SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2026
ORGANIZATION AND MANAGEMENT SERIES NO. 250

DIGITAL COMPETENCES AS A DETERMINANT OF INFORMATION PROCESS PERFORMANCE IN MUNICIPAL ADMINISTRATION

Angelika WODECKA-HYJEK[1*], Hubert OBORA[2], Michał TECZKE[3]

[1] Krakow University of Economics; wodeckaa@uek.krakow.pl, ORCID: 0000-0002-6930-4438
[2] Krakow University of Economics; oborah@uek.krakow.pl, ORCID: 0000-0003-2744-726X
[3] Krakow University of Economics; teczkem@uek.krakow.pl, ORCID: 0000-0001-9617-1936
*Correspondence author

Purpose: The aim of the study is to identify and analyse the role of employees' digital competences in shaping the performance of information processes in a municipal administration, using the Krakow City Hall as a case study. Achieving this objective required assessing the level of employees' digital competences, identifying available forms of development support, and examining the scale and nature of errors occurring in information processes.
Design/methodology/approach: The theoretical part of the article discusses the determinants of information processes in the digital age and the role of digital competences in the development of e-government. The empirical part presents the results of an online CAWI survey conducted among 245 employees from nine organisational units of the Krakow City Hall that most frequently reported problems related to the functioning of information processes. The collected data were analysed using descriptive statistics.
Findings: The results indicate that the level of employees' digital competences, according to their self-assessment, is only moderate (mean score of 2.93 on a five-point scale), accompanied by a moderate level of errors in information processes. The study identified, among others, situations related to information overload and information scarcity, difficulties in interpreting information, and the retention of information by employees. The findings suggest that insufficient digital competences constitute one of the factors contributing to the occurrence of information inefficiencies.
Research limitations/implications: The limitations of the study relate primarily to its scope, which covered selected organisational units of the Krakow City Hall, and to the fact that the measurement of competences was based on respondents' self-assessment. Future research should extend the analysis to all organisational units of the office as well as to other municipal administrations, and should employ additional research methods, including objective competence tests and qualitative approaches.
Practical implications: The results highlight the need for a systemic strengthening of employees' digital competences through the development of training programmes, greater managerial involvement in motivating employees to improve their skills, and the promotion of an organisational culture supportive of digital transformation. Such measures may contribute to reducing errors in information processes and improving the quality of public services.

Social implications: Enhancing the level of digital competences in public administration is a key element of the digital transformation of the public sector and directly affects the quality of life of citizens and their access to public services. Reducing information inefficiencies through the development of employees' competences may foster trust in digital administration, help reduce digital exclusion, and increase civic participation in public life.
Originality/value: The article combines the perspective of digital competences with the analysis of specific information inefficiencies within a local government administration office, thereby addressing a gap in national research on the digital transformation of the public sector.
Keywords: digital competences, information processes, information inefficiencies, e-administration, e-government, local government administration.
Category of the paper: Research paper.

1. Introduction

Although the concept of digital transformation is widely used, it is rarely defined unambiguously in the literature (Alvarenga et al., 2020). D.M. Mazzone (2014) defines digital transformation as "the intentional and continuous digital evolution of an organisation, its business model and processes, implemented at both strategic and tactical levels". M. Fitzgerald et al. (2013), in turn, describe it as the use of new digital technologies, such as social media, mobile devices, analytical tools or embedded technologies, to achieve significant business improvements, including improved customer service quality, optimisation of operational processes and the creation of new business models. Digital transformation is also understood as a process of change leading to a certain level of technological advancement or, more broadly, as a set of trends and consequences resulting from the increasingly intensive use of digital technologies (Dufva, Dufva, 2019). In this perspective, it refers to organisational transformation resulting in the integration of digital technologies with business processes and leading to the development of a new operating model based on these technologies (Liu et al., 2011). In practice, the terms digitisation, digitalisation and digital transformation are sometimes used interchangeably in the literature (Mergel et al., 2019, p. 1).

The rapid development of markets based on information and communication technologies (ICT) has been an important driver of economic growth in recent years. The dynamic advancement of digital technologies has led to the transfer of many areas of social life into the virtual environment. This process is associated with the need to develop appropriate competences enabling the conscious, effective and safe use of ICT, thereby enabling full participation in social life. The development of information and communication technologies has also enabled a key innovation in service delivery in the form of electronic services. In the most general sense, electronic services (e-services) are defined in the literature as services provided via a network (Rust, Kannan, 2003, pp. 37-42).

Digital transformation in the public sector involves new ways of collaborating with stakeholders, creating innovative service delivery frameworks and building new forms of relationships (Mergel et al., 2019, p. 1). The digitalisation of public administration is one of the key transformation processes of the modern state, which must adapt its legal and organisational structures to a rapidly changing technological environment. The introduction of modern technologies into public administration is intended to increase the efficiency of public offices and improve the accessibility of services for citizens. A modern administration should therefore not only perform its tasks effectively but also respond to the expectations and needs of citizens. An important prerequisite for well-designed digital public services and a high level of service delivery is the continuous development of digital competences among public administration employees, particularly those working in local government administration. In the public sector, digitalisation has primarily affected the way public services are delivered, enabling institutions to better adapt to the changing expectations of citizens. In this context, the concept of e-government becomes particularly important. It can be interpreted broadly as the use of ICT to provide access to public information and, more narrowly, as the use of these technologies directly in the process of delivering public services (Mergel et al., 2019).

A study conducted by Miazga et al. (2022) on the digitalisation of municipal offices in Poland revealed a limited systemic approach to digital transformation in Polish city administrations, strongly differentiated by the size of the city. Most municipalities lack strategic documents or organisational structures dedicated to digitalisation, which results in the uncoordinated and fragmented implementation of ICT solutions. Although the experience of the COVID-19 pandemic contributed to accelerating digitalisation processes, particularly in larger cities, solutions with limited functionality still dominate and are largely based on central government administrative platforms. E-services are typically dispersed, allow only partial completion of administrative procedures online, and are rarely designed from a user-centred perspective. The main barriers to digital transformation include financial and competence-related shortages, organisational resistance, and siloed administrative structures. In the long term, these factors may deepen digital disparities between small and large cities.

This study aims to identify and analyse the role of employees' digital competences in shaping the efficiency of information processes in a local government administration office, using the Krakow City Hall as a case study.

The theoretical part of the article discusses the determinants of information processes in the digital age and examines the concept of digital competences in the context of the development of e-government. The empirical part is based on a CAWI survey conducted among 245 employees from nine organisational units of the Krakow City Hall. The analysis focused on employees' assessments of their level of digital competences, the availability of development support, and the scale and nature of errors occurring in information processes. The study was designed to verify two hypotheses concerning the need to further strengthen digital competences and their influence on the occurrence of information inefficiencies.

The final part of the article presents a discussion of the results in relation to both Polish and international research, highlighting similarities and differences in the role of digital competences in the functioning of public administration and their importance for reducing errors in information processes.

2. Determinants of information processes in the digital age

The digitalisation of the public sector reshapes the conditions under which information processes operate, increasing the scale, intensity and complexity of information flows within the sector under analysis. The literature emphasises that digital transformation is not limited to the implementation of IT tools but involves the integration of technological infrastructure, e-services and human capital development (Valaskova et al., 2025; Jafari et al., 2025). In this perspective, information becomes part of a broader organisational system in which technology, procedures and employees' competences remain interrelated. The issue of information inefficiencies under conditions of digitalisation has also been examined in empirical studies conducted within local government administration. A case study of the Municipality of Krakow indicates the multidimensional nature of disruptions in information circulation, encompassing quantitative, temporal and competence-related aspects (Obora, Teczke, 2024). This perspective confirms the relevance of analysing information processes in the public sector from an integrated standpoint that combines both structural and cognitive dimensions.

Studies concerning the public sector indicate that the process of digital transformation is regionally and institutionally differentiated (Valaskova et al., 2025). This implies that the level of digital maturity may vary between organisations and countries, which may also affect the organisation and performance of information processes. At the same time, longitudinal studies show that as digital organisations mature, the focus shifts from IT infrastructure alone towards a broader integration of technological resources with organisational processes and human capital (Jafari et al., 2025). This, in turn, indicates the need to analyse information processes from a multidimensional manner.

The first dimension considered in the analysis is the quantitative dimension, in which information overload is a frequently examined phenomenon. Model-based studies on team decision-making demonstrate that as the level of information overload increases, the effectiveness of information-sharing strategies may change depending on the priority adopted (speed versus accuracy of decisions) (van Veen et al., 2020). Although the authors do not refer directly to the public sector, their findings suggest that an increase in the volume of processed information may require adjustments in the ways information is shared and selected. Research on digital environments has also shown that information overload may be associated

with information avoidance behaviours. An analysis of social media user behaviour indicates that system design may influence the level of information overload, which in turn may be related to behaviours involving the limitation of exposure to information content (Kumalasari, Priharsari, 2023). Although the study was conducted in the context of social networking services (SNS) and pandemic-related information, the mechanism identified may also occur in other contexts, highlighting the importance of the structure and intensity of communication in digital environments.

In the literature addressing information overload, attention is also drawn to its potential links with the cognitive characteristics of individuals in managerial positions (Vieira, Razzolini Filho, 2019). These studies focus in particular on the validation of instruments used to measure information overload and the construct of need for cognition. The authors analyse the relationship between the perceived amount of information and the cognitive characteristics of the individual. Their findings suggest that the quantitative dimension of information processes may be interpreted both in terms of the objective volume of information and the subjective perception of information excess.

Another dimension examined in a multidimensional perspective is the temporal dimension. Digital communication systems enable a substantial reduction in the time required to transmit information and increase the frequency of data updates. The literature on digital transformation emphasises that technology may support the reorganisation of work and the integration of organisational processes (Jafari et al., 2025). However, this does not automatically lead to improvements in all parameters of organisational functioning. Results of model-based studies (van Veen et al., 2020) suggest that under certain levels of information overload, communication strategies may differ in effectiveness depending on whether the priority is the speed or the accuracy of decisions. Although the authors do not refer directly to public administration, their findings indicate that the pace of information flows remains related to the quality of information processing. For this reason, the temporal dimension of information processes can be understood as encompassing not only the speed of information transmission but also the synchronisation, timeliness and appropriateness of the moment at which information is delivered.

From a broader perspective, analyses of the digitalisation of the public sector indicate gradual changes in the level of digital inequality among EU member states (Valaskova et al., 2025). It should be noted, however, that these studies do not directly address the speed of information circulation within organisations. Therefore, their conclusions concerning the temporal dimension should be interpreted primarily within the broader context of the development of digital infrastructure and e-services.

The third dimension considered in the multidimensional analysis is the qualitative dimension of information. Information quality in digital environments includes such characteristics as relevance, clarity and consistency of content. Studies on the design of SNS-based systems indicate that features of information systems may be related to users'

perceptions of information quality (e.g., information relevance and information equivocality) as well as to the level of information overload (Kumalasari, Priharsari, 2023). This suggests that the design of digital tools may significantly influence the reception and processing of information. In the context of public sector transformation, digital maturity is understood to include, among other elements, the development of e-services, the strengthening of digital competences and the integration of data resources (Valaskova et al., 2025). The cited authors analyse these elements from a comparative perspective across EU member states. Their findings clearly emphasise the importance of structural conditions for the functioning of information systems. The literature addressing information overload also highlights that the perception of information excess may be related to the cognitive processes of decision-makers (Vieira, Razzolini Filho, 2019). This indicates that information quality can be considered not only in objective terms but also in subjective terms related to the ability of individuals to process information.

The final dimension of the analysis is the competence dimension. Numerous studies on the public sector emphasise the importance of digital competences in transformation processes. An analysis of employees in the Portuguese public sector indicates that digital transformation may be hindered by insufficient levels of digital competences, while participation in digital training programmes remains limited (Lopes et al., 2023). The authors report a relatively low level of self-assessed digital knowledge and a high proportion of employees who have not participated in training activities in recent years. These findings highlight the importance of investment in human capital. From an organisational perspective, the literature also emphasises the role of digital leadership and intellectual capital management in the public sector (Firmansyah et al., 2025). The cited authors suggest that improvements in intellectual capital management and digital leadership may be associated with higher quality of public services and increased stakeholder trust. Longitudinal studies on the transformation of public organisations indicate that effective integration of digital technologies requires adjustments in organisational culture and institutional structures (Jafari et al., 2025). In this sense, digital competences can be understood as part of a broader institutional framework encompassing both human resources and organisational arrangements.

3. Digital competences in the context of the development of e-government

The primary document defining digital competences is the Council Recommendation of 22 May 2018 on key competences for lifelong learning (Council Recommendation of 22 May 2018, 2018). According to this document, digital competences refer to the confident, critical and responsible use of digital technologies in education, work and participation in society. They include, among others, the ability to work with information and data, communication and

collaboration, media literacy, digital content creation (including programming), security (including cybersecurity and digital well-being), issues related to intellectual property, problem-solving and critical thinking.

A more detailed elaboration of the concept of digital competences is presented in the same document (Council Recommendation of 22 May 2018 on key competences for lifelong learning, p. 9), where digital competences are defined as the confident, critical and responsible use of, and engagement with, digital technologies for the purposes of learning, working and participation in society. They encompass the ability to work with information and data, communication and collaboration, media literacy, digital content creation (including programming), security (including digital well-being and cybersecurity competences), issues related to intellectual property, problem-solving and critical thinking. The use of digital technologies and digital content requires a reflective and critical, yet also curious, open and forward-looking attitude towards their development. It also requires an ethical, safe and responsible approach to their use.

The European Commission Communication on the Digital Education Action Plan 2021-2027 identifies two strategic priorities: the development of a high-performing digital education ecosystem and the strengthening of digital competences for the purposes of digital transformation. The implementation of the first priority requires appropriate infrastructure, access to connectivity and digital equipment, effective planning of organisational capacity development, as well as competent educational staff and high-quality digital content and tools that comply with safety and ethical standards. The second priority focuses on the development of both basic and advanced digital competences (Digital Education Action Plan…, 2021).

Digital competences constitute a broad set of skills enabling the effective use of digital technologies. Their key importance for active participation in the information society is widely emphasised, as is their integrated and multidimensional character in the process of their development (Rozkrut, 2018, p. 349). Digital competences refer to the ability to understand and use information available in various formats and electronic sources. In this context, the crucial factor is not merely technical proficiency but the ability to think critically, evaluate the quality of information and use it in a conscious and responsible manner. These competences also include attitudes and skills enabling the search, analysis, integration and creation of digital resources, as well as communication and cooperation in various areas of social life (Tarkowski et al., 2015, p. 30).

According to the definition adopted by the Polish Ministry of Digital Affairs, digital competences consist of several interrelated components. The first category includes IT competences, which involve the ability to use computers and other electronic devices, safely use the internet, applications and software, as well as emerging intelligent digital technologies. This category also includes the ability to apply methods derived from computer science when programming and developing digital solutions to problems in various domains (computational thinking). The second category comprises information and communication competences,

understood as the ability to search for information, comprehend it, critically evaluate and select relevant content, and communicate remotely using digital technologies. The third category includes functional competences, understood as the practical application of the above skills in different areas of everyday life, such as finance, work and professional development, maintaining social relationships, health, hobbies, civic engagement or spiritual life, while respecting the principles of safe use of digital technologies (Digital Competences, 2020). The ability to use digital technologies significantly affects quality of life, labour market position, access to information, educational and health services, and a wide range of products that facilitate everyday functioning and improve work performance. The benefits associated with possessing digital skills are therefore substantial, whereas their absence not only limits the ability to benefit from digital transformation but may also contribute to the deepening of social inequalities. Digital competences should therefore be understood not only as the ability to operate tools and technologies, but also as a set of soft skills, including critical thinking, effective communication and the ability to adapt to a dynamically changing digital environment. These capabilities enable individuals to fully exploit the potential of digital technologies while simultaneously reducing the risk of digital exclusion. At the level of the European Union Member States, digital competences are commonly assessed using five categories of digital skills related to: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving (Definition and Levels of Digital Competence, 2024).

It therefore appears justified to advance the argument that the development of digital competences—both among employees of public institutions and within society more broadly—constitutes a necessary condition for the effective implementation of modern information and communication technologies in the public sector. At the same time, a significant challenge is the shortage of highly qualified ICT specialists in public administration. It should also be emphasised that digital competences in public administration should not be limited solely to technical aspects. Technology constitutes a tool for the implementation of public tasks, and the continuous development of the digital skills of local government employees contributes to the wider use of digital solutions supporting the delivery of public services.

A multidimensional analysis of information processes clearly indicates that technology, although it provides an essential infrastructural foundation, does not in itself determine the overall performance of information flows within an organisation. The previously identified dimensions—quantitative, temporal and qualitative—ultimately converge in the competence dimension, which in everyday managerial practice may function either as a catalyst or as a bottleneck of the entire transformation process. While general research models often emphasise the architecture of information systems, in the highly formalised and institutionally specific environment of public administration it is human capital that becomes the primary driver of change. Consequently, shifting the analytical focus from purely technical solutions to their users necessitates a more in-depth examination of the role of the human factor within the

digital ecosystem. From this perspective, a detailed analysis of the digital skills of public administration staff appears justified as a necessary step towards understanding the mechanisms shaping the effectiveness of information flows within local government structures. These employees constitute the practical foundation of the dynamically developing system of e-government.

The introduction of modern information and communication technologies into public administration constitutes an important element of activities aimed at improving the functioning of administrative institutions, rationalising administrative processes and enhancing the accessibility and quality of services provided to citizens. In this context, the concept of modern administration refers not only to the ability to perform public tasks efficiently and in compliance with legal requirements, but also to the capacity to respond to evolving social needs and expectations, including the growing demand for digital, remote and user-oriented services. A key prerequisite for the effective design, implementation and maintenance of high-quality digital public services is the possession and continuous development of digital competences among public administration employees. These competences encompass not only technical skills but also the ability to adapt to organisational and technological changes. Their importance is particularly evident at the level of local government, which remains closest to citizens and plays a fundamental role in the everyday delivery of public services as well as in shaping citizens' experiences of digital public administration.

4. Study methodology and characteristics of results

The study constituted part of a broader research project concerning the analysis of information inefficiencies and the digital solutions intended to mitigate them in the Krakow City Hall.

The analytical framework adopted in the study was based on a multidimensional approach to information processes in the context of digital transformation. The analysis incorporated four interrelated dimensions discussed in the theoretical section: the quantitative dimension (related to information overload and information scarcity), the temporal dimension (related to the timeliness and circulation of information), the qualitative dimension (related to the clarity, completeness and interpretability of information), and the competence dimension (related to employees' digital competences and organisational support for their development). These dimensions were operationalised through a set of survey questions included in the CAWI questionnaire, enabling the empirical assessment of both the level of digital competences and the occurrence of information inefficiencies within the analysed organisational units of the Krakow City Hall.

The empirical research sought to answer the following questions:

1. In the opinion of the employees of the Krakow City Hall, are their digital competences sufficient for the efficient use of digital solutions supporting information processes?
2. Does the level of digital competences among employees of the Krakow City Hall influence the occurrence of errors in the information processes they perform?

These questions formed the basis for the formulation of the following research hypotheses:

H1. Despite initiatives undertaken by the management of the Krakow City Hall, the level of employees' digital competences requires further support.

H2. The level of digital competences among employees influences the occurrence of errors in information processes.

The study was conducted at the Krakow City Hall between 18 and 25 October 2024 using the CAWI survey method. A total of 245 employees participated in the survey, representing nine organisational units of the office that most frequently reported problems related to the functioning of information processes. The detailed structure of the research sample is presented in Table 1.

Table 1.
Structure of respondents by organizational units

Code	Organisational units of the Krakow City Hall (departments)	Number of respondents	Percentage of respondents
W1	Department of Education	49	20.00
W2	Department of Municipal Services and Climate	42	17.14
W3	Department of Vehicle and Driver Registration	34	13.88
W4	Department of Social Communication	29	11.84
W5	Department of Entrepreneurship and Innovation	23	9.39
W6	Department of Investment Strategy, Planning and Monitoring	20	8.16
W7	Department of Tourism	18	7.35
W8	Department of Spatial Planning	17	6.94
W9	Department of Administrative Enforcement and Debt Recovery	13	5.30

Source: authors' own elaboration.

Differences in the number of respondents representing particular organisational units of the office resulted primarily from differences in the number of employees working in these units. To verify Hypothesis H1, responses to the following three questions posed to employees of the analysed organisational units were used:

1. In your opinion, do employees of the Krakow City Hall possess sufficient digital competences?
2. In your opinion, does the office provide training aimed at developing digital competences?
3. In your opinion, does the management of the office actively encourage employees to develop their digital competences?

Respondents had the opportunity to answer these three questions using a five-point Likert scale, where a score of 1 meant "definitely not", 2 – "rather not", 3 – "moderately", 4 – "rather yes" and a score of 5 meant "definitely yes".

Respondents answered these questions using a five-point Likert scale, where a score of 1 indicated “strongly disagree”, 2 “rather disagree”, 3 “moderately”, 4 “rather agree”, and 5 “strongly agree”.

To verify Hypothesis H2, responses to the questions used to test H1 were analysed together with a set of questions concerning errors occurring in the office’s information processes. These questions were grouped into three thematic blocks related to: the quantity of information available to employees, the timeliness of information delivery, and the manner in which information is formulated or presented. The first block consisted of four questions:

1. Does it happen that you receive information that is unnecessary for the tasks you perform?
2. Does it happen that you receive so much information that it cannot be effectively analysed and used?
3. In your work, is there a risk of making an incorrect decision due to a lack of information?
4. In your work, is there a risk of making an incorrect decision due to receiving incomplete information?

The second block included two questions:

1. Does it happen that information necessary for making specific decisions reaches you much too early?
2. Does it happen that another employee withholds information needed for your work?

The third block also consisted of two questions:

1. Does it happen that the information you receive creates difficulties in interpretation?
2. Does it happen that the information you receive for your work is mutually contradictory?

As in the case of the questions concerning digital competences, respondents answered using the same five-point Likert scale, where 1 indicated “very rarely”, 2 “rather rarely”, 3 “moderately”, 4 “rather often”, and 5 “very often”.

The first question used in the survey was: “In your opinion, do employees of the Krakow City Hall possess sufficient digital competences?” The responses obtained for the entire research sample (mean score on the five-point scale: 2.93) indicate that the office still has considerable room for improvement in the area of employees’ digital skills. Responses to this question varied across the individual organisational units of the office (Table 2). The lowest level of digital competences was reported by employees of the Department of Administrative Enforcement and Debt Recovery (mean score: 2.38), while the highest assessments were provided by respondents representing the Department of Spatial Planning (3.18) and the Department of Entrepreneurship and Innovation (3.17).

Table 2.
Answers to questions about digital competences

Digital competence questions	Mean responses to questions concerning digital competences by organisational unit									Overall mean
	W1	W2	W3	W4	W5	W6	W7	W8	W9	
Do the employees of the Office have sufficient digital competences?	2.88	2.95	2.82	3.14	3.17	3.05	2.61	3.18	2.38	2.93
Does the Authority provide training on improving digital competences?	3.12	3.38	2.50	3.14	3.39	3.35	3.11	2.65	3.31	3.10
Does the management of the Office actively motivate employees to develop digital competences?	3.06	2.81	2.53	3.10	2.83	2.70	2.78	2.41	2.38	2.80

Source: authors' own elaboration.

The next two questions were intended to indicate the possibilities for the further development of digital competences. The first concerned the opportunities available to employees of the Krakow City Hall to participate in training aimed at improving their digital literacy. The mean score obtained for the entire sample of 245 employees (3.10) suggests that either the training opportunities offered in the area of digital competences are insufficient or that information about the possibility of participating in such training does not effectively reach employees. The lowest evaluation of the possibility of participating in such training was reported by employees of the Department of Vehicle and Driver Registration (mean: 2.50), while the highest was reported by respondents representing the Department of Entrepreneurship and Innovation (3.39) and the Department of Municipal Services and Climate (3.38). The third question concerned the active encouragement of employees by the management to improve their digital competences. The overall result, which was below three points (2.80), indicates a need to strengthen managerial efforts aimed at motivating employees to develop their digital skills. The lowest level of support in this area was reported by employees of the Department of Administrative Enforcement and Debt Recovery (2.38), while the highest was reported by respondents from the Department of Social Communication (3.10). An analysis of responses to all three questions indicates that employees perceive a need for stronger managerial efforts aimed at developing their digital competences. Hypothesis H1 was therefore confirmed.

The next block of questions concerned errors occurring in information processes. The first four questions referred to the amount of information reaching employees who use it in the course of their work. Responses to the first of these questions indicate that problems related to the amount of information within information processes occur at a moderate level (Table 3). Similar results were obtained both for questions concerning excessive information and for those concerning insufficient information.

Situations in which employees receive information that is unnecessary for the tasks they perform were rated at 2.80, which corresponds to a level between "rather rarely" and "moderately". The lowest frequency of such situations was reported by employees of the Department of Spatial Planning (2.18), while the highest was reported by employees of the Department of Municipal Services and Climate (3.10). According to respondents, situations in which the information received is relevant but so abundant that it cannot be fully utilised occur slightly more frequently (overall mean: 2.84). Employees of the Department of Administrative Enforcement and Debt Recovery identified with this situation most strongly (3.23), while employees of the Department of Spatial Planning reported it least frequently (2.35).

Table 3.
Problems related to the amount of information

Problems related to excess or insufficient information	**Department mean**									
	W1	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**	**W8**	**W9**	
Receiving information that is unnecessary for the tasks performed.	2.92	3.10	2.65	2.86	2.78	2.60	2.67	2.18	3.00	2.80
Receiving such a large amount of information that it cannot be effectively analysed and used.	2.98	3.12	2.65	2.38	2.83	3.00	2.89	2.35	3.23	2.84
Risk of making an incorrect decision due to a lack of information.	2.80	3.07	2.91	2.66	2.70	2.70	2.61	2.71	3.15	2.82
Risk of making an incorrect decision due to incomplete information.	2.92	3.05	2.82	2.72	2.70	2.90	2.78	2.82	3.15	2.88

Source: authors' own elaboration.

Respondents provided very similar answers to questions concerning situations related to the lack of information necessary for work. In response to the question about the absence of information required to make a specific decision, the mean response for the entire sample was 2.82, indicating a moderate likelihood of such situations. Employees of the Department of Tourism encountered such situations least frequently (2.61), while they were reported most frequently by employees of the Department of Administrative Enforcement and Debt Recovery (3.15). According to the respondents, situations in which the information received is incomplete occur slightly more often (2.88), which may lead, for example, to incorrect decisions. Such situations are reported most frequently by employees of the Department of Municipal Services and Climate (3.05) and least frequently by respondents from the Department of Entrepreneurship and Innovation (2.70).

The next two questions concerned errors related to the timing of information delivery to its users. The first question was: "Does it happen that the information you need reaches you too early and you have to return to it after a longer period of time?" Responses suggest that such situations occur rather infrequently. The mean response to this question was 2.32 (see Table 4).

The lowest value was recorded among employees of the Department of Vehicle and Driver Registration (2.09), while the highest—approaching a moderate level of occurrence—was observed in the Department of Education (3.06). According to the results obtained, situations in which employees withhold information, resulting in delays in its delivery to the position requiring it, occur more frequently in the office. The mean score for the occurrence of such situations was 3.11.

Table 4.
Issues related to the time of acquisition of information

Problems of transmitting information over time	Department mean									Overall mean
	W1	W2	W3	W4	W5	W6	W7	W8	W9	
Receiving information too early to be used effectively	3.06	2.21	2.09	2.24	2.65	2.45	2.28	2.18	2.69	2.32
Withholding information required by other positions	2.92	3.48	2.59	2.90	3.30	3.50	3.33	3.18	3.15	3.11

Source: authors' own elaboration.

In three of the nine organisational units of the Office included in the study, this value did not exceed 3. Respondents representing the Department of Vehicle and Driver Registration assessed the occurrence of this phenomenon at 2.59. The highest values were recorded among employees of the Department of Strategy, Planning and Investment Monitoring (3.50) and the Department of Municipal Services and Climate (3.48).

The final group of questions used in the study concerned problems in information processes related to the content of information received by users. The distribution of responses to these questions is presented in Table 5.

Table 5.
Content issues

Problems of information formulation and interpretation	Department mean									Overall mean
	W1	W2	W3	W4	W5	W6	W7	W8	W9	
Receiving information that is difficult to interpret correctly	3.06	3.50	3.21	2.79	3.35	3.50	2.83	2.65	3.38	3.16
Receiving mutually contradictory information	2.65	3.02	2.85	2.62	2.61	2.55	2.22	2.47	3.23	2.71

Source: authors' own elaboration.

In response to the question concerning difficulties in interpreting the information received, the mean score for all respondents was 3.16. Such situations were reported most frequently by employees of the Department of Municipal Services and Climate and the Department of Strategy, Planning and Investment Monitoring (3.50 in both cases), and least frequently by employees of the Department of Spatial Planning (2.65). Cases of receiving mutually

contradictory information were also reported. The overall mean score for this phenomenon was 2.71. It was observed most frequently by respondents representing the Department of Administrative Enforcement and Debt Recovery (3.23) and least frequently by employees of the Department of Tourism (2.22).

Responses to the questions concerning errors occurring in information processes indicate a moderate level of their occurrence in the Krakow City Hall. When these results are considered together with the relatively low assessment of digital competences by employees, it may be concluded that errors in information processes are partly a consequence of an insufficient level of such competences. This relationship was particularly evident in the Department of Administrative Enforcement and Debt Recovery, whose employees assessed their digital competences as the lowest among the units analysed. This organisational unit also reported a higher frequency of the analysed errors in information processes than the other units included in the study. By contrast, in the Department of Social Communication and the Department of Spatial Planning, where employees assessed their digital competences more highly than in other departments, the reported occurrence of individual errors in information processes was in most cases below the overall mean. This indicates that in organisational units whose employees assess their digital competences at a higher level, errors in information processes occur less frequently. The obtained results therefore confirm hypothesis H2.

5. Discussion of the results of the study

The conducted study enabled a multidimensional assessment of the level of digital competences among employees of the Krakow City Hall and their relationship with the quality of information processes carried out within the organisation. The obtained results indicate that the overall assessment of digital competences in the analysed sample is moderate (mean score 2.93 on a five-point scale), suggesting that the organisation's digital potential is not yet fully developed. The variation in assessments between organisational units shows that digital competences are not evenly distributed across departments. They were rated highest in the Department of Spatial Planning and the Department of Entrepreneurship and Innovation, while the lowest ratings were recorded in the Department of Administrative Enforcement and Debt Recovery. These differences may result both from the specific nature of the tasks performed and from the varying extent to which digital tools are used in everyday work.

The analysis of responses concerning opportunities for developing digital competences indicates the existence of a gap between the need for improvement and the perceived level of organisational support. Although the assessment of training availability (3.10) is slightly higher than the overall assessment of competences, it still does not indicate the existence of systematic and fully satisfactory solutions. An even lower score was recorded for the extent to which

management motivates employees to improve their digital competences (2.80), which may suggest that a culture of learning and development in the area of digital transformation is not yet sufficiently embedded within the organisation. The confirmation of hypothesis H1 therefore indicates that employees perceive a need to intensify managerial efforts aimed at developing digital competences, both by expanding the training offer and by strengthening motivational mechanisms.

The results concerning errors in information processes reveal moderate but regularly occurring problems related to information overload, information shortages and incomplete information. Mean scores in most cases range between 2.8 and 3.1, indicating that these phenomena cannot be regarded as merely incidental. From the perspective of organisational efficiency, particularly significant are situations involving information withholding (mean 3.11) and difficulties in interpreting information (3.16), which may lead to delays in decision-making, increased risk of errors and a decline in the quality of public tasks performed. The occurrence of mutually contradictory or incomplete information further increases decision-making uncertainty and may generate additional organisational costs.

A key conclusion from the conducted analyses is the clear relationship between the level of digital competences and the frequency of errors in information processes. Departments in which employees assessed their digital skills more highly generally reported a lower intensity of information-related problems. The opposite pattern was observed in the Department of Administrative Enforcement and Debt Recovery, where the lowest self-assessment of digital competences coincided with the most frequent reporting of errors in information circulation. These findings allow hypothesis H2 to be confirmed and indicate that the level of digital literacy may constitute an important factor influencing the efficiency of information processes in public administration.

Similar conclusions can also be found in the national literature. In her study, Łukaszuk (2022) assessed the current level of digital competences among public administration staff as an important factor in the digital transformation of local government units in Poland. The author's findings indicate that one of the main challenges of digital transformation is the insufficient level of administrative staff competences in the areas of procuring, designing, implementing and maintaining IT systems. The lack of specialised knowledge results in a growing dependence on external providers, limits the ability to make informed technological decisions and weakens control over the quality and security of implemented solutions. This deficit has both a quantitative dimension (an insufficient number of experts) and a qualitative dimension (a mismatch between existing competences and rapidly evolving technologies). Another important dimension of civil servants' digital competences is digital awareness, understood as the ability to adopt a process-oriented and digitally oriented approach from the very beginning of the implementation of public tasks. Digital transformation requires a shift towards an organisational model based on data integration, system interoperability and user orientation. Without a mental and cultural change among administrative staff, even the

most advanced technological tools will not deliver the expected results. The author also points to significant psychological and organisational barriers related to the digital transformation of public offices. Concerns among civil servants about job losses resulting from process automation, a lack of motivation to improve qualifications and insufficient institutional support weaken the dynamics of transformation. At the same time, the absence of a systemic approach to the development of digital skills—including the lack of central coordination and a coherent strategy—leads to the fragmentation of training activities and limits their effectiveness. Łukaszuk (2022) also highlights the importance of cybersecurity, which constitutes an integral component of civil servants' digital competences. Ensuring the confidentiality, integrity and availability of public data requires not only appropriate technological infrastructure but also aware and responsible system users. A low level of awareness of digital threats increases the vulnerability of public administration to incidents and undermines citizens' trust in electronic services.

A comparison of the empirical findings with the previously conducted theoretical analysis makes it possible to observe that the phenomena identified within the structures of the Krakow City Hall constitute a clear example of broader mechanisms accompanying the digital transformation of the public sector. The inversely proportional relationship identified in the study between the level of employees' self-assessment of digital competences and the frequency of operational errors in information processes corresponds directly with the key arguments presented in the literature. The competence deficit observed in the analysis, particularly among respondents representing the Department of Administrative Enforcement and Debt Recovery, has also been identified in international studies conducted by Lopes et al. (2023). These authors, analysing the European public sector, demonstrated the existence of similar barriers related to competence self-assessment, which hinder the development and implementation of modern e-government solutions. The situation observed in the Krakow City Hall confirms that low confidence in one's digital skills, often associated with limited participation in professional training, may significantly reduce the overall operational efficiency of public administration units.

By contrast, the results obtained for organisational units such as the Department of Social Communication and the Department of Spatial Planning indicate that a relatively higher self-assessment of technological competences among employees is accompanied by a lower frequency of errors in information flows. Such a distribution of variables supports the thesis that an appropriately high level of digital literacy constitutes an essential buffer ensuring the overall quality and reliability of public services (Hamouche et al., 2025). As Firmansyah et al. (2025) argue, effective management of intellectual capital and the development of digital leadership within public administration institutions represent key determinants of institutional capacity. At the organisational level, these factors contribute directly to reducing information noise and improving decision-making processes. Importantly, the higher level of irregularities in information circulation observed in departments characterised by lower competence

indicators can also be interpreted in the context of the previously discussed quantitative and qualitative dimensions of information processes. In this area, a clear relationship emerges with the phenomenon of information overload described by van Veen et al. (2020) and with the mechanisms of information avoidance highlighted in the studies of Kumalasari and Priharsari (2023). It can therefore be concluded that employees with less developed digital competences reach the threshold of cognitive capacity much faster in an environment characterised by intensive and multi-channel data flows. Under conditions of time pressure and an excess of digital stimuli, insufficient ability to effectively use digital tools may hinder the selection and prioritisation of information, ultimately manifesting itself as errors, delays or distortions in the implementation of administrative processes.

6. Conclusions

From a broader perspective, the results obtained contribute to the discussion on the role of digital competences as a key resource of public organisations in the context of ongoing digital transformation. The efficient functioning of information processes requires not only appropriate technological infrastructure but, above all, competent users capable of critical analysis, selection and interpretation of data. An insufficient level of competences may lead both to information overload and decision-making errors, which in public administration directly affects the quality of services provided to citizens.

The empirical material collected in this study also illustrates the problem of institutional mismatch, highlighted in the analyses of Jafari et al. (2025). These authors demonstrate that the implementation of technological infrastructure alone, without an adequate adjustment of organisational culture and a substantial development of human resource competences, may lead to organisational dissonance that significantly limits the potential of implemented innovations. This phenomenon is reflected in the intra-organisational asymmetry observed in the study. The fact that individual departments within the same office—operating in a very similar legal and technological environment—display noticeable differences in the efficiency of information processes indicates a form of internal reproduction of digital inequalities. In this sense, the asymmetry of digital maturity identified by Valaskova et al. (2025) at the macrostructural level, when analysing development gaps between European Union countries, is reflected at the micro level in the case of the Krakow City Hall, in the form of uneven rates of digital adaptation across organisational units.

In summary, the results indicate the need for a systemic approach to the development of digital competences within the organisation, including the diagnosis of training needs, increasing the availability and relevance of training programmes, and strengthening the role of management in building a digital organisational culture. Improving employees' digital skills

may contribute to reducing errors in information processes, improving organisational efficiency and enhancing the quality of public services.

Despite their significant analytical value, the conducted study has several limitations. First, it was based on self-assessment by employees, which means that the results reflect the subjective perceptions of respondents rather than objectively measured levels of digital literacy. The research also had a cross-sectional design, which prevents the analysis of changes over time and limits the possibility of drawing clear causal conclusions regarding the relationship between digital competences and the quality of information processes. Moreover, the study was conducted in a single organisation, which restricts the generalisability of the findings to other public administration units. In addition, broader contextual variables—such as age, length of professional experience or the level of use of digital tools—were not included in the analysis, although they could potentially explain differences observed between departments.

Future research should therefore employ more diverse methodological approaches, including objective competence assessments and qualitative research methods. Longitudinal studies would also be valuable in order to analyse changes over time, particularly in the context of implementing training programmes and introducing new technologies. Extending the scope of research to other public administration institutions would enable inter-organisational comparisons and the identification of best practices. An important direction for further research is also the deeper exploration of the relationship between digital competences and organisational performance, service quality and the role of leadership and organisational culture in the digital transformation of public administration.

Acknowledgements

The publication was financed from the subsidy granted to the Krakow University of Economics – Project nr 042/ZZN/2025/POT and Project nr 043/ZZO/2025/POT.

References

1. Alvarenga, A., Matos, F., Godina, R., Matias, J.C.O. (2020). Digital transformation and knowledge management in the public sector. *Sustainability, 12(14),* 5824. DOI:10.3390/su12145824.
2. Council Recommendation of 22 May 2018 on key competences for lifelong learning (2018). https://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:32018H0604(01), 03.02.2026.

3. Council Recommendation of 22 May 2018 (2018). *Official Journal of the European Union*, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)&rid=7, 06.05.2025.
4. *Definition and levels of digital competences* (10.12.2024). Ministry of Digital Affairs, https://kompetencjecyfrowe.gov.pl/aktualnosci/wpis/definicja-i-poziomy-kompetencji-cyfrowych, 03.02.2026.
5. Digital Competences (23.01.2020). Ministry of Digital Affairs, https://www.gov.pl/web/cyfryzacja/kompetencje-cyfrowe, 03.02.2026.
6. Digital Education Action Plan (2021-2027). *Resetting education and training for the digital age, European Commission 2021.* https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en, 06.05.2025.
7. Dufva, T., Dufva, M. (2019). Grasping the future of the digital society. *Futures, 107*, 17-28. DOI: 10.1016/j.futures.2018.11.001
8. Firmansyah, A., Irawan, F., Wijaya, S. (2025). Unlocking public sector excellence: The synergy of intellectual capital and digital leadership in tax administration. *Intangible Capital, 21(2)*, 201-230. https://doi.org/10.3926/ic.3147
9. Fitzgerald, M., Kruschwitz, N., Bonnet, D., Welch, M. (2013). Embracing Digital Technology: A New Strategic Imperative. *MIT Sloan Management Review, Research Report*, https://www.academia.edu/28433565/Embracing_Digital_Technology_A_New_Strategic_Imperative, 12.05.2025.
10. Jafari, P., Van Looy, A., Helbin, T. (2025). About the interplay between technological resources and institutional factors for realizing digital work: A public sector long-term view. *Journal Of Advances In Management Research*. https://doi.org/10.1108/JAMR-11-2024-0412
11. Kumalasari, R., Priharsari, D. (2023). Investigating the Role of SNS Design on Covid-19 Information Avoidance: The Perspectives of the Stimulus-Organism-Response Theory. *Telematics and Informatics Reports, 11,* 100083. https://doi.org/10.1016/j.teler.2023.100083
12. Liu, D., Chen, S., Chou, T. (2011). Resource fit in digital transformation: Lessons learned from the CBC Bank global e-banking project. *Management Decision, 49(10),* 1728-1742. DOI: 10.1108/00251741111183852
13. Lopes, A., Sargento, A., Farto, J. (2023). Training in Digital Skills-The Perspective of Workers in Public Sector. *Sustainability, 15(13).* https://doi.org/10.3390/su151310577
14. Łukaszuk, A. (2022). The issue of digital competences of public administration personnel as an important factor in the digital transformation process of local government units in Poland. *Studia Prawnoustrojowe, 58,* https://doi.org/10.31648/sp.7985
15. Mazzone, D.M. (2014). *Digital or Death: Digital Transformation – The Only Choice for Business to Survive Smash and Conquer*. Mississauga: Smashbox Consulting Inc.

16. Mergel, I., Edelmann, N., Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly, 36*, https://www.sciencedirect.com/science/article/pii/S0740624X18304131?via%3Dihub, 12.05.2025.
17. Miazga, A., Dziadowicz, K., Pistelok, P. (2022). *Digitization of city offices, Urban Policy Observatory research.* Warsaw/Krakow: Institute for Urban and Regional Development, https://doi.org/10.51733/opm.2022.01
18. Obora, H., Teczke, M. (2024). Information inefficiencies in the digital age – a case study of the municipality of Krakow. *Scientific Papers of Silesian University of Technology Organization and Management Series, 212,* 429-450. https://doi.org/10.29119/1641-3466.2024.212.25
19. Rozkrut, D., Rozkrut, M. (2015). Digital skills as a factor in the development of the knowledge-based economy. *Studies and Works of the Faculty of Economic Sciences and Management of the University of Warsaw, 42(1),* 75-87. https://doi.org/10.18276/sip.2015.42/1-05
20. Rust, R.T., Kannan, P.K. (2003). E-service: A New Paradigm for Business in the Electronic Environment. *Communications of the ACM, 46(6),* 37-42. DOI: 10.1145/777313.777336
21. Tarkowski, A., Mierzecka, A., Jasiewicz, J., Filiciak, M., Kisilowska, M., Klimczuk, A., Bojanowska, E. (2015). *Taxonomy of functional digital competences and methodology for measuring the level of functional digital competences of people from the 50+ generation*. "Cities on the Internet" Association, 1-164. https://depot.ceon.pl/bitstream/handle/123456789/8309/taksonomia_funkcjonalnych_kompetencji_cyfrowych.pdf?sequence=1&isAllowed=y
22. Valásková, K., Nagy, M., Figura, M., Rousek, P. (2025). Res publica digitalis: The uneven digital transformation of the European public sector and the impact of policy disparities on governance, service efficiency, and socioeconomic inclusion. *Oeconomia Copernicana, 16(3)*, 1177-1260. https://doi.org/10.24136/oc.3866
23. van Veen, D., Kudesia, R., Heinimann, H. (2020). An Agent-Based Model of Collective Decision-Making: How Information Sharing Strategies Scale With Information Overload. *IEEE Transactions On Computational Social Systems, 7(3),* 751-767. https://doi.org/10.1109/TCSS.2020.2986161
24. Vieira, I.D.O., Razzolini Filho, E. (2019). Overloading information in the decision-making: Legitimation of scales and its relationship to the need for cognition of the decision. *AtoZ: Novas Práticas Em Informação e Conhecimento, 8(1),* 32. https://doi.org/10.5380/atoz.v8i1.67257