SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2022
ORGANIZATION AND MANAGEMENT SERIES NO. 167

INFORMATION AND COMMUNICATION TECHNOLOGY AND THE IMPLEMENTATION OF BUSINESS PROCESS MANAGEMENT IN PUBLIC ORGANIZATIONS IN POLAND

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Purpose: The article deals with the important topic of the impact of information and communication technology (ICT) used in public organizations in Poland on the possibility of implementing the Business Process Management (BPM) concept in these entities.
Design/methodology/approach: In order to assess the above indicated dependence, a research was conducted to identify the level of ICT use in selected public administration units, i.e. in the community offices. The research covered one of the voivodships of Poland, i.e. Warmian-Mazurian, where the entire population of community offices was surveyed. Then, referring to the literature on the subject, the obtained level was assessed for the possibility of implementing and developing the scope of BPM use in these entities.
Findings: The conducted research revealed that there are differences in the use of ICT between different types of community offices – the offices of urban type were the leaders in this matter. Thus, it was found that they were best prepared for the use of BPM. Overall, however, the research showed a low level of ICT use in the surveyed entities. Thus, it was concluded that ICT, perceived as a determinant of BPM, has a low potential to stimulate the use of the discussed concept in these entities and may constitute its barrier. The level of use of e-services is also low, and the surveyed offices to a large extent still operate in the traditional system, in which paper documents are the primary carrier of information.
Research limitations/implications: (if applicable) If research is reported on in the paper, this section must be completed and should include suggestions for future research and any identified limitations in the research process.
Originality/value: The conducted research, in the practical dimension, has the potential to raise the awareness of public managers as to the impact of ICT on the implementation and extension of the use of BPM in the entities they manage.

Keywords: ICT, process management (BPM), public organization, community office.

Category of the paper: research paper.

1. Introduction

Information and communication technology (ICT) refer to technologies that provide access to information through telecommunication. It is similar to Information technology (IT) but focuses primarily on communication technologies. This includes the internet, wireless networks, cell phones and other communication mediums (Ratheeswari, 2018). ICT, from the moment of its wider dissemination over the past 30 years, has been effectively supporting organizations of various types in optimizing the processes they implement and conduct (Ferris, 2012). The perception of the organization through the prism of the processes carried out in it, with a simultaneous departure from the traditional, functional view of the organization, is the basic determinant of the concept of Business Process Management (BPM, process approach). BPM, according to M. Weske, includes other concepts, methods and techniques that support designing processes, their administration, representation, configuration, implementation and analysis. Moreover, the basis of the discussed concept is a clear representation of processes along with their activities and implementation restrictions between them (Weske, 2007). Bearing in mind that the application of BPM in organizations brings many benefits to their functioning (including: better adaption to the challenges posed by the environment in which the organization operates, creation of new possibilities of gaining advantage over the competition, improvement of organization's profitability and customer satisfaction etc.), it becomes reasonable to define specific factors included in individual areas facilitating the implementation and development of the scope of BPM use (Bitkowska, 2020). These areas can be perceived as the conditions/determinants of the BPM use in organizations and, according to literature, these are, among others: organizational culture (the so-called "process culture"); organizational strategy expressed in the processes conducted in an organization; organizational structure that requires flattening and shaping it, considering the logic of the flow of processes in an organization; supporting leadership and, finally - the use of ICT (Kaziano do Amaral Castro et al., 2019). The indicated determinants are similar both in the case of business and public organizations (public administration units), although in the case of the public ones, legal conditions take on additional significance.

The modernization of public organizations in Poland has been taking place more or less since the 1990s, when New Public Management concept (NPM) was introduced in many countries, referring to a set of reforms that have come to radically redefine the nature of public sector organizations (Fredriksson, 2021). Since then, in the spirit of the assumptions of the NPM, reforms covering public administration units assumed the introduction of concepts originally used in business organizations. Thus, public organizations in Poland began to be introduced, inter alia, concepts such as: Total Quality Management, Outsourcing, Knowledge Management or BPM. It is worth mentioning here that the use of the process approach in transforming public organizations in Poland is not a whim, but a recommendation, which was

emphasized in various government documents, and is also reflected in many modernization projects that have been carried out, i.e., *System support for management processes in local government units* or the *Institutional Development Planning* (Raczyńska, Krukowski, 2019a). In addition, in Poland, there are ongoing activities aimed at the widest possible introduction of e-services in different public organizations. This process cannot be carried out without introducing at least some of the BPM elements, especially focused on implementing ICT solutions.

Given the above, according to the authors, it is important to know the factors that may constitute potential stimulators and barriers of implementing and developing the scope of use of BPM in public organizations in Poland. Identifying these elements would allow public managers to focus on supporting the elements conducive to BPM implementation and expansion, as well as trying to influence the aspects that may obstruct these activities.

Thus, the authors conducted a study aimed at identifying the presence of factors from the previously indicated areas in public organizations in Poland, in order to later determine whether these factors have the power to stimulate or inhibit the introduction of the process approach to these organizations. The area analyzed in this article is the information and communication technology, and the research subjects are the community offices in Poland, which provide public services to citizens. Therefore, the aim of the presented research in this paper was to identify factors from the ICT area, which occur in the community offices in Poland. Subsequently, the identified factors were assessed in the context of their significance in the introduction and development of BPM in the examined entities. In order to achieve the goal of the presented study, associations between BPM and ICT were indicated and literature review on ICT, supporting the implementation and development of BPM in organizations was reviewed (Section 2). Subsequently, the research methodology was described, emphasizing, among other factors, the applied methods and the potential limitations of the research (Section 3). Finally, the results of the survey were presented, together with their discussion and summary (Sections 4-6).

2. Theoretical background

At the beginning of theoretical considerations, one can confidently draw the opinion that the introduction and development of the process approach in organizations would not be possible at present without the support of information and communication technologies. In fact, ICT is considered a critical BPM construct by many authors (Gabryelczyk, Roztocki, 2018). Also, meeting the ever-changing needs of customers, be they business or public organizations, especially in the times of the Covid-19 pandemic (and probably in the post-Covid era), requires the automation of all or part of the processes carried out in organizations. It is worth noting,

however, that the use of ICT, and in particular - information technology, was already one of the main postulates announced by propagators of the use of e.g. the Business Process Reengineering concept, strongly related to the genesis of the process approach (Hammer, Champy, 2006). There is no doubt that processes carried out by organizations, including public entities, can be supported by various aspects of ICT use - for example, by introducing IT systems that enable their modeling, analysis, control, automation and integration, as well as supporting their implementation. For example, in the case of basic processes carried out strictly in public organizations, the recipient of which is most often a citizen, process automation has become one of the main postulates of e-government, which in Poland is called as "e-administration". According to G. Means and D. Schneider, e-government is the relationships between governments, their customers (businesses, other governments, and citizens) (Means, Schneider, 2000), and M.M. Brown and J.L. Brudney characterize this concept as the as the use of technology, especially Web-based applications to enhance access to and efficiently deliver government information and services (Brown, Brudney, 2004). As part of e-government, there are, among others, e-services. For the purposes of this study, e-services can be considered as a fully computerized form of processes provided by public organizations. In addition, in the case of public administration units, ICT systems support the transfer of data (e.g. information and decisions) between various departments. For example, thanks to the use of electronic document circulation systems, it is possible, among others, to deliver documents that have been sent by means of an electronic inbox, by e-mail or provided on external data carriers by citizens - to places of their further processing, or the documents that should be proceeded from chosen departments to the managerial board. Also, ICT conditions the success of processes implementation in public organizations, thanks to the possibility of continuous monitoring of their course and diagnosis of their bottlenecks (Kim, S.-B., Kim, D., 2020). Thus, the use of ICT provides these organizations with a number of various possibilities that seem not to be sufficiently noticed by managers of public administration units. This is evidenced by the still unsatisfactory state of use of information and communication technologies in public organizations in Poland, presented in various studies. One of such studies is carried out periodically by the United Nations. The United Nations ranks the countries of the world in terms of the development of their e-government using the EGDI index. The value of this indicator is within the range of 0-1, with the highest value, i.e. 0.9758 achieved in the world in 2020 by Denmark (publicadministration.un.org…, 2020). And since Poland was placed 36th in the world in 2016 (EGDI indicator value - 0.7211), in 2020 it achieved 24 position in the ranking (EGDI value - 0.8531) (United Nations E-government Survey…, 2016; E-government Survey…, 2020) - however, these results are still not satisfactory.

Among the studies carried out by researchers in Poland, there are not too many examples showing the level of ICT use in public organizations in Poland, and especially in the community offices. A good example of such research is the one carried out by E. Kuzionko-Ochrymiuk in 2014. The subjective scope of this research covered local government administration offices

(and thus the community offices) throughout Poland. And so, on the basis of the analysis carried out by the author, it can be concluded that the level of computerization of public administration in Poland should be considered unsatisfactory - 93% of local government administration offices indicated the traditional, i.e. paper-based system as the basic method of documenting the course of examining and resolving cases. In 60% of units, however, it was supported by electronic communication tools, but in most offices the traditional office model was still used (Kuzionko-Ochrymiuk, 2018).

The authors dealing with BPM-related issues also indicate that without the use of ICT it is difficult to increase the process maturity of an organization. Process maturity is most often expressed in the literature on the subject through the prism of the maturity of the processes occurring in the organization. Consequently, most of the process maturity models developed is also based on the processes existing in a given organization, and the achieved level of process maturity determines the advancement of a given organization in the implementation of the BPM concept. Based on the above, it can be concluded that process maturity mainly concerns the degree and scope of implementation of the discussed concept in an organization, through the use of methods and techniques characteristic for it (Bitkowska, 2009; Krukowski 2016). Therefore, in the literature, the term "BPM maturity" can sometimes be found (Rosemann, de Bruin, 2005). The view presented above is supported by the construction of many process maturity models, where at their higher levels there is a condition of automation of processes occurring in organizations, regardless of the type of these organizations, precisely through the use of ICT. In order to determine the impact of using IT (specifically) on the achievement of higher levels of process maturity by organizations, A. van Looy reviewed 37 selected process maturity models. The author noticed that in most of the analyzed models it is recommended to introduce IT in order to improve process modeling, facilitate their implementation and optimization, as well as simplify management, change the organizational culture towards the process profile, or influence structural aspects. In addition, with the increasing opportunities offered by the use of IT, processes are able to cross departmental boundaries in organizations, and even go beyond the area of the organization in general (van Looy, 2010).

The impact of the use of ICT on the achievement of higher levels of process maturity by public organizations (specifically the community offices) was emphasized in the study by I. Chomiak-Orsa and M. Flieger (they examined 107 community offices in the Lower Silesia). These authors assumed, on the basis of objective reasons (which are also appropriate for the research carried out by the authors of this article and will be indicated in the methodological part of the work) that the results of their research can be extended to the level of ICT use in the community offices throughout Poland. Based on the results of their research, Chomiak-Orsa and Flieger conclude that the use of ICT, especially modern solutions proposed in this area, is a necessity that determines the achievement of full process maturity, and thus the full use of the BPM potential by public organizations. Thus, by finding a statistical relationship between the level of process maturity achieved by the surveyed entities and the scope of using ICT in

these organizations, they proved that the wider the use of selected ICT tools, the higher the level of process maturity achieved by the community offices. The study of Chomiak-Orsa and Flieger also showed that less than half of Lower Silesia community offices had network solutions enabling, for example, internal sending of mail (45% of the surveyed entities) or sharing information in integrated databases (21%) - which is a limitation, inter alia, for the implementation of efficient horizontal communication in these organizations. In addition, only 32% of offices implemented document management systems (15% implemented a specific electronic document management system, enabling e.g. monitoring of the status of cases being handled), 12% used solutions enabling the provision of e-services, and 8% used tools for electronic monitoring and supervision of implementation processes. The conducted research got the above-mentioned authors to draw another conclusion that the main barrier to achieving higher levels of process maturity of the community offices in Poland is the low degree of integration of their internal IT systems (Chomiak-Orsa, Flieger, 2012).

Among the number of other limitations on the use of information and communication technologies in Polish public organizations the authors also include: inconsistency and ambiguity in the state computerization strategy or emphasis on the integration of ICT systems, but mainly within the given departments in public administration units – one have to remember that, in many cases, the processes carried out by public administration units are performed not by one, but by several departments of an office, where the organizational units are interested in only a specific part of the process carried out by this unit. Moreover, processes often go beyond the boundaries of a given organization and are related to processes carried out in other entities of the public sector. And in the current realities of the interoperability of ICT systems in Polish public administration, it practically prevents comprehensive implementation of a given service entirely electronically (as a e-service). The authors also point out to the: existence of an outdated organizational structure that is not adapted to the tasks and processes carried out by modern public administration; local specificity of the processes implemented in various units; unfavorable legal situation, which still demands using paper as the main carrier of information as the basis; low motivation of public organizations' managers to undertake the computerization process; low level of knowledge in the field of management and the possibility of its support by ICT; focusing the selection of an ICT system not on its potential impact on the effectiveness of the organization, but on the price - this consequently leads to the selection of the cheapest and not necessarily the best solutions; relatively low interest in e-services among the society (Świątek, 2019). And assuming that it will be possible to implement modern e-administration services on a large scale in Poland, one cannot expect the mass use of these services, because the problem of the still high digital exclusion of society, as well as the low level of its digital competences is a big barrier here. In addition, there is great dissatisfaction in the society with the quality of e-services offered by public administration, especially in the field of: the inability to "settle" a given case entirely electronically, a complicated description of the manner of carrying out the case, poorly constructed forms or the frequent inability to track progress of the

given case via the Internet. Moreover, Polish citizens are concerned about the security of their data and having too low competence in completing formalities when using e-services (Jedlińska, Rogowska, 2016; Śledziewska, Zięba, 2016).

It is also worth noting that in the case of public organizations, there is a separate category of models relating to the maturity of e-government processes. An example of one of the first models is the one proposed by K. Layne and J. Lee. They distinguished 4 levels of e-government development, which include: 1 - "catalogue", 2 - "transaction", 3 - "vertical integration" and 4 - "horizontal integration" (Table 1) (Layne, Lee, 2001).

Table 1.
K. Layne and J. Lee e-government processes maturity model

Level of e-government processes maturity	Characteristics
"catalogue"	An organization's website has been created, which mainly contains information about a given unit and procedures (the manner of their implementation, required documents, deadlines, etc.).
"transaction"	There is a potentiality of providing e-services to citizens, which boils down to providing a possibility of downloading forms from the website and enabling citizens to send them by e-mail.
"vertical integration"	There is an integration of databases of various public organizations that are parties to the implementation of some processes jointly provided to citizens.
"horizontal integration"	Various data systems are linked, bringing together separate groups of services provided for citizens, thanks to which the citizen gains the opportunity to "settle" many matters in one place.

Source: (Layne, Lee, 2001).

Some other interesting proposals have been created by, among others K.V. Andersen and H.Z. Henriksen, who extended the model presented above (Andersen, Henriksen, 2006), J. Zwicker, P. Fettke i P. Loos, authors of the "48-h promise" model (Zwicker et al., 2010) or experts of the United Nations, who introduced the United Nations Maturity Model (UN E-Government Survey…, 2012). Also, in Poland, one can find proposals of models aimed at assessing the process maturity of public organizations. A model dedicated to the process maturity assessment, created specifically for the community offices, is, for example, a proposal created under the Institutional Development Program, which was updated by M. Flieger (Flieger, 2016).

3. Methodology

In order to fulfill the research goal, aimed at identifying factors from the ICT area, which occur in the community offices in Poland, a study was conducted with the use of a questionnaire. The questionnaire included questions about the assessment of individual areas determining the implementation and development of the use of BPM in the community offices

in Poland, including the ICT area. In the field of that area, the survey respondents had the opportunity to assess the presence of 16 selected factors:

ICT1 - regular updating of information in the Public Information Bulletin (BIP),
ICT2 - the possibility of sending letters to the e-mail address of the office by the commune's inhabitants,
ICT3 - the possibility of using the electronic inbox on the e-PUAP platform by the commune's inhabitants,
ICT4 - the possibility of submitting documents on IT data carriers by the commune's inhabitants,
ICT5 - electronic implementation of the most important services in the form of e-services,
ICT6 - the possibility of using the electronic signature by the commune's inhabitants,
ICT7 - the possibility of electronic reservation of the queue by the commune's inhabitants,
ICT8 - possibility of checking the status of the case being handled by the commune's inhabitants,
ICT9 - using the traditional system to perform office activities,
ICT10 - using the Electronic Document Management System to perform office activities,
ICT11 - using information from integrated IT databases available at the office in a network manner,
ICT12 - use of the Intranet,
ICT13 - using various information channels to communicate with the commune's inhabitants (e.g. newsletter, profiles on social media, text messages),
ICT14 - active promotion of the use of e-services among the commune's inhabitants,
ICT15 - conducting regular training for employees in the provision of e-services in the office,
ICT16 - using IT tools for supporting the use of BPM in the office (e.g. Visio, Aris, Adonis).

These factors were assessed on a five-point Likert scale. The respondents had the opportunity to assess to what extent individual factors are present in the office, where: 1 - not present, 2 - low level of presence, 3 - moderate level of presence, 4 - high degree of presence, 5 - the factor always occurs.

The questionnaire was sent to respondents by post or delivered in person to each office.

The respondent in the surveyed entities was a person holding the position of the secretary of the office (secretary) and a person indicated by the secretary who, in his or her opinion, had experience in implementing and/or developing the scope of use of the BPM in the office. When selecting secretaries for respondents, their position in the organizational structure of the office, as well as the scope of duties performed (often requiring comprehensive knowledge on, among others, the functioning of the office, the methods and concepts of management used in the office, or the subject of activity of individual units in the organizational structure of the office) were considered (Raczyńska, Krukowski, 2019b).

The research was conducted in one of the voivodships in Poland, i.e. the Warmian-Mazurian voivodship. The research covered the entire population of the community offices in that voivodship - 116 offices, including: 67 offices of rural type (R), 33 offices of urban-rural (U-R) type and 16 offices of urban type (U). Responses were obtained from 99 offices (198 questionnaires). Thus, a return rate of 85% was achieved. However, 194 questionnaires were qualified for the final analysis - 97 pairs from individual offices. Therefore, the final research sample encountered for 97 entities. The vast majority of entities in the research sample were offices of rural type (54 entities, i.e. 55.7% of offices in the final sample). The second position was occupied by the offices of urban-rural type (28 entities, i.e. 28.9% of offices in the final sample), and the least numerous groups was consisted of the offices of urban type (15 entities, i.e. 15.4% of offices in the final sample).

The obtained results were entered into the electronic database and analyzed in the IBM SPSS Statistics 24.

Considering common method bias (CMB), the Brewer's Split Sample Method was used, when constructing the questionnaire (Brewer, 2006). To eliminate CMB, one of the assessed aspects, i.e. the type of the community office, was an objective administrative data and only the assessment of the occurrence of individual factors from the ICT area depended on the respondents' opinions (Podsakoff et al., 2012; Jakobsen, Jensen, 2015). Moreover, as it was mentioned before, the questionnaire was addressed to two people (the secretary and the person designated by the secretary) with sufficient specialist knowledge, so that the answers to the questions did not relate to vague concepts (MacKenzie, Podsakoff, 2012). Also, the respondents were to assess the present occurrence of factors, which should also reduce the risk of the discussed error. As a next step, the Cronbach's alpha test, the Kaiser-Meyer-Olkin test and the Barlett's test were conducted (Table 2) (Raczyńska, Krukowski, 2019b).

Table 2.
Measurement properties

Variable	Cronbach's Alpha Test	Kaiser-Meyer-Olkin Test	Barlett's Test *
ICT	0,809	0,766	874,558

Source: Own work based on research results.

Thanks to the Cronbach's alpha and Kaiser-Meyer-Olkin test results obtained, the reliability of the research tool was confirmed. The authors are aware that the factors selected for the study are correlated with one another. However, this is due to the fact that they relate to one phenomenon occurring in an organization. The purpose of the study, however, was not to indicate their relationship but to identify their occurrence and to evaluate them in context of their influence on using BPM in the researched community offices.

Finally, a one-way analysis of variance for independent samples was conducted (by the statistic method developed by R. Fisher) in order to verify whether individual types of community offices differed with respect to the occurrence of the individual factors from the area of ICT.

Despite the research being carried out only in one of the voivodships in Poland, in the opinion of the authors of the study, supported by the views of other researchers, the introduction of BPM into the organization is not conditioned by geographical factors, thus the obtained results provide the basis for drawing conclusions on the entire population of the community offices in Poland.

4. Research results

The results of the conducted one-way analysis of variance for independent samples showed that in case of ICT area, *F* is higher than 1. This means that the test is statistically significant (Table 3). Also, in the case of various types of offices in the area of ICT, there were statistically significant differences at the level of $p < 0.05$, and the size of the η^2 effect was 0.16.

Table 3.
The result of a one-way analysis of variance for independent samples for the ICT area

Dependent variable	Type of a community office	M	SE	LL	UL	*F*	*p*	η^{2*}
ICT	urban	3,55	0,1	3,35	3,75	18,59	<0,001	0,16
	urban-rural	2,96	0,08	2,81	3,11			
	rural	2,84	0,05	2,73	2,94			

Source: Own work based on research results.

In order to illustrate the disproportions between the city offices of various types in the use of ICT factors, an analysis of the frequency of these factors was carried out. The principle was adopted that the condition for qualifying a particular factor to those used in a given type of office is the sum of respondents' declarations of its high degree and absolute presence (indicating 4 and 5 on the numerical scale in the questionnaire) - it should be greater than 50%.

As mentioned in the "Methodology" section, the ICT area contained 16 different factors. On the basis of the data contained in Table 4, it can be noted that in the city offices from Warmian-Mazurian voivodship, respondents declared using 11 factors in these entities, and in the offices of urban-rural and rural type, 7 and 5 factors, respectively. Thus, it can be concluded that in urban communes, usually inhabited by a larger number of residents and in which more employees are employed in their respective community office, the need to use various tools from the ICT area increases, both for serving residents and those for supporting the management of the entire office.

Table 4.
Frequency of indications of the occurrence of specific factors from the ICT area in the community offices from the Warmian-Mazurian voivodship (in %)

Factor	Type of the community office														
	Urban					Urban - rural					Rural				
	Given answers					Given answers					Given answers				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
ICT 1	-	-	6,7	20	73,3	-	-	7,1	39,3	53,6	-	-	10,2	38	51,8
ICT 2	-	3,3	3,3	10	83,4	-	1,8	14,3	17,9	66	-	7,4	9,3	22,2	61,1
ICT 3	3,3	13,3	10	16,7	56,7	19,7	7,1	12,5	8,9	51,8	5,6	28,7	12	12	41,7
ICT 4	26,7	10	6,7	20	36,6	16,1	44,6	5,4	7,1	26,8	34,3	24,1	16,6	7,4	6,5
ICT 5	3,3	30	13,3	33,4	20	23,2	42,9	23,2	7,1	3,6	9,3	28,7	48,1	7,4	6,5
ICT 6	13,3	16,7	-	10	60	12,5	46,4	3,6	3,6	33,9	32,4	21,3	13,9	9,3	23,1
ICT 7	79,9	6,7	-	6,7	6,7	89,3	10,7	-	-	-	91,7	3,7	1,8	1	1,8
ICT 8	46,7	-	20	20	13,3	69,5	3,6	16,1	5,4	5,4	62,1	18,5	6,5	8,3	4,6
ICT 9	6,7	3,3	-	3,3	86,7	-	-	5,4	16	78,6	1,8	2,8	12,1	17,6	65,7
ICT 10	23,3	23,3	6,7	13,3	33,4	67,8	3,6	16,1	5,4	7,1	71,3	13	10,2	3,7	1,8
ICT 11	6,7	10	16,7	30	36,6	12,5	3,6	30,4	23,2	30,3	18,5	14,9	20,4	23,1	23,1
ICT 12	6,7	10	-	23,3	60	17,9	-	7,1	10,7	64,3	28,6	6,5	5,6	17,6	41,7
ICT 13	6,7	-	6,7	53,5	33,3	10,7	12,5	23,2	28,6	25	11,1	25,9	19,5	25,9	17,6
ICT 14	-	20	23,3	20	36,7	8,9	35,7	41,1	8,9	5,4	14,8	36,1	35,2	8,3	5,6
ICT 15	6,7	10	46,6	20	16,7	16,1	44,7	25	7,1	7,1	17,6	27,7	30,6	17,6	6,5
ICT 16	66,7	3,3	10	13,3	6,7	87,5	7,1	5,4	-	-	77,8	16,7	1,8	0,9	2,8

Where: ICT1–ICT16 - are the abbreviations of the factors listed in "Research methodology" section; 1 - not present, 2 - low level of presence, 3 - moderate level of presence, 4 - high degree of presence, 5 - the factor always occurs.

Source: Own work based on research results.

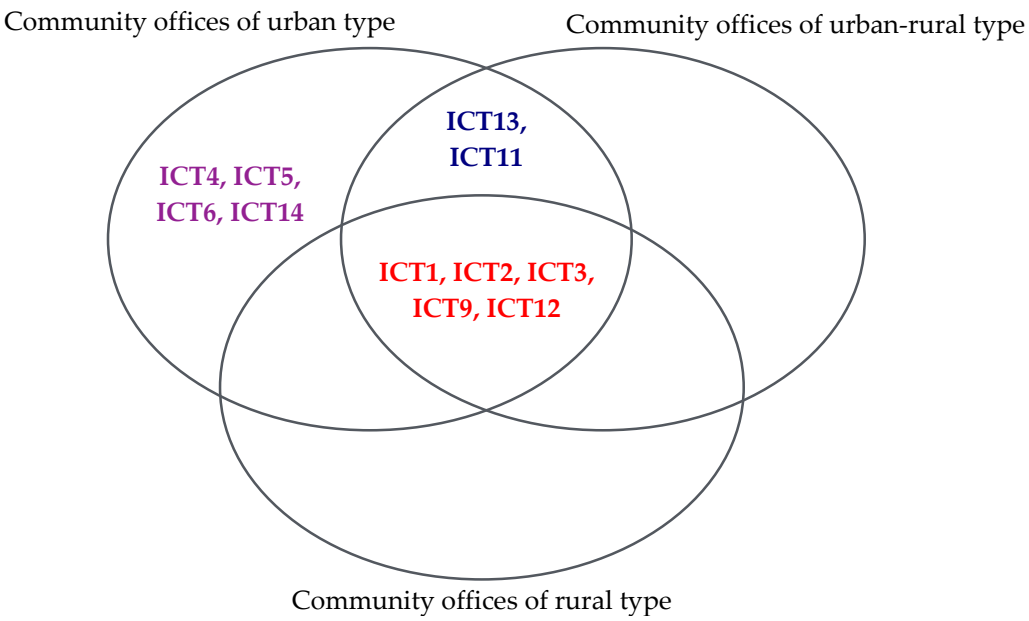
In the case of factors such as: regular updating of information in the Public Information Bulletin (BIP) (ICT1), the possibility of sending letters (e.g. complaints, requests for public information) to the e-mail address of the office by commune's inhabitants (ICT2), the possibility of using the electronic inbox on the e-PUAP platform by the commune's inhabitants (ICT3) and using the traditional system to perform office activities (ICT9), their presence was declared by the majority of respondents from the researched offices of all types (for ICT1 - 93.3% indications of respondents from U, 92.9% from U-R and 89.8% from R; for ICT2 - 93.4% indications of respondents from U, 83.9% from U-R and 83.3% from R; for ICT3 - 73.4% indications of respondents from U, 60.7% from U-R and 53.7% from R; for ICT9 - 90% indications of respondents from U, 94.6% from U-R and 83.3% from R). Also, more than half of the respondents from the offices of every type indicated that their organizations used the Intranet (ICT12 - 83.3% indications of respondents from U, 75% from U-R and 59.3% from R).

Based on the research results it was also possible to determine the solutions that were more popular in the offices of urban and urban-rural type, than in the offices competent for the rural communes. These factors include: using various information channels to communicate with the commune's inhabitants (e.g. newsletter, profiles on social media, text messages) (ICT13 - 86.6% of indications of respondents from U, 53.6% from U-R and 43.5% from R) and using information from integrated IT databases available at the office in a network manner (ICT11 - 66.6% of indications of respondents from U, 56.2% from U-R and 46.2% from R).

On the other hand, in the case of factors such as: the possibility of submitting documents on IT data carriers by the commune's inhabitants (ICT4), electronic implementation of the most important services in the form of e-services (ICT5), the possibility of using the electronic signature by the commune's inhabitants (ICT6) and the active promotion of the use of e-services among the commune's inhabitants (ICT14), their use was each time indicated only by the majority of respondents from the offices of urban type, while respondents from the offices of urban-rural and rural type indicated rather to the occurrence of these factors to a small extent. Only in the case of factor ICT5, almost half of the respondents from the offices of rural type (48.1%) declared the average degree of electronic implementation of the most important services in the form of e-services, and in the case of factor ICT14, almost half of the respondents from the offices of urban-rural type (41.1%) declared the average level of active promotion of the use of e-services among the commune's inhabitants.

The least popular undertakings in the field of information and communication technology, carried out in the researched community offices in the Warmian-Mazurian voivodship, were: the possibility of electronic reservation of the queue by the commune's inhabitants (ICT7), possibility of checking the status of the case being handled by the commune's inhabitants (ICT8), using the Electronic Document Management System to perform office activities (ICT10), conducting regular training for employees in the provision of e-services in the office (ICT15) and using IT tools for supporting the use of BPM in the office (e.g. Visio, Aris, Adonis) (ICT16). The ICT7 was indicated only by every eighth respondent from the offices of urban type (12.4%) and less than 4% of respondents from the rural ones. The occurrence of ICT8 was declared by every third respondent from the offices of urban type (33.3%) and, respectively, 10.8% and 12.9% of respondents from the urban-rural and rural ones. ICT10 was mentioned sporadically, and only in the case of the offices of urban type, responses confirming the presence of this factor were provided by 46.7% of respondents, and in the case of the urban-rural and rural entities - it was 12.5% and 5.5%, respectively. Based on the conducted research, it can also be concluded that conducting regular training for employees in the provision of e-services in the office (ICT15) was conducted more often in the offices of urban type (36.7%) than in urban-rural (14.2%) or rural ones (13.9%). The same applied to the use of IT tools for BPM (e.g. Visio, Aris, Adonis) (ICT16 - 20% of respondents' indications from U, no indications from U-R and 3.7% of indications from R). However, one has to remember that the above factors were still implemented in the community offices in the Warmian-Mazurian voivodship at a low level.

Similarities and differences in the use of individual factors in the area of information and communication technology in the researched community offices, depending on their type, are presented in Figure 1.



Where ICT1–ICT14—are the abbreviations of the factors listed in the "Research methodology" section.

Figure 1. Similarities and differences in the occurrence of factors from the ICT area in the community offices of the Warmian-Mazurian voivodship, depending on their type.

Source: Own work based on research results.

In the field of information and communication technology, five factors were recognized as common for the all types of the community offices in the voivodship covered by the study, two factors for the offices of urban and urban-rural type, as well as four factors specific only for the offices of urban type.

5. Discussion

On the basis of the presented research results it can be conducted that the examined community offices use the solutions from the ICT area to a small extent and, despite the continuous development of public organizations in Poland towards the implementation of e-services, most of the cases in the offices are still carried out in the traditional office system. The results of the research carried out by I. Chmiak-Orsa and M. Flieger (2012), as well as the research of E. Kuzionko-Ochrymiuk (2018), are thus confirmed. And assuming that from a technological and technical point of view there are no obstacles, e.g. in the implementation of most tasks of local government units in Poland in form of e-services, the situation presented in the above study may result from barriers of a different nature. Regardless of the type of community offices, typical for the surveyed entities is the existence of elements of one-way interaction with residents through a static website, or the provision of traditional ICT tools for communicating with the office (such as e-mail or electronic inbox). Therefore, if the ICT

solutions used were not distinguished according to the type of community offices, it could be concluded that the maturity of the processes implemented within e-government by the examined entities is at the "transaction" level, according to the previously presented model by K. Layne and J. Lee (2001).

However, it has been shown that there are differences in the use of specific ICT solutions between community offices of various types. The lead in the implementation of individual ICT factors is the urban offices, i.e. entities employing a greater number of employees than the urban-rural and rural ones, due to the fact that they provide services to a greater number of inhabitants of the communes they respond [the relationship between the number of inhabitants of communes and the number of workers employed in the corresponding offices was established on the basis of the existence of significant statistical relationships through the analysis of the correlation of ranks with the Spearman's *rho* coefficient. It was subsequently checked whether the urban communes from the sample were occupied by more inhabitants than the urban-rural and rural ones. For this purpose, an analysis of variance for ranks (Kruskal-Wallis test) was performed, also confirming the existence of significant statistical relationships]. Thus, it can be assumed that managing a larger number of employees and servicing a larger number of inhabitants usually entails the need to use more solutions in the field of ICT like e.g. facilitating customer service by introducing a certain level of use of e-services and promoting this form of meeting needs among the inhabitants of communes or enabling the use of an electronic signature. In these larger entities (and also in the offices of urban-rural type), more emphasis was also placed on using information from integrated IT databases available at the office in a network manner or for the use of various information channels to communicate with the commune's inhabitants (e.g. newsletter, profiles on social media, text messages). The above elements undoubtedly determine the possibility of introducing and developing the process approach in the surveyed entities. One of the basic principles of introducing the process approach in organizations is focusing on the client's needs. And, despite the fact that, as indicated, Polish society is not yet fully prepared to use e-services, or is not satisfied with their level, managers of public organizations should pay special attention to developing this form of cooperation with residents. The effective introduction of e-services on a large scale has the potential to improve the processes of providing services to citizens through, inter alia, shortening their duration, reducing the resources used for their implementation, and thus - reducing the costs of their implementation. A positive action implemented by the offices of urban type, indicated by the respondents, is using various channels to communicate with the society. And, especially in the case of younger citizens, the use of social media in communication can be considered meeting their needs. In the era of emphasis on the emergence of new styles of governance, which promote higher levels of transparency and the engagement of citizens, comprehensive communication with citizens using the Internet not only enhance the interactivity, transparency, and openness of public sector entities but also presents the ability to promote new forms of accountability (Bonsón et al., 2012).

A very important aspect of introducing and developing BPM in organizations is to enable the most efficient horizontal communication (and to eliminate barriers to communication in general, e.g. by creating an environment for undisturbed use of the information needed in the implementation of processes). The conducted research shows that the entities of urban and urban-rural type are much better prepared in this field than the offices of rural type, because only respondents from these entities indicated using information from integrated IT databases available at the office in a network manner. Unfortunately, the use of information from integrated IT databases was not commonly followed by the Electronic Document Management System to perform office activities. And, based on the views of the authors presented in the Theoretical Backround section, this is not a favorable situation for increasing the level of process maturity of the researched entities, but even a situation that may inhibit this process.

The conducted research has shown that the least popular ICT solutions in the surveyed entities (regardless of their type) are those activities, the potential use of which would allow for full implementation of processes in the form of e-services. Unfortunately, the inability to even check the status of the case being handled by the users of these services, or the electronic reservation of the queue, may be one of the important reasons for their dissatisfaction with the process output. The fact that the respondents of the survey indicated that in their entities training increasing employee competences in the field of e-service implementation is also a scarceness, is not without significance for the created and perceived quality of this services. It is also unfavorable that in the community offices of the Warmian-Mazurian voivodship, IT programs helpful in process management are not used in principle. This situation undoubtedly limits the possibility of increasing the process maturity of these entities.

It is worth mentioning here the activities that, in the literature on the subject, are perceived as potential stimulators of increasing the scope of ICT use in public administration units in Poland, aimed in particular at supporting and developing the processes they implement. These include, among others: unifying and simplifying to the maximum e-services and documents necessary for their implementation; adapting the provisions of applicable law to the possibility of relying in the implementation of e-services only on electronic documents; extending the possibility of handling a wide range of e-services using various types of mobile devices (e.g. smartphones, tablets, etc.); the implementation of e-services through the electronic communication channel selected by the client; an appropriate and trustworthy level of security of the e-services offered; relieving citizens from the need to provide data that already exist in the resources of various units of public administration; providing offices with standard programming solutions, as well as the necessary infrastructure for the implementation of e-services (e.g. providing a simple CRM platform via the Internet, which would facilitate contact with residents and register all data from each contact in a common database, regardless of the communication channel used by the client); securing all offices of a sufficiently fast internet connection; continuous education of office employees in the scope regarding the possibilities and conditions of using ICT in public administration units (Czajkowski, 2016).

6. Conclusions

Based on the research carried out and presented in the article, one can conclude that public organizations in Poland still make little use of information and communication technology solutions. Considering the presented dependencies between ICT and the possibility of implementing and developing the process approach in organizations, it can also be concluded that the low level of ICT use is not conducive to the use of BPM in public organizations and can be considered a barrier to this activity.

Among the entities participating in the study, i.e. the community offices in the Warmian-Mazurian voivodship, the largest entities, i.e. the offices of urban type, were the most advanced in terms of ICT implementation. It was also these entities that to the greatest extent implemented and promoted the implementation of processes provided to citizens in the form of e-services.

A limitation of the presented study may be its survey nature. And, despite the attempt to reduce the common method bias, it should be assumed that the respondents did not avoid at least an element of subjectivity in their answers. Another limitation is focusing only on entities from one voivodship. However, the authors showed that the results of their research can be considered representative for the entire territory of Poland, and the research carried out by other authors in other voivodships of Poland showed similar results.

An interesting direction of research, extending the topic under consideration, would be to examine the level of process maturity of the community offices in Poland and correlate this level with the level of use of ICT solutions by these entities. Thus, the view presented in the article, that the use of information and communication technology actually determines the level of process maturity achieved by organizations, could be verified. It would also be worth recognizing the current limitations of such low use of ICT by public organizations in Poland.

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