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ASSESSING EMPLOYEE PERCEPTIONS OF INFORMATION TECHNOLOGIES IN PUBLIC SECTOR DIGITALISATION

Radoslav Kostev
Technical University of Sofia,
Sofia, Bulgaria
ORCID iD: 0000-0003-1209-4705

Kiril Anguelov*
Technical University of Sofia,
Sofia, Bulgaria
ORCID iD: 0000-0001-7936-3290

*Corresponding author:
E-mail: ang@tu-sofia.bg

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Introduction. The increasing role of digitalisation in the public sector is caused by the possibility of improving the quality of public services. However, the effective implementation of digitalisation in public organizations and its use is influenced by technological, organizational, environmental and human factors. Therefore, it is relevant to assess the perception of employees of government bodies and their perception of using information systems and technologies.

Aim and tasks. The goal is to study the resilience of public organisations and employee reactions in crises using information systems. The stated goal determined the survey of employees' opinions on the effects of the implementation and use of information and communications technology (ICT) in terms of improving communication and coordination in the organisation, crisis response capabilities, and satisfaction with the use of the system.

Results. The study analysed the responses of representatives of various public administration and administrative management levels in Bulgaria, the results of which were analysed using IBM SPSS Statistics. The survey involved 73 employees of public organisations holding various positions, which made it possible to assess the perceptions and impact of ICT use by employees. In the context of this study, it has been proven that information systems technology supports communication and coordination in public organisations. This affects the system's perceived usefulness and the employees' handling of unexpected changes (crises). Resolving crises using information and communication technologies affects employee satisfaction, which contributes to increasing organisational resilience.

Conclusions. This study examines the attitude of employees working in public administration toward the use of information and communication systems and the strengthening of the digitalisation process. Based on rank correlation analysis, research hypotheses were proven. It was found that there is a relationship between the use of ICT, improved organisational coordination and communication, crisis management and satisfaction of public sector employees with the use of ICT. The above factors affect organisational resilience and the ability to adapt in the context of digital transformation.

Keywords: employees, digitalisation, ICT, organisational resilience, public administration.

1. Introduction.

Achieving digital transformation in the public sector is only possible through government organisations' active implementation of information systems and technologies. In the management theory of public organisations and the digitalisation of the public sector, the provision of digital public services to society takes a central place. More research is needed on digitising internal organisational processes and activities and their effects on public-sector employees (Haesevoets, et al., 2024).

This is the starting point for achieving effective digital transformation and providing quality public services to citizens and businesses. However, the digitalisation of the public sector is influenced by employees' perceptions of the use of information systems and technologies. This study uses information systems to examine public organisations' resilience and employees' reactions in crises.

However, this impacts employee satisfaction with the use of information systems. Resilience implies that employees handle crises as unexpected changes due to external or internal factors. A major challenge for public organisations, and everyone in general, was the COVID-19 crisis. This further strengthens the need for digitisation and information and communication technologies. In this regard, it is necessary to study employees' perceptions and their effects on using information systems to achieve resilience in public organisations.

2. Literature review.

The analysis of the research literature shows the advantages and opportunities of new technologies, digitalisation, information systems and artificial intelligence for purely business purposes. Companies (as a driving factor for the overall economy) usually enjoy much attention from scientists, a phenomenon that is explainable and understandable. Despite the continuous modernisation efforts of public administration and public entities, such structures remain on the periphery of scientific interest from the point of view of implementing new technologies to provide public services. However, in practice, this has been happening in recent decades.

2.1. Focus on the AI in public services.

Li and Wang (2024) explored the characteristics of government chatbots. Their findings reveal that attributes of chatbots, such as politeness, proactivity, conscientiousness, fairness, and professionalism, significantly shape citizens' experiences. Larsen and Følstad (2024) contribute findings indicating that citizens and public service providers perceive chatbots as enhancing access and efficiency, though not as a significant transformation.

Zhu et al. (2024) study how a platform functioning as a meta-organisation facilitates the successful implementation of a public service project. They argue that such platforms bring together multiple stakeholders to improve public services, mitigate conflict, and stimulate innovation. This collaboration helped establish norms to regulate actions and enhance service delivery.

Horvath et al. (2023) found limited proof of the minimisation of the negative impact of AI on human participation. Kleizen et al. (2023) also emphasised society and citizens' general trust in AI. Their research results indicated that general information about ethical AI has little to no influence on citizens' trust, perceived trustworthiness, or support for related policies.

2.2. New technologies in environmental, education and transport systems.

Rico and Laukyte (2024) analyse the European Travel Information and Authorization System and its AI capacity, which must comply with human rights and have to be considered in this system: transparency, personal data protection, accuracy fairness and redress mechanisms.

Xu et al. (2024) consider using AI for environmental assessment and propose an AI-driven model, which has all the prerequisites to gain the public opinion's trust in assessing such sensitive topics as the environment. The same idea comes from Szramowiat-Sala et al. (2024), who propose a new approach based on AI, but this time – to control the impact on the environment that conventional energy technology has.

Beege et al. (2024) explore the use of AI for STEM education and admit that expectations for future adoption of AI are significantly higher.

Numerous studies cover different aspects of using AI in the educational process of contrite subjects, for instance, language education (Chang & Sun, 2024; Xiao et al., 2024; Dong et al., 2024; Woo et al., 2024).

Chan and Tsi (2024) pose a logical question if generative AI will replace teachers and present perceptions of both teachers and students. Their study found that teachers have to understand how generative AI can complement their roles.

2.3. Challenges of using new technologies in public service.

In the Bulgarian context, exciting research has been conducted by Petrov and Tsonkov (2023), who propose an analysis for the development of intelligent transport systems prepared for the largest cities in the country. Ahmedova (2022) focuses on the digitalisation of the Bulgarian transport sector, which was forced by the COVID-19 pandemic. Toshev et al. (2024) explore digitalisation in the country's health care. Stoyanova and Angelova (2024) for using AI in higher education institutions (including those with public financing). Dimcheva and Stoyanov (2024) studied new perspective of engineering education, based on the expectations of representatives of IT sector. Stoykov (2024) explores the impact of change management in the security education system and new perspectives.

Information and communication technologies in public administration have been the subject of research as a strategy for the prevention of corruption (Anguelov, 2008; Kostev & Anguelov; 2022).

Lindgren (2024) pays attention to several critical problems with new information systems and automation in public administration, including the tasks, roles, and responsibilities that arise from automation.

Another interesting aspect when we look at information systems and opportunities for automation, reengineering and overall improvement of work of the public authorities through the possibilities provided by new technologies was developed by Ruschemeier and Hondrich (2024), who analyse the shortcomings of existing EU and national legal frameworks in effectively addressing the risks associated with automation bias.

In this regard, Arcila (2024) claims that although risk regulations, such as the AI Act, govern certain aspects of human-machine interactions, they do not grant individuals affected by AI systems sufficient rights or adequate means to seek redress. From a corrective justice standpoint, according to the scholar, the risk regulation should be complemented by liability law, ensuring that individuals who experience harm from AI systems receive appropriate compensation.

3. Methodology.

The research is based on the results of a survey conducted on the opinions of employees of public organisations regarding the effects of using information systems. The study covers 73 public organisations in Bulgaria, of which 50 are state and municipal administrations and 23 are state and municipal enterprises that have implemented and used Information Systems. Anonymity in completing the questionnaire was guaranteed to obtain honest answers and to minimise respondents' concerns. The questionnaire was designed to identify the factors influencing the implementation and use of information systems and their effects on employees in public organisations. The survey questions cover five main groups that aim to identify.

The structure and characteristics of the respondents, such as age, level of education, and position held in the organisation.

– Technological factors affecting the implementation and use of information systems in public organisations. Factors related to the information system.

– Organisational factors. Factors related to the internal structure and elements of the organisation.

– Environmental factors – external factors influencing the functioning of the organisation and the possibilities for implementation and use of information systems.

– Human perceptions– factors related to human perceptions when using the information system.

This study provides a general point of view of the research problem, aiming to establish the following two hypotheses:

H1: The use of information systems increases communication and coordination between employees and departments in the organisation, which affects the work of employees and decisions made in conditions of unexpected changes caused by factors (crises).

H2: The improvement of communication and coordination between employees and departments in the organisation due to the information system leads to greater employee satisfaction with the use of the system.

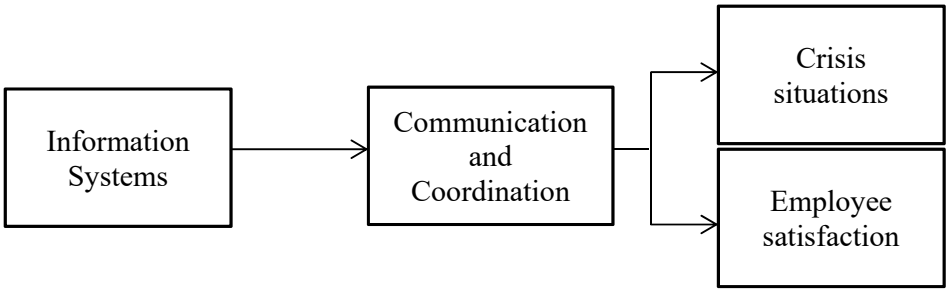

Fig. 1. Methodological model of interaction.

The current study focuses on the fifth group of factors from the survey: Human perceptions. This group of factors includes statements for respondents to rate regarding their perceptions of the effects of the information system in use. The possible values of each measure are located on a standardised Likert scale from 1 to 5 (from "strongly disagree" through to "strongly agree"). The aim is to evaluate the effects of an information system on employees.

First, to what extent has the information system facilitated the employees' work, and what is their level of satisfaction with using the system? Next, how does the information system affect communication and coordination within the organisation and employees' response time? Finally, how is the use of the information system affected by unexpected changes (crises) caused by various factors - internal or external to the organisation? The model includes the opinion of employees regarding the statements:

– Has the information system increased communication and coordination between employees and departments in the organisation?

– Has the information system increased the adaptability and flexibility of employees and the organisation concerning changes (crises) caused by various factors (internal and external)?

– Did using the information system facilitate your work and increase your satisfaction?

The Spearman rank-order correlation coefficient (Spearman's ρ (rho)) was used to prove the defined research hypotheses. In this study, rank (ordinal) data are used, and sometimes, in statistical analysis, it is necessary to transform primary interval or proportional data into rank data. In these cases, and when the assumption of a normal distribution of the Pearson coefficient is not fulfilled, it is appropriate to use the Spearman correlation coefficient.

The Spearman rank-order correlation coefficient measures the strength of the increase or decrease in the relationship between two variables by not using the original data but by ranking it and analysing the ranked data.

Pearson's correlation coefficient r and Spearman's ρ take values from -1.00 to + 1.00 and are interpreted similarly.

The prerequisites for calculating Spearman's rank correlation coefficient (Laerd Statistics, 2018) are the same as for any nonparametric test:

– Random sampling. The selection of respondents must be random.

– The data for the variables must be independent. Each respondent completed only one survey and was not influenced by the opinions of other respondents.

– There is a monotonic relationship between the two variables.

A monotonic relationship exists when the value of the variables increases together, or when the value of one variable increases, the value of the other variable decreases. The statistical hypotheses that are tested are the following:

H_0: There is no monotonic relationship between the two variables.

H_1: There is a monotonic relationship between the two variables.

The processing of the received data is based on a set of statistical methods implemented through the software product IBM SPSS Statistics. The methods for analysing the variables are: descriptive analysis and statistical testing of hypotheses for research of dependencies by Spearman rank-order correlation.

4. Results.

The survey, conducted in May-September 2024, involved 73 respondents – employees of state organisations, of whom 23 (or 31.5%) worked in state-owned enterprises and 50 (or 68.5%) in the public administration.

Figure 2 shows the distribution of respondents by type of organisation and territorial level.

The territorial distribution of the respondents shows that 44 work in national-level organisations, of which 12 are in-state public enterprises, and 22 are in state administration.

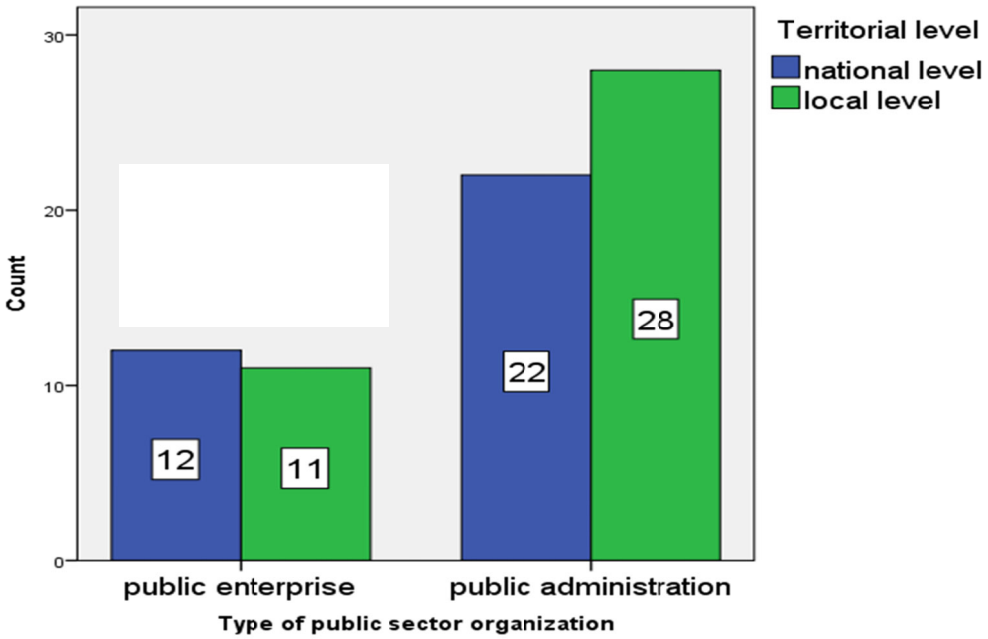

Fig. 2. Distribution of respondents by type of organisation and territorial level, 2024.

The responses of those working in public organisations at the local level include 11 employees in municipal enterprises and 28 employees in local administrative structures. The distribution of the surveyed employees is approximately 34, who work in public organisations at the national level and 39 at the local level, which can give us a general idea of the state of the problem.

Figure 3 shows the distribution of respondents by level of education. Level of education is a significant factor influencing employees' intention to use information systems and perceived usefulness.

Employees hold the largest share with a master's degree – over 70% of the respondents. The share of employees with PhD degrees is significant.

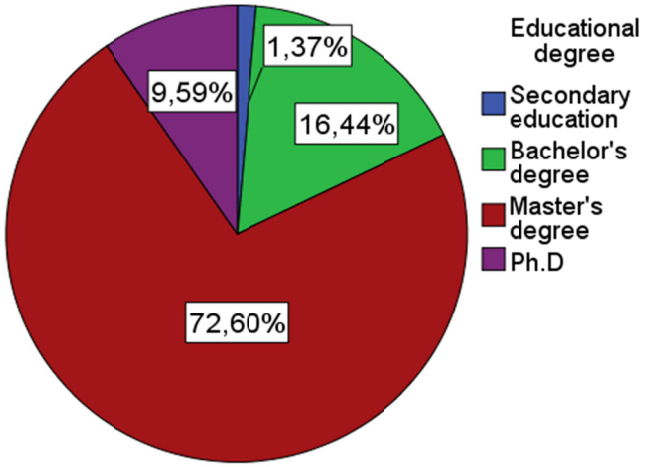

Fig. 3. Level of education of the respondents, 2024.

Figure 4 shows the distribution of employees by age group. The distribution is relatively even, with no extreme values being noticed. The largest share of employees is between the ages of 40 and 49. The share of employees under 29 and over 60 is the same. The age structure of public sector employees is also a major factor influencing employees' intention to use information systems and perceived usefulness.

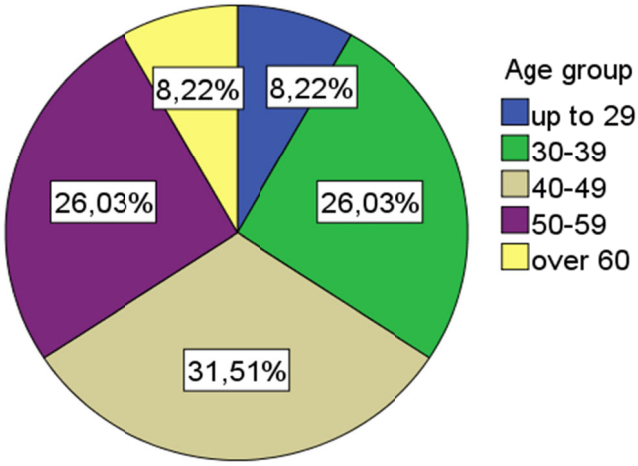

Fig. 4. Age structure of the respondents, 2024.

Figure 5 shows the distribution of employees according to the occupied hierarchical position in the organisation.

The distribution is roughly between employees who do not hold managerial positions and those who hold managerial positions (about 50%). This gives us reason to consider the respondents' assessments as a representative, as it thinks the opinion of both employees and managers in public organisations, who are assumed to be more familiar with and involved in the process of implementing information systems and have a view of the effects of system usage and employee behaviour.

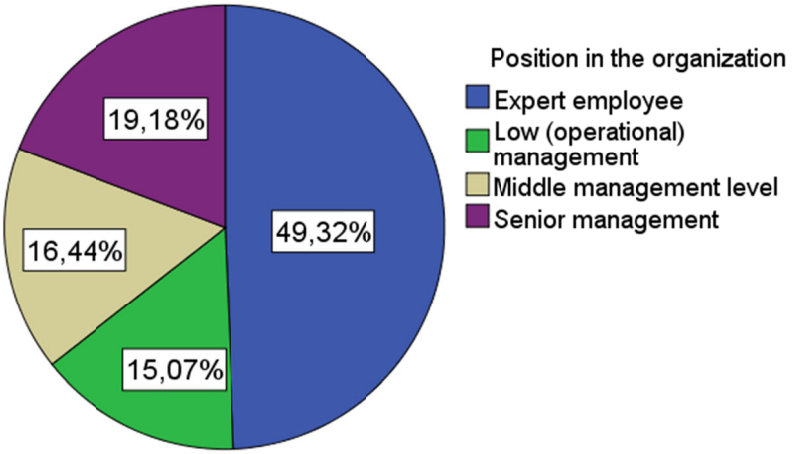

Fig. 5. Position of the employees in the organisations, 2024.

To prove the research hypotheses, a relationship is sought between the variables in the model (the respondents' evaluations of the effects and their perceptions related to the use of the information system): "Communication and Coordination", "Crisis situations", "Employee satisfaction". Table 1 presents the respondents' evaluations of the relevant statements.

Table 1. Evaluation of factors by employees, 2024.

Factors	Rating	Frequency	Percent %	Mean	Median	Mode
Employee satisfaction	Strongly Disagree	2	2,7	3,75	4	4
	Disagree	7	9,6			
	Undecided	10	13,7			
	Agree	42	57,5			
	Strongly Agree	12	16,4			
Communication and Coordination	Strongly Disagree	1	1,4	4,00	4	4
	Disagree	2	2,7			
	Undecided	13	17,8			
	Agree	37	50,7			
	Strongly Agree	20	27,4			
Crisis situations	Strongly Disagree	7	9,6	3,05	3	4
	Disagree	21	28,8			
	Undecided	14	19,2			
	Agree	23	31,5			
	Strongly Agree	8	11,0			

The general opinion of the employees is that the information system facilitates their work and increases satisfaction with the use of the system, with 74% of respondents indicating that they indicated "Agree" and "Strongly Agree". 12.3% of employees do not have this opinion, and 13.7% cannot judge.

Regarding "Communication and Coordination", about 78% of employees believe that the information system has improved communication and coordination between employees and departments and reduced response time. The assessments regarding the adaptability and flexibility of employees and the organisation concerning changes (crises) using the information system are more varied.

The share of employees who believe that the information system helps to deal with crises is 42.5%. About 38% of employees think it helps to deal with crisis situations, and 19% cannot judge. It also has the lowest rank average of 3.05 (Undecided).

5. Testing the research hypotheses.

H1: The use of information systems increases communication and coordination between employees and departments in the organisation, which affects the work of employees and the decisions made in conditions of unexpected changes caused by various factors (crisis situations).

Table 2. Correlations between "Communication and Coordination" and "Crisis situations".

			Communication and Coordination	Crisis situations
Spearman's rho	Communication and Coordination	Correlation Coefficient	1,000	,384**
		Sig. (2-tailed)	.	,001
		N	73	73
	Crisis situations	Correlation Coefficient	,384**	1,000
		Sig. (2-tailed)	,001	.
		N	73	73

**. Correlation is significant at the 0.01 level (1-tailed).

Source: based on SPSS.

There is a monotonic relationship between the two variables (Table 2). Spearman's rho value is 0.384 and is statistically significant (Sig. (1-tailed) = 0.001) at a one-sided critical region and error risk α=0,01. This provides reason to reject the null hypothesis in favour of the alternative, i.e. there is dependence between the respondents' assessments of the two factors: "Communication and Coordination" and "Crisis situations". Addiction can be rated as moderately strong. The value of Spearman's rho is positive, which means that the information system improves communication and coordination between employees and departments in the organisation and affects handling unexpected changes (crisis situations).

Research hypothesis H1 is confirmed.

H2: The improvement of communication and coordination between employees and departments in the organisation, as a result of the information system, leads to greater employee satisfaction with the use of the system.

Spearman rank-order correlation results in SPSS showed a monotonic relationship between the two variables. Spearman's rho value is 0.358 and is statistically significant (Sig. (1-tailed) = 0.05) at a one-sided critical region and error risk α=0,05.

This gives reason to reject the null hypothesis in favour of the alternative, i.e. there is dependence between the respondents' assessments of the two factors – "Communication and Coordination" and "Employee satisfaction" (Table 3).

Table 3. Correlations between "Communication and Coordination" and "Employee satisfaction".

			Communication and Coordination	Employee satisfaction
Spearman's rho	Communication and Coordination	Correlation Coefficient	1,000	,358*
		Sig. (2-tailed)	.	,014
		N	73	73
	Employee satisfaction	Correlation Coefficient	,358*	1,000
		Sig. (2-tailed)	,014	.
		N	73	73

*. Correlation is significant at the 0.05 level (1-tailed).
Source: based on SPSS.

Addiction can be rated as moderately strong. The value of Spearman's rho is positive, which means that the information system, improving communication and coordination between employees and departments in the organisation, affects employees' satisfaction with the use of the system, which in turn facilitates their work.

Research hypothesis H2 is confirmed.

6. Discussion.

Interesting answers to the open questions were obtained in the survey, which expanded our knowledge of the studied problem. In essence, answers do not differ from the already established results of the hypotheses but provide an opportunity to specify complementary understandings about the usefulness of information and communication technologies in public administration.

First, information and communication technologies are expected to be created regarding the sustainability of work processes in public administration and public enterprises. The main functions that information and communication technologies have concerning the sustainability of work processes are identified, as among them are the retrospection of the actions performed, the possibility of publicity and public control, the integration of information and the impossibility of individual employees making decisions in an unregulated manner (anti-discretion).

The obtained results are also in this direction, as the respondents report these characteristics of information systems in public administration.

Second, is the interaction between information systems, both at the level of a concrete administrative structure and between different administrative structures? The open questions give a good idea of the lag in the development of information connectivity between the different administrations, which could lead to the discrediting of the entire administrative system.

Related to these open questions are the directions of future research that the authors find necessary to explore the influence of the functions of information and communication systems on work processes in public organisations and the state of information connectivity in Bulgaria in a national and European context.

7. Conclusions.

Digitisation is an inevitable process that improves an organisation's efficiency and overall performance. Undoubtedly, this is most prominent in business organisations, but it is also critical for implementation in service delivery and the overall operation of public authorities. The present study examines the attitude of employees working in public administration toward the use of information and communication systems and the increased digitalisation process. The study confirmed the defined research hypotheses and showed that using information systems increases communication and coordination between employees and departments in the organisation, which affects the work of employees and decisions made in conditions of unexpected changes caused by crisis situations.

Improving communication and coordination between employees and departments in the organisation, as a result of the information system, leads to greater employee satisfaction with using the system, as confirmed by data analysis.

This study contributes to the broader discussion on digitisation in public administration and, more specifically, on civil servants' perception of these processes.

The question of achieving resilience in public organisations and employee responses in crises with the help of information systems remains open for future research.

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