mentioned factor than older people. The lowest scores were recorded in the 18-24 year old

group (M = 4.01; SD = 0.88), a slightly higher impact was attributed to the aforementioned factor among the respondents between 25 and 44 years of age (from M = 4.25; SD = 0.94 in the 45-54 year group to M = 4.33; SD = 0.81 in the 25-34 year group), while the highest scores were recorded in the group over 54 years of age (M = 4.4; SD = 0.7). These correlations were found to be statistically significant (stage of decision to adopt innovation: R = 0.11; t(N-2) = 2.26; p < 0.05; implementation stage: R = 0.17; t(N-2) = 3.36; p < 0.001). There was no statistically significant relationship between the above variables for the innovation initiation stage.

There was a significant relationship between age and ratings of the shape of the impact of a joint commitment to a specific project in the innovation implementation stage in terms of adoption. The lowest impact ratings for the aforementioned factor were attributed to those in the age groups 45-54 (M = 3.7; SD = 0.95) and 45-54 (M = 3.79; SD = 1.22), and the highest to those in the age groups 25-34 (M = 4.17; SD = 0.87) and 35-44 (M = 4.3; SD = 0.85. This correlation was found to be statistically significant, R = 0.22; t(N-2) = 4.37; p < 0.001. For the other stages of the innovation process, there was no significant relationship between age and the shape rating of the impact of the above-mentioned factor on innovation adoption.

In contrast, there was no relationship between age and shape ratings of the impact of managers' promotion of the values of dialogue, collaboration, and partnership at different stages of innovation introduction on innovation adoption. The impacts of the aforementioned factor were at similar levels between age groups, and the correlations between the aforementioned variables were not statistically significant at any stage of the innovation process.

Encourage employees to discuss the ideas of others was also rated similarly across age groups in terms of its impact on innovation adoption at each stage of the innovation process. Correlations between the aforementioned ratings at each stage (i.e., the innovation initiation stage, the innovation adoption decision stage, and the innovation implementation stage) and age were found to be statistically insignificant.

Evaluation of the shape of the impact of regular brainstorming at the innovation initiation stage in terms of innovation adoption was significantly related to the age of the respondents. It turned out that among those aged up to 54 years, the above-mentioned ratings increased with age (with a slight deviation in the group 35-44 years) (18-24 years: M = 4.15; SD = 0.89; 45-54 years: M = 4.39; SD = 0.89). The correlation was statistically significant, R = 0.11; t(N-2) = 2.18; p < 0.05. For the other two stages, there was no significant association between the variables mentioned above.

There was also a relationship between the age of the respondents, and the assessment of the shape of the impact of openness to new solutions and flexibility in problem solving at the innovation initiation stage in terms of innovation adoption was significantly related to the age of the respondents. The older the respondents, the greater the influence they attributed to the above-mentioned factor (18-24 years: M = 4.2; SD = 0.94; over 54 years: M = 4.7; SD = 0.48), and this correlation was statistically significant, R = 0.15; t(N-2) = 2.95; p < 0.01. There was

no statistically significant relationship between the above mentioned variables for the other two stages of the innovation process.

Ratings of the shape of the impact of mutual trust within a team or organisation at the innovation implementation stage in terms of innovation adoption were significantly related to the age of the respondents. It appeared that the above-mentioned ratings increased with age (with some deviation in the 45-54 years group) (18-24 years: M = 4.16; SD = 0.8982; 45-54 years: M = 4.56; SD = 0.53). The correlation was statistically significant, R = 0.2; t(N-2) = 3.89; p < 0.001. For the previous two stages, there was no significant association between the above variables.

Additionally, there was a relationship between the age of the respondents and the assessment of the shape of the influence of appropriate appreciation and motivation of employees at the different stages of the innovation process on the adoption of the innovation. It turned out that the older the respondents, the greater the influence attributed to the factor mentioned above at the innovation initiation stage (18-24 years: M = 4.19; SD = 0.89; older than 54 years: M = 4.6; SD = 0.52) and its implementation (18-24 years: M = 4.23; SD = 0.88; older than 54 years: M = 4.7; SD = 0.48). A similar trend was observed for the stage of the decision to adopt the innovation, but only for those aged up to 54 years (18-24 years: M = 4.17; SD = 0.88 and 45-54 years: M = 4.58; SD = 0.83). The reported correlations, as the analysis showed, were statistically significant (innovation initiation stage: R = 0.16; t(N-2) = 3.19; p < 0.01; innovation adoption decision stage R = 0.17; t(N-2) = 3.48; p < 0.001; implementation stage: R = 0.15; t(N-2) = 2.93; p < 0.01).

There are interesting examples in the literature of research on innovation adaptation. One noteworthy example is a Delphi study conducted among 264 experts with diverse professional and academic backgrounds. It made it possible to examine the importance of a wide range of factors for different stages of the innovation adoption process. The results of the analysis show that the aforementioned factors do not affect the innovation adoption process with the same strength but have different effects on the subsequent stages (Pichlak, 2016).

#### 4. Conclusions

The age of the respondents influenced their perception of the influence of multiple factors at different stages of the innovation process in terms of adoption, as well as their assessment of the shape of this influence. Younger people tended to perceive the influence of individual factors more frequently than older people. At the same time, younger people tended to attribute less influence on the adoption of innovations to individual factors than did older age groups (there was often a trend of gradual increase in the above-mentioned assessments with the age of the respondents). The presented research results may be useful for managers to improve the adaptation of innovations in their companies.

The research presented in this article has some limitations. Firstly, it was carried out only in Poland, secondly, only in the IT sector, and thirdly, the age of the respondents was considered in the context of their perception of the influence of only selected factors related to internal communication, external communication, and organisational culture on the adoption of innovation.

In the future, they are planned to be carried out on a much larger scale in other industries both domestically and internationally, considering additional factors that may influence the adoption of innovations.

However, based on research to date, it is clear that for the process of adoption of innovation to be successful, companies should focus on creating a coherent communication system that is familiar to all participants in the organisation and that forms an integral part of the organisational culture. Then there is a chance that the trend presented in research will change and that increasingly younger employees will see a significant impact of both communication and the culture on the adoption of innovations.

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