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Analysis of the situations and potentials for digitalization of municipalities with a recommendation for implementation models

CONTENTS

ANALYSIS OF THE SITUATIONS AND POTENTIALS FOR DIGITALIZATION OF MUNICIPALITIES WITH A RECOMMENDATION FOR IMPLEMENTATION MODELS

Preface

The analysis of the situations and potentials for digitalization of municipalities with recommendations for implementation models was prepared in the frame of the project "Empowering Municipal Councils - Phase 2", which is financed by the Government of Switzerland and the Ministry of Local Self-Government, and is co-financed and implemented by UNDP. The report was prepared in accordance with the identified priority measures for the implementation of the Action Plan 2021-2023 from the Programme for Sustainable Local Development and Decentralization 2021-2026.

The analysis of the situations and potentials for digitalization of municipalities aims to provide an insight into the current state of digital platforms and the users of those platforms in the local self-government units (LGUs).

For the purposes of this analysis, a survey was prepared, which was sent to all 81 LGUs on 14 October 2022, and 73 of them submitted the completed survey in the period from 19 October to 21November.

The digital platforms of LGUs are an inseparable segment of the future platforms that would be used for providing digital services to all citizens of the LGUs, and any identified weakness in one or several of LGUs platforms may represent a risk for the efficient and safe functioning of integral platforms for providing electronic services to citizens. This means that the potential risks arising from the digital platform of any LGU do not represent a risk only for that specific municipality, but potentially for all other LGUs as well. For these reasons, this analysis should provide insight into the current state of the LGUs digitalization and, according to the identified conditions, it should provide guidelines for the next steps for the consolidation and balanced development of the digital platforms of all LGUs, which would provide conditions for reliable development of central platforms and solutions for advanced digital operations and providing services to citizens through electronic channels.

The results of this analysis will also serve as a basis for providing valuable input parameters to support the preparation of the reports that the Ministry of Local Self-Government is tasked with by the Government of the RNM, and refer to the analysis of the need and the possibility of unifying the e-Services at the local level, as well as for the analysis of the possibilities of using the national portal for the services provided by the LGUs.

This analysis can be considered as a complementary addition to the report on the electronic readiness of the municipalities in the Republic of North Macedonia[1] in which, based on a sample of four municipalities with different profiles (Gostivar, Veles, Bogdanci and Zrnovci), the qualitative conditions in the municipalities were established and at the same time, the main shortcomings for the digital transformation of municipalities were identified.

The analysis of the situations and potentials for digitalization of the municipalities has been upgraded with quantitative data at the level of all LGUs that allow us to propose informed recommendations for the next steps that should be taken in order to digitize the business processes and services provided by the local self-government units.

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[1] The Report on the conducted e-Readiness Assessment of the Municipalities in the Republic of North Macedonia was prepared in March 2022 as part of the project "Macedonian Model of e-Municipality" financially supported by the Ministry of Finance of the Republic of Slovakia, and implemented by the United Nations Development Program (UNDP).

Introduction

The main citizens' expectation from the municipalities is to receive a service in the shortest possible time through a clear and simple procedure. The legitimacy of this expectation stems from the exercise of the rights of citizens that are subject to legal regulation and their enabling through a clearly defined legal procedure. Therefore, each municipality should be committed to shortening the deadlines for the delivery of its services, as well as to simplifying the procedures that are necessary for the exercise of certain rights of the citizens, and the same applies to the procedures for regulating their obligations to the municipality arising from the legal regulation. These goals can be achieved through digital transformation of business processes, through the introduction of digital platforms, digital connection with the systems of other institutions and provision of alternative channels for meeting citizens' requests.

The digitalization of the traditional operation of municipal offices brings great benefits, such as:

- Traceability of cases
- Measuring efficiency
- Reducing or excluding bias in the case handling
- Easier detection of defects in the case handling
- Possibility of instant access to any data or case and overview of its status, regardless of the time period in which it was acted upon
- Saving time and resources
- Many other potential benefits

However, the ultimate goal of digitalization remains the commitment in the digitalization process to ensure the possibility of publishing services through Internet channels, which would enable provision of services according to the principle of "One Stop Shop 24/7", first come first served, without the need for travel and physical presence, i.e., complete service in an impartial procedure through an electronic counter.

The European Commission, since 2008, defines the scale of sophistication of electronic services in 5 categories:

- Level 1 – Information only.
- Level 2 – One-way interaction.
- Level 3 – Two-way interaction.
- Level 4 – Transaction.
- Level 5 – Personalization.

Without disputing the importance of publishing electronic services at any level of sophistication according to the possibilities, taking into account the fact that since 2016 we have already entered the era of the "Fourth Industrial Revolution", it should not be considered pretentious to believe that only services with sophistication level 4-Transaction and 5-Personalization, provide the necessary digital dividend which it is worth entering into strategic planning and implementation. All the more so that only with these levels of sophistication can a complete physical disconnection be made between the

applicant and the service provider, and a drastic reduction or complete exclusion of the possibilities for any abuse by any actor involved in the procedure.
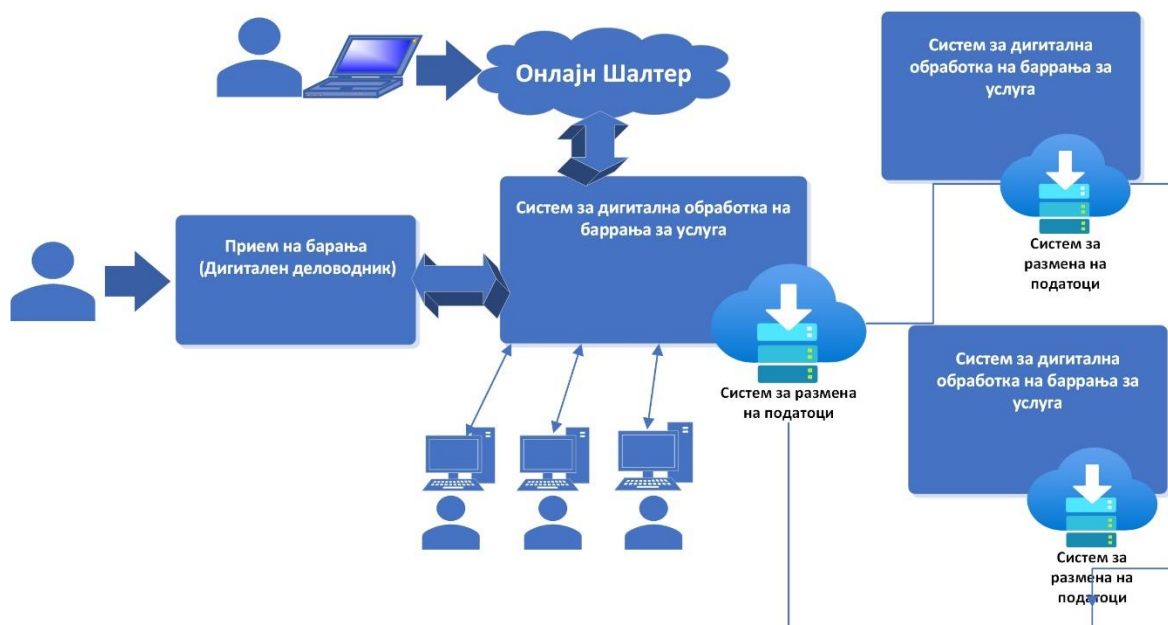
The term digitalization is a generic term that can range from simply equipping the staff with digital work tools to the complete introduction of the most sophisticated digital systems for digital support of each business process. Based on the analysed data on the current situation in the municipalities, below we will lay out the vision of development and propose the anatomy of a digital municipality, while offering projections for the steps that should be followed to achieve the set goals.

Traditional versus digital way of operation

The local self-government units, in accordance with the competences arising from the legal regulation and the obligations to perform delegated competences on behalf of other bodies, have the right and obligation to implement them and to enable the regulation and organisation of life at the local level in the best interest of citizens and businesses in the territory under their competence. Taking into account that the legal regulation imposes the principle of prohibition until an appropriate permit or consent is obtained in a precisely defined procedure, the municipality is obliged to provide an equal opportunity for exercising rights through a quick and efficient procedure for all categories of citizens, regardless of their educational, social or any other characteristic. Hence the need in the digitalization process not to overlook the possibility that certain segments of the population, for objective or subjective reasons, do not have the opportunity and knowledge to use advanced digital solutions, and to always leave the possibility for them to be able to exercise their rights by submitting requests for service in the traditional manner, through the municipal front offices. This possibility does not mean that compromises should be made when planning digitalization processes. On the contrary, this should only mean that the municipality should take over the digitalization of the submitted requests on behalf of its citizens who are not able to do that at their own expense. In addition, this approach leaves us with the possibility of monitoring and evaluating the success of digitalization processes. The level of use of digital systems gives us the opportunity to make a real time assessment whether the digitized service meets the requirements for simplicity, usability and functionality, or if there is a need for certain corrections to the process itself. If the principle of exclusion is applied and only the possibility of digital submission of requests for service is given, it is very easy to get the wrong picture about the quality of existing digital solutions and exclude the possibility of their improvement.

Architecture of a digital municipality

A successfully digitized municipality is a municipality that is ready to receive a request for service through multiple channels, typically through a front office or an online counter, and can equally enter and process them through its digital service processing system and deliver them back to the applicant in an appropriate manner.

Онлајн Шалтер

Систем за дигитална обработка на бaрања за услуга

Прием на барања (Дигитален деловодник)

Систем за дигитална обработка на барања за услуга

Систем за размена на податоци

Систем за дигитална обработка на бaрања за услуга

Систем за размена на податоци

Систем за размена на податоци

In order to be able to respond to such needs, the system should have the following components:

- Front Office for receiving and digitalizing requests
- Digital solution for administrative and archive operations
- System for digital submission of requests for service – Online counter
  - o The online counter should be supported by a system for creating and storing verified user identities, in order to enter into an administrative interaction with a known and recognized party
- System for digital processing of submitted requests
- Back Office for processing and servicing requests received in the system
- System for exchange of data with other systems that store data of interest to the procedure for the received request - Interoperability system

Providing services to the citizens is a vital, but not the only obligation of the municipality. The business process requires the support of decision-making processes, plans, budgets, solutions and other activities, which, in addition to the needs for the afore-stated components, necessarily include the needs of:

- System for creating and managing user identities and access authorisation
- Document management system and teamwork
- Data loss protection system
- Security solutions for system and data protection
- Communication and collaboration platforms
- Program for training and professional development of the staff

Guided by the mentioned needs, for the purposes of assessing the current situations in the municipalities, a survey was prepared and distributed on the absolutely necessary components that each local self-government unit must have in order to be functionally and safely involved in the digitalization processes, while for the systems for which there is no justification to be implemented at the level of individual municipalities, in the final recommendations, solutions will be provided for integral solving of their needs.

Front Office for receiving and digitalizing requests

The Front Office for receiving requests for service is a basic feature of any organization with a proper set up that in its activity includes interaction with clients or applicants. As such, this service should be a single point where applicants can submit a request of any kind, and receive feedback on the status of the request, information on the completion of the procedure and delivery of the service in question. Any practice of directing applicants to submit their requests directly to certain internal municipal offices clearly indicates that there is no single institute, i.e., there is no one organization but a set of a many mutually unrelated entities. The fulfilment of the expectations from such an office necessarily requires the possibility of digitalization of the requests received at the front office, their direct registration, i.e. input in a digital system, properly categorized and described with the necessary meta data. Digital copies entered into the system can be considered valid for further processing, according to the fact that the municipality owns the original documents received at the front office. Pursuant to the legal provisions, every case received by the municipality should and must be registered in the administrative-archive book, and therefore proper digitalization of the administrative operations is one of the first steps in the process of digitalization of the municipality. In order to be able to meet the expectations, this office should be provided with the necessary knowledge to use the system, as well as with appropriate technical assets and software through which it will be able to perform its tasks in a safe manner.

Digital solution for administrative and archive operations

The basic attribute of a municipality with a high level of digitalization is the ability to receive requests through multiple channels in a non-selective manner and, regardless of the channel, to be able to enter all of them into a single servicing system and afterwards to register the completion of the procedure and document it accordingly. In order to achieve these goals, it is necessary to have a digital solution for administrative operations, capable of receiving input of digitized documentation related to the submitted request, and distributing it accordingly to the designated persons in charge of the procedure. At the same time, this solution should also provide registration of the requests received through digital channels in the system for servicing requests according to the same principles, and finally provide access to consolidated information in one place for all received requests, regardless of which channel they arrived through.

System for digital submission of requests for service – Online counter

The existence of a digital channel for transactional interaction with the municipality is the main attribute of every highly digitized municipality. Providing this opportunity is the element that gives the main yield of digital dividend in the form of fast receipt of the service, geographical independence of the applicant, savings of time and means of transport, non-discrimination and equal treatment, as well as a series of other benefits. Therefore, providing this opportunity is the main argument for confirming that an organization has completed its digitalization process. For these reasons, the publication of the so-called electronic counter comes as the last step in the digitalization process, after all the necessary prerequisites have been met for a functionally completed process of digital processing, creating validated digital user identities, security and reliability of systems, business continuity etc.

System for digital processing of submitted requests

The system for digital processing of submitted requests is a platform which makes a digital clone of the general procedure for each of the services that is the subject of provision. During the implementation of such a system, the possibility of optimizing and simplifying the process should always be taken into account, if possible, before commencing the implementation. It is always necessary to carefully analyse the possible technological limitations, and if necessary, redesign the process in order to bring it to a state where it can be effectively digitalized, and thus obtain an acceptable level of usability in terms of the possibility of quickly mastering the necessary skills for its efficient use, and excluding the high level of complexity that can result in increased instead of decreased time necessary to act upon the case.

The system for digital processing of submitted requests is needed not only for the simple copying of processes in a digital form, but even more for its potential opportunities to connect and exchange data with other systems that store data of interest for the procedure in real time, which provides opportunities for ensuring the greatest value in terms of saving time and funds when serving the citizens.

Back Office for processing and servicing requests received in the system

The Back Office for servicing requests received in the system is a team of qualified individuals who, according to the nature of the processes being implemented, as individuals or groups, implement a procedure comprising of an appropriate number of digital steps. In order to be able to meet the expectations, this office should be provided with the necessary knowledge to use the system, as well as with appropriate technical assets and software through which it will be able to perform its tasks in a safe manner. Of course, such systems for digital processing of requests and the corresponding subsystems are a mandatory prerequisite for this office to be able to implement its activities.

System for exchange of data with other systems – Interoperability system

Any procedure for servicing a request usually requires the submission of one or more accompanying documents as a basis for issuing an appropriate permit or decision. Each of the required documents should be provided in a separate procedure before the same or other competent bodies, which entails spending additional time and resources that burdens the procedure for obtaining the requested service. In view of the fact that most of the time all necessary documents are owned by the same or other state body, the interoperability system can provide them in the most efficient way in real time and provide confirmation of their existence without the need to initiate multiple previous procedures. Such a system can provide huge savings in time and resources not only for applicants, but also for the bodies that have to issue the necessary documents that will be used as a basis for exercising certain right. For these reasons, the interoperability system is one of the elements that is indispensable for achieving a functional digitalization with a high return on investment.

System for creating and managing user identities and access authorisation

The digital identity of the actors involved in the digital procedure is the basis for entering into any digital transaction. Before entering into any digital interaction, it is necessary to perform validation of

the parties entering into a transaction, i.e., to provide proof of: who, when and what action was taken. In order to achieve this goal, in addition to validated digital identities for applicants, it is necessary to establish a system for creating user identities for persons in charge of the services through which access control and access authorization for each individual in the organization can be carried out. Without a central system for creating user identity and access authorization, it is not possible to ensure efficient control and traceability of the activities undertaken by each individual, nor to ensure an efficient and controlled teamwork and collaboration when performing tasks within the organization. These are activities that affect not only the processes of serving the citizens, but also the work on the internal processes of preparation and adoption of acts and decisions of importance for the work of the municipality. This need is additionally imposed by the Law on the Personal Data Protection, pursuant to which any possibility of unauthorized access to data of a personal nature is subject to sanctions.

Document management system and teamwork

Any process of administrative work involves preparation and work with documents. Documents are less often the subject of individual work and are usually handled by groups or teams and, in the process of parallel activities or a series of activities carried out by several employees, they reach the final versions of acts, decisions, decisions or other types of final documents. For effective collaboration and teamwork, it is necessary to have a document management platform, i.e. a document management system, which will allow users to create a space for collaboration in an organized manner, keep documents in multiple versions, monitor the progress of the activity, as well as to avoid the possibility of losing documents or creating confusion due to the existence of multiple versions of final documents.

Data loss protection system

Transferring traditional ways of working into a digital system brings many advantages, but also certain risks that should be anticipated and handled in a timely manner. The digitalization of municipal operations involves creating large amounts of digital documents and data, which are the result of implemented procedures and at the same time proof of given rights. The loss of that data can have catastrophic consequences, and therefore it is necessary to provide conditions for all data to be copied to backup locations in a timely manner, and in the event of loss, to have the possibility to retrieve them with full integrity in the shortest possible time. Regardless of the sophistication of the implemented systems, the possibility of losing data or the systems as a whole can never be excluded, whether for technical reasons and defects or due to targeted activities of malicious actors inside or outside the organization.

Security solutions for system and data protection

Cybersecurity threats date back to before the era of personal computers, but with the advent and popularization of personal computers, these threats are beginning to grow exponentially. At the beginning, only for the sake of fun and prestige among young talented experts, and with the increased use of computer technology in businesses and state authorities, these security threats also acquired a dimension of crime in order to gain benefit of a financial or political nature. Lately, the ubiquity of digital technologies in all aspects of social and business life has led to a situation where these threats resulted in cyber or hybrid warfare between countries, with potentially catastrophic consequences for the targeted party.

The digitalization and improvement of the digital operations of the municipalities, which entails the necessary centralization of platforms and solutions on the one hand, and on the other hand potentially serves the entire population of the country, makes these platforms visible and a potential focus for malicious parties who are ready to cause damage of enormous proportions. Therefore, security policies and security solutions must be under the strong attention of the implementers of initiatives and the institutions that will undertake their implementation and maintenance.

Security must start with each individual workstation and each individual user of that workstation, all the way to the level of the overall platform and solutions. To reduce the possibility of compromise, a legitimate software must always be used with an ongoing period of support by the manufacturer, who regularly releases security updates to patch newly discovered security vulnerabilities of the product. There should be an established policy and practice for applying those upgrades in the shortest possible time. Using software that is not supported by the manufacturer means that the manufacturer no longer provides updates for existing security vulnerabilities, and those vulnerabilities can in the long run be used to attack and compromise the system, either by destroying the system itself or by unauthorized data breach. On the other hand, the use of unlicensed software means either not being able to receive security updates, or, in a frequent case, arbitrary and conscious use of programmes for cracking the license protection known as cracks, which by nature are designed to carry malicious codes of unknown nature. The consequences of installing such license cracking programmes can range from unauthorized installation of cryptocurrency mining applications to taking full control of systems and their complete destruction. In addition, each workstation must be provided with an anti-virus programme from a relevant commercial manufacturer. This is in order to reduce the possibility of compromise when new malicious codes appear, in the period from the detection of such code until the moment of upgrading the antivirus program with a new definition that recognizes that code as malicious and can respond in case of such an occurrence.

Today's level of existing threats also requires additional implementation of systems for advanced recognition of threats to the infrastructure, before those threats lead to compromise. This of course includes constant monitoring of messages and alerts generated by such systems, and taking timely measures by the IT security staff.

Communication and collaboration platforms

Communication and collaboration systems are an inevitable element of any working group that wants to be digitally efficient. The systems for electronic mail, instant text communication and audio-video conferences with the possibility of sharing and viewing the screen, are inevitable elements for effective digital operations, both within the organization itself and in communication with external applicants.

These systems should also be of known origin, due to the existing very large possibilities for misuse and unauthorized interception of data if any free alternatives of unverified origin are used.

Program for training and professional development of the staff

As we have already emphasized, to ensure secure and functional business continuity, it is necessary to always use software versions that are supported by the manufacturer in order to minimize the possibilities of compromise. In order to maintain the capacity for successful use of the basic working assets, it is necessary to conduct periodic planned training of the staff, so that they could continue using the technologies efficiently, without any obstacles and continuously in case of such changes.

These trainings should include topics of using an operating system and internet environment, using the main tools of the office software package, communication and collaboration, and recognizing security threats and rules of behaviour when they occur.

Extraordinary training events should be planned each time a new system or a new service is introduced that the employees have to use in the future, or in case of significant changes or upgrades of existing systems or services.

IT staff should also be subject to continuous training. The development of equipment, software and software versions is so fast-paced that often in a few years the old knowledge becomes irrelevant for maintenance and support of the upcoming technologies, and it is only a matter of time when they are implemented in the systems they serve.

Analysis of the current situations

Taking into account the vision described above regarding what a modern digital municipality should look like, in the past period a comprehensive analysis of the situations and potentials for digitalization of the municipalities in the Republic of North Macedonia was conducted. The purpose of this analysis is to carry out a detailed insight into the current digital capacity of the municipalities and, based on the data obtained, to give recommendations on the necessary steps that the municipalities should take in order to achieve digital transformation. For this purpose, the analysis was aimed at collecting data from all 81 local self-government units in the country regarding the following aspects:

- Total number of employees in the municipal administration
- Number of IT staff
- Number of employees using a computer
- Number of available workstations (computers) in the municipality
- Age of the workstations (computers)
    - 1 year
    - 2 years
    - 3 years
    - 4 years
    - 5 years
    - More than 5 years
- Operating system used on the workstations (computers)
    - Windows 11
    - Windows 10
    - Windows 8.1
    - Older version of Windows (Windows 8, Windows 7, Windows Vista, XP)
    - MacOS
    - Linux
    - Other operating system
- Percentage of workstations without legal (paid) license for the operating system
- Office software used on the workstations (computers)
    - Microsoft Office 365
    - Microsoft Office 2021
    - Microsoft Office 2019
    - Microsoft Office 2016

- o Microsoft Office 2013
- o Older version of Microsoft Office
- o Open Office
- o Libre Office
- o Other version of office software
- Percentage of workstations without legal (paid) license for office software
- Number of computers protected by commercial (paid) antivirus protection
- Does the municipality have a local network for connection of the workstations (LAN)?
- Does the municipality have Internet access?
- Does the Internet access capacity meet the needs?
- Is the Internet access protected by an internet traffic controlling device (Firewall)?
- Has the municipality provided official e-mail addresses to the employees?
- Percentage of use of official e-mail addresses for everyday work
- Is there a process for planned backup of the e-mail communication and recovery of messages in case of loss?
- Is a corporate system used for real-time communication via text, voice or video (MS Teams, Zoom, Google Meet or other)?
- Does the municipality have an implemented system for the central creation and management of user identities and access authorization (Directory Services – Windows Active Directory or similar services)?
- Does the municipality have an implemented document management system (document-management)?
- Does the municipality have a data backup system?
- Does the municipality have a defined protocol for data backup and safe storage of backup copies?
- Does the municipality have an implemented system for advanced threat recognition, notification and response in case of a detected threat (SIEM/SOAR – Security Information and Event Management – Security Orchestration, Automation and Response, such as MS Sentinel, Checkpoint, Fire eye or similar)
- Does the municipality have a digital solution for archive and administrative operations
- Coverage of costs for IT needs in percentages
  - o From own funds (municipal budget)
  - o From funds provided from external sources
- Training plan for maintaining the staff competence
  - o Number of trainings in using computer and Internet per employee in the last 5 years
  - o Number of trainings in using office software per employee in the last 5 years
  - o Number of trainings in safe use of IT systems and recognition of security threats in the last 5 years
  - o Number of technical trainings per IT employee in the last 5 years
  - o Number of acquired certificates from a reputable issuer per IT employee in the last 5 years

Based on the presented criteria, a Survey (Appendix 1 to this document) i.e., a data collection form, was prepared and it was sent to all eighty municipalities and the City of Skopje. Based on the obtained data, an analysis of the current situation was made, and based on the conclusions drawn, we provide recommendations for the next steps that should be taken to improve the digitalization process of the municipalities.

SITUATIONS

The analysis of the current situations that we carried out, mainly focuses on the elements of the infrastructure that must remain in operation in each of the municipalities, and they refer to the situations with the basic working assets, staff, status of basic software in use, network connection, security situation, communication and collaboration, documents management and their protection, sources of funding and staff training.

The insight into the existing situation with the availability of digital service management systems, the system for data exchange between systems, the situation with the available online services and the online counter, are not the subject of this analysis because they are systems for which it is not justified to be implemented individually by each municipality, or by small groups of municipalities. The services that are provided or that will be potentially provided by municipalities through digital channels are subject to symmetrical competence and are identical for all municipalities in terms of form and content. Any implementation at the individual level only reflects the general delay in the development of shared systems and it is an unnecessary waste of resources and a compromise with quality and safety. The development of any service or a system for digital services provisioning at an individual level, differs only in one additional field for the municipality name, through which the users and persons in charge of the service would be directed to the corresponding segment of the application solution.

The only exception in this analysis is the insight into the situation with the digital register, which by all characteristics should also be subject to a centralized approach.

In the recommendations that will follow, we will not leave out the existing applications that all or almost all municipalities already have, which refer to the calculation and management of taxes, fees, parafiscal charges, salary calculations, invoicing of utility services and the like. All these systems are identical in nature and replicated in 80 locations. In conditions of high budget deficits of the municipalities and deficit of staff for providing the services, no justification can be found for multiplying costs of such a scale. Most of these application solutions represent a database for implementation of online services for payment thereof, so keeping their distributed status entails additional future costs for each municipality separately, as opposed to solving the same needs through a centralized solution for all municipalities.

With this approach, the gap between the few municipalities with a greater capacity to individually address needs will be reduced, as opposed to the majority of municipalities that probably will not be able to fulfil these needs individually in the very long term.

The survey prepared and sent to all 80 municipalities and the City of Skopje was completed and returned by 72 municipalities and the City of Skopje (73 LGUs in total), which represents a high response rate of over 90%. There is a small part of missing answers about the percentage of use of legal licenses for software packages. It is assumed that these answers are missing because the senders refrained from disclosing this information, due to the possible consequences of non-compliance with the Law on Protection of Intellectual Property and therefore, in the calculations, these items are considered as not properly regulated with a license.

This analysis does not aim to provide an insight into the observance of the laws on protection and compliance with intellectual property, but focuses only on the functional and technical, as well as

security aspects arising from the given conditions, and can significantly affect the process of digital operation of the local self-government units.

Digital involvement of municipal staff

In the local self-government units that completed the submitted survey, a total of 5086 persons are employed, of which 4155 use a computer in their everyday work. The actual situation indicates that currently, 81.7% of the employees are equipped and digitally included in the work process within the existing possibilities for digital
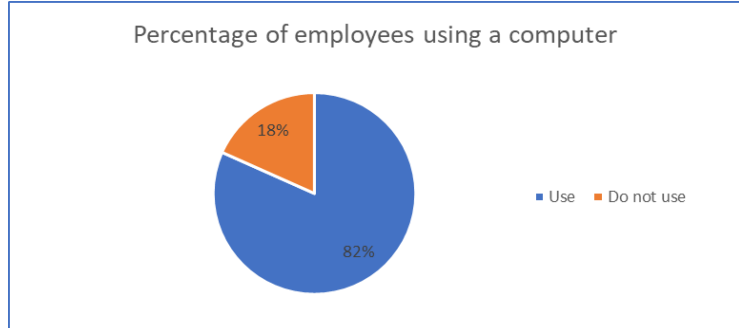
operation. The number of workstations owned by municipalities (on a sample of 90% of LGUs, there are 4564 workstations available for 4155 employees who use a computer,) exceeds the number of employees who use a computer (1.1 workstations per active user). However, if the actual obsolescence of the equipment is taken into account, this data does not give a realistic representation of the current situation, since the parameters of usability of the workstations should be followed, which are given below in the analysis. The 81.7% of digital inclusion indicates high digital inclusion of the municipal offices and represents a good basis for increased investments in the further development of
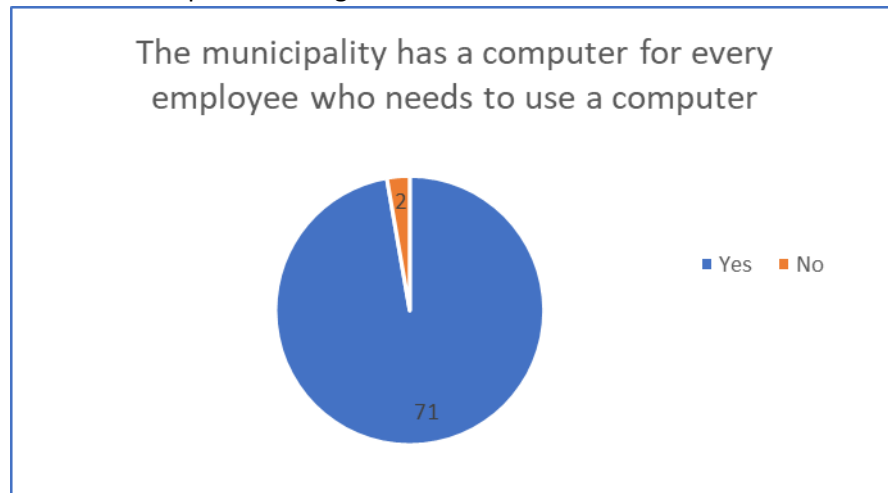
digitalization of the business process in the municipalities, as well as for the development of electronic services for citizens who use municipal services. The part of the staff that is not yet digitally included due to the nature of their work, because of the development of the concepts of "smart cities", in the medium term, can be considered as a potential user base that should be properly digitized in order to more efficiently perform their work tasks.

For 2.7% of the municipalities, it was established that they do not have enough workstations, so they have to share them, which can lead to a potential stoppage in the case of high-level digitalization of the operations.

IT staff

The situation with the engaged IT staff in the municipalities is with a high level of diversity, however, it can be concluded that most of the municipalities do not have access to IT support at all, or the level of IT support they receive is at the capacity of basic support, and there are no professional capacities for

independent handling of more complex digital systems to support the business process, as well as for the development of electronic services for citizens.

Number of municipalities according to the number of IT employees

	No IT employees	1 IT employees	2 IT employees	3 IT employees	4 IT employees	5 IT employees	More than 5 IT employees
	26	24	13	6	2	1	1
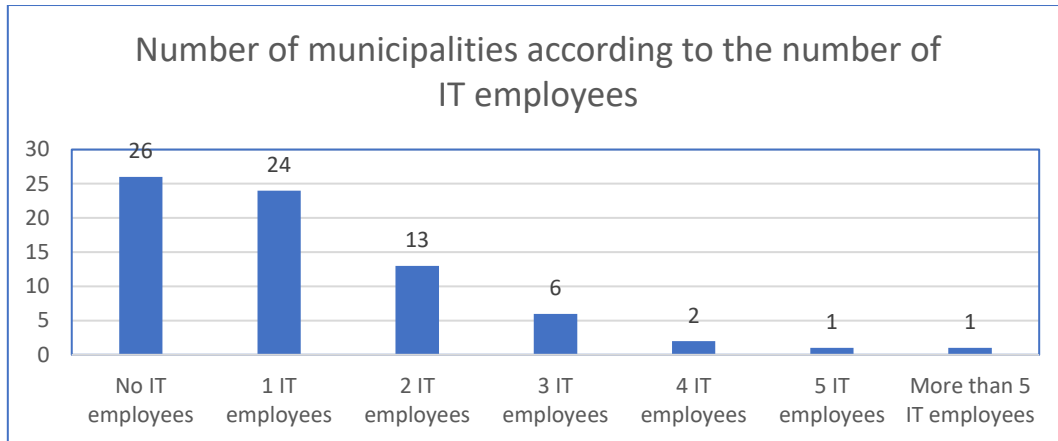
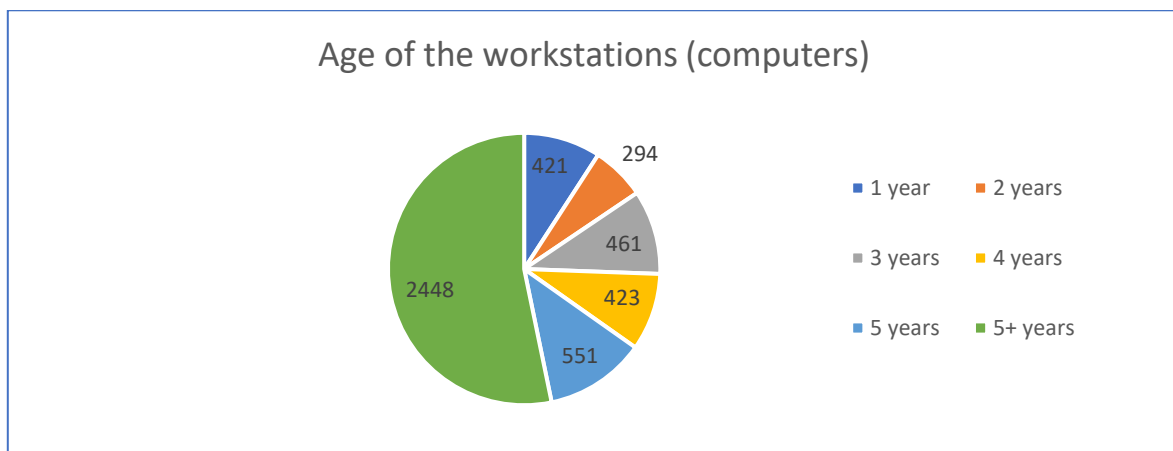The percentage of employed IT staff from the total number of employees who use a computer is 2.19% or 1.24 IT employees per municipality on average, while 36% of municipalities do not have access to their own IT support at all. Only 5% of LGUs have engaged 4 or more IT employees, a number that provides the opportunity for the staff to specialize in IT disciplines and to create opportunities for managing complex systems for digital support of the operations.

The established state of great diversity of the IT capacities resulting from several factors (including the objective unavailability of IT resources on the market in a large number of rural municipalities, as well as the difference in size between municipal organizations of up to 20 times) necessarily requires that the search for solutions for a balanced approach to IT support be directed towards centralizing resources and establishing centres for shared provision of the needs of most or all local government units.

Workstations

Although currently the number of workstations owned by the municipalities is greater than the number of employees who use a computer, the usability of the workstations can be assessed as poor.

Age of the workstations (computers)

421 — 1 year
294 — 2 years
461 — 3 years
423 — 4 years
551 — 5 years
2448 — 5+ years

The workstation, as a basic prerequisite for inclusion in a digitalized business process, must ensure high reliability that no defect will occur, or in the event of a defect, to have the possibility to restore their function in the shortest possible time. Only a workstation that is not older than 5 years can be

considered of having these characteristics. For workstations up to 5 years old, it can be reliably considered that there is a possibility to cover them with an extended warranty period and provide the necessary components in case of defect.

Currently, 53.2% of the available workstations owned by the municipalities can be considered outdated and unsuitable for use and inclusion in a process with a high level of digitalization. 12% can be considered as almost outdated, and only 34.8% of the available workstations can be reliably used for work, with a useful life of one to four years. For workstations that can be considered usable, the average usability period is 2.8 years, while the average usability period of all workstations is 1.3 years.

A comprehensive study by Intel[2] indicates that workstations older than 4 years, unlike workstations up to 3 years old, exhibit the following conditions:

Downtime. Workstations that are 4 years old exhibit twice as much downtime than workstations that are 3 years old. Consequently, it can be assumed that the downtime period can only increase as they get older.

Need for technical support. For workstations older than 4 years, the need for technical support is 55% higher compared to the required technical support for workstations that are between 3 and 4 years old.

Data loss. Organizations using workstations older than 4 years are three times more exposed to loss of business data compared to organizations using workstations that are up to 3 years old.

Security compromises. For workstations older than 4 years, it has been established that they are three times more subject to security compromises compared to workstations that are up to 3 years old.
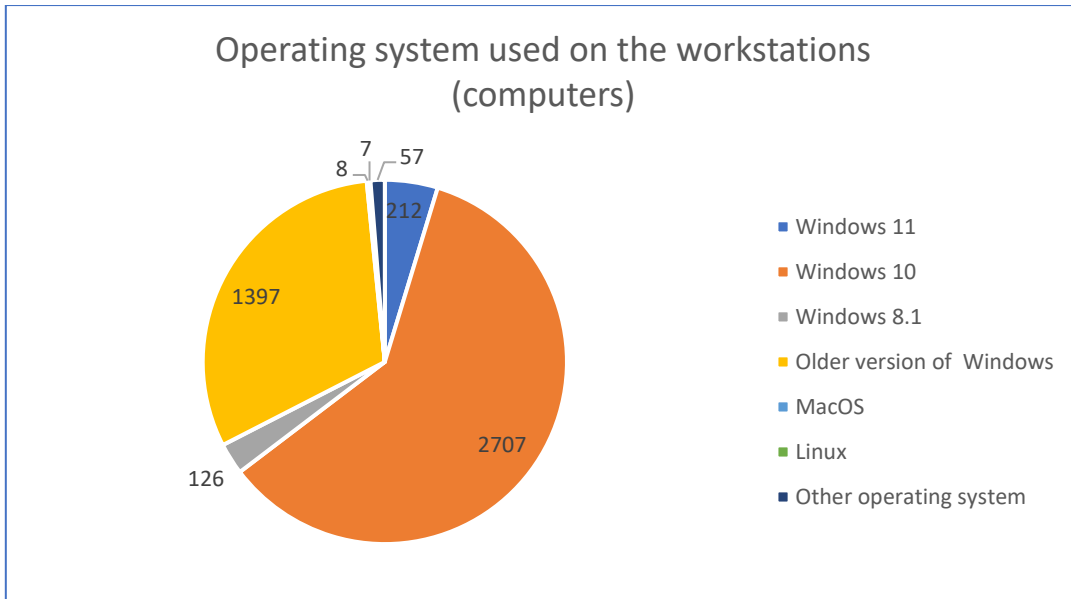
The conclusion of this study is that a workstation replacement period of 4 years is optimal. However, taking into account the current factual situation and the financial challenges faced by the municipalities, a useful life of a workstation of 5 years can be considered acceptable, with a recommendation to obtain an extended warranty period of up to 5 years with the purchase of each workstation.

According to the established situation of significant obsolescence of the workstations, as well as the lack of own budget funds as the main reason for this situation, measures should be taken to help the municipalities in a certain period of time to replace the outdated workstations with new ones.

Operating system

For efficient and secure operation, each workstation must have an operating system that is supported by the manufacturer and access to updates for any newly discovered security vulnerabilities in its code. Operating systems that are not supported by the manufacturer due to their obsolescence do not have the ability to obtain such upgrades, and any newly detected code vulnerability remains a permanent threat to the security of the workstation, and thus to all systems accessed by that workstation.

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[2] PC Refresh Strategy for Business (intel.com)

Operating system used on the workstations (computers)

- Windows 11
- Windows 10
- Windows 8.1
- Older version of Windows
- MacOS
- Linux
- Other operating system

From the submitted data, it has been established that there is a great consistency in terms of the type of operating system used by the LGUs, i.e., 98% of workstations use the Windows operating system, while only 2% use another type of operating system. Despite the positive aspects of the situation, which can result in savings in the development of digital platforms that can have a high level of compatibility, the obsolescence of the used versions and the fact that the use of safe-legal versions of the operating system is at a low level are a serious security and functional threat for inclusion in business processes with a high level of digitalization.

Support of the operating systems Windows

- Поддржан ОС
- Застарен ОС
- Друг ОС

Percentage of PCs without legal licence for OS

55%
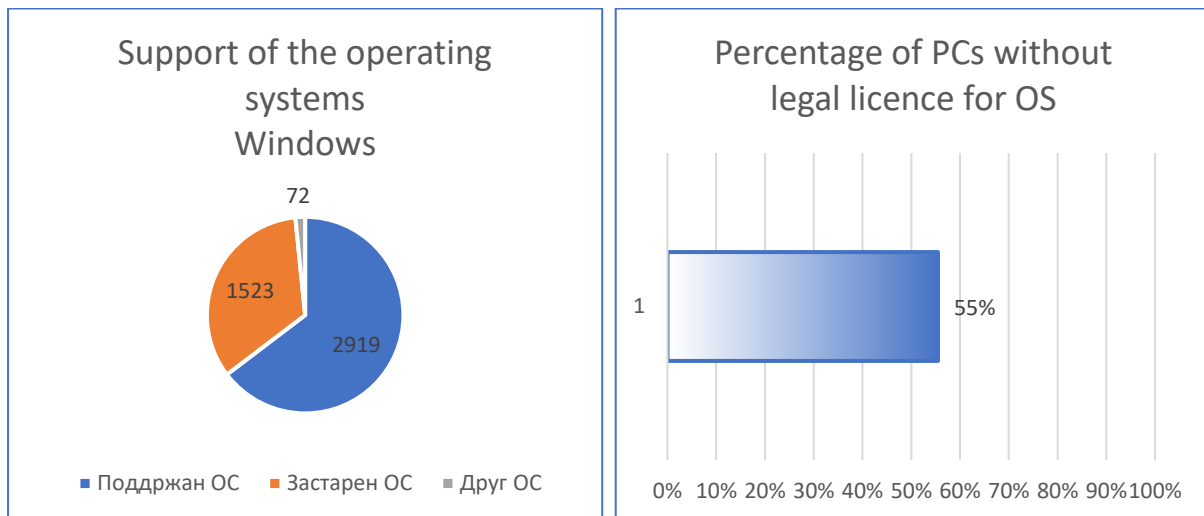
The provided data indicates that over 33.7% of the workstations are exposed to security risks due to their outdated version and as much as 55% of them are used without a proper license. This means that certain softwares for breaching the license protection has been used on these workstations, which, as a rule, contain malicious components and a high risk of further compromising the system, or they do not receive regular updates that ensure safe use and reduce the risks of compromises.

Office software

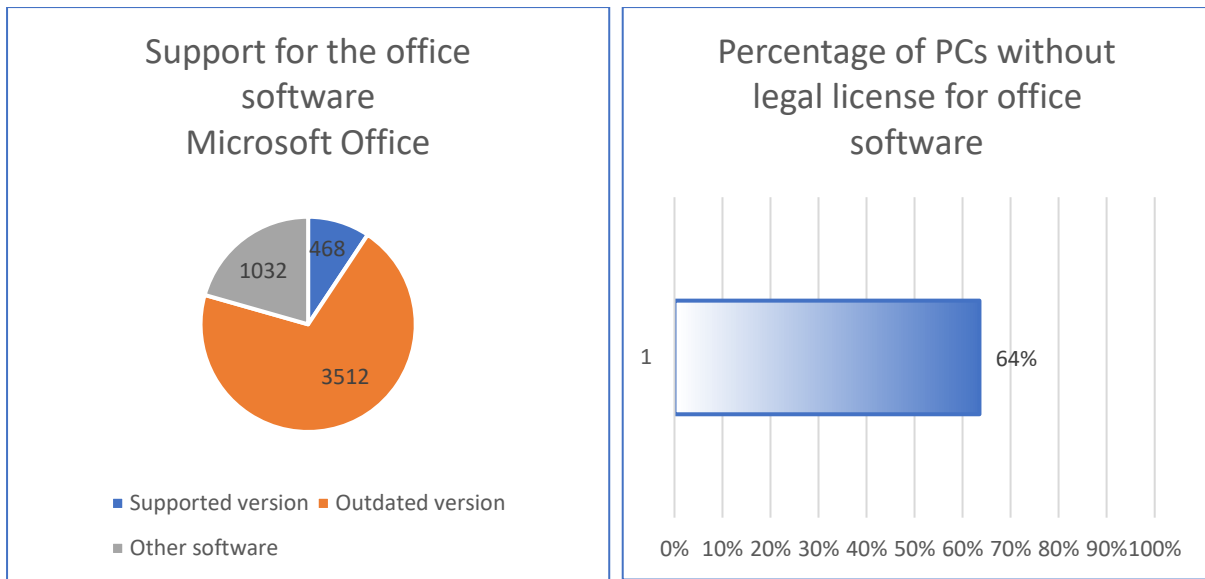For efficient and secure work and for providing opportunities to work with the latest document formats, each workstation must have an office software package that is supported by the manufacturer and access to updates for any newly discovered security vulnerabilities in its code. Office software packages that are not supported by the manufacturer due to their obsolescence do not have the ability to obtain such upgrades, and therefore any newly detected code vulnerability remains a permanent threat to the security of the workstation, and thus to all systems accessed by that workstation.

Office software used on the workstations (computers)
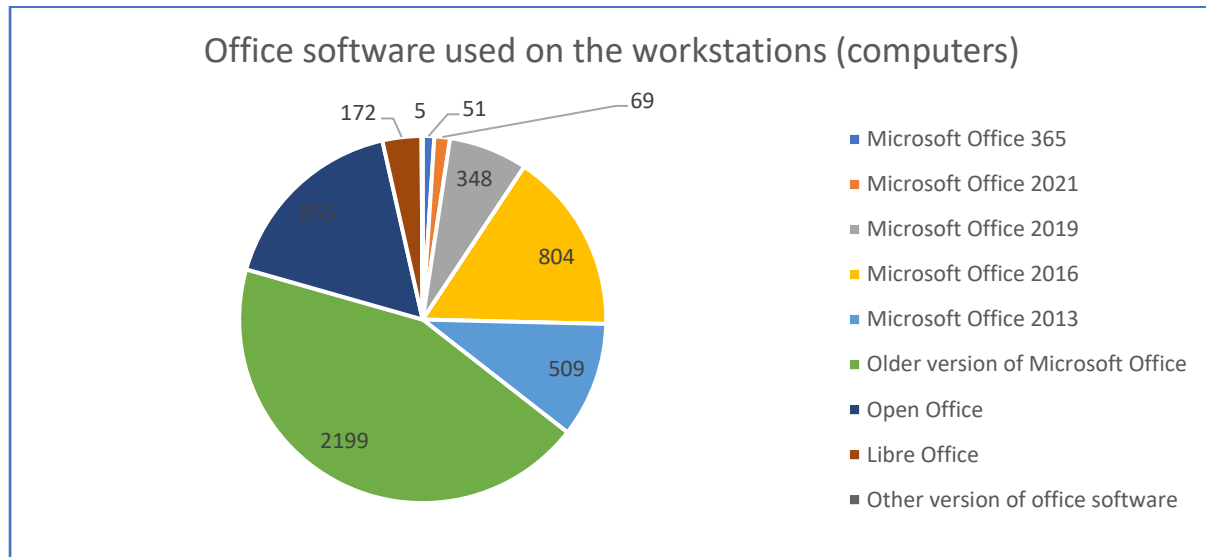
From the submitted data, it has been established that there is a high level of consistency in terms of the type of office software used by LGUs, i.e., 79.5% of workstations use MS Office package, while 20.5% use other type of office software. Inconsistency in the number of office suites compared to the total number of available workstations can be established from the provided data, however, it is assumed that statistical percentage patterns can still be a relevant source of reliable conclusions.

The use of open-source office software has financial benefits in terms of absence of payment obligations, however, care should be taken for the compatibility of the document formats used with the document formats used by the other municipalities, as well as the citizens with whom digital interaction would be initiated. Also, special attention should be paid to timely provision of security upgrades, which may also result in a need for financial expense, because the security of the systems must not be subject to compromise.

The use of safe-legal versions of commercial office suite software is at a low level and represents a serious security and functional threat for inclusion in business processes with a high level of digitalization.

Support for the office software Microsoft Office

468
1032
3512

■ Supported version ■ Outdated version
■ Other software

Percentage of PCs without legal license for office software

1   64%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

In addition to the need for special care for the versions of open-source office software, the provided data indicate that only 11.7% of the workstations using the MS Office office suite have a version that is supported and safe for operation. Additionally, 64% of the total MS Office office suites are used without a proper license, which means that certain softwares for breaching the license protection is used, which, as a rule, contains malicious components and a high risk of further compromising the system, or they do not receive regular updates that ensure safe use and reduce the risks of compromises.

Anti-virus protection

Having an anti-virus protection software from a reputable commercial manufacturer, which has been verified to rapidly update the definitions for recognition of newly emerging malicious codes during the "zero-day" exposure period, i.e., has the ability to identify newly emerging threat codes in a short period of time and deliver new definitions that recognize that threat within hours, provides a high level of certainty that the threats from newly emerging malicious codes will be promptly intercepted and minimized. Although general threats to systems by far exceed the threat of (only) distribution of malicious codes, the number of such malicious codes in daily circulation is so large that it requires mandatory use of verified anti-virus programs to deal with this threat.

Percentage of PCs without anti-virus protection

1   73%

0%   10%   20%   30%   40%   50%   60%   70%   80%   90%   100%
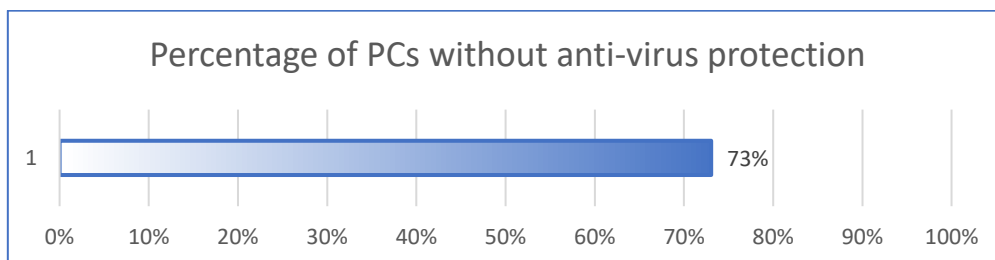
From the analysed data, it is established that only 27% of the workstations used in LGUs in the country are adequately protected with anti-virus protection. This situation represents a great risk for the digitalization process and it should be properly addressed.

Network connectivity and Internet access

Digitalization of the processes and services includes communication and data exchange, both within the organization and through the global network with external parties. This necessarily requires networking of workstations within the organization and provision of conditions for controlled and secure access to the Internet with satisfactory capacities.

The situation on the field shows that almost all municipalities have a local network connectivity with over 95%, while the connectivity to the global network is complete.

Municipalities with LAN connectivity

Municipalities with internet connection

The internet access capacity meets the needs
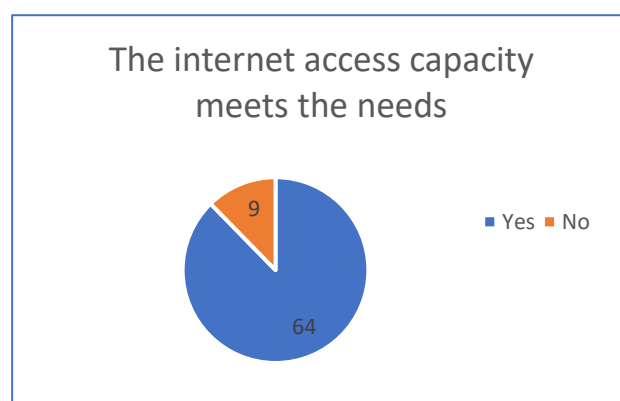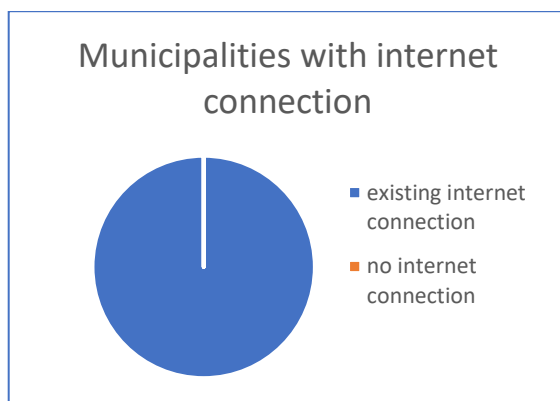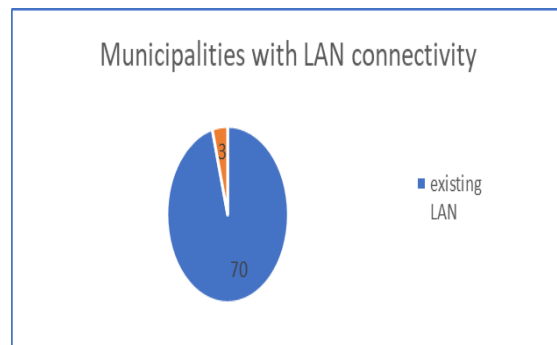
Significant improvements should be undertaken to improve the Internet access capacities because even at the current moment, when the level of digital interaction with the outside world is minimal (mainly due to the absence of digital platforms for high-intensity data exchange), problems can already be identified with the lack of sufficient capacities of the internet connections, so more than 12% of the municipalities already lack sufficient capacity of their connections. With the development of digital platforms and the increase in the number of services that are available online, the need to increase the capacities will further come to the fore.

Over 46% of the municipalities have not secured their internet access with basic network security devices and this should be addressed due to the associated risks that follow from this deficiency.

Is the internet access protected by an internet traffic controlling device (Firewall)
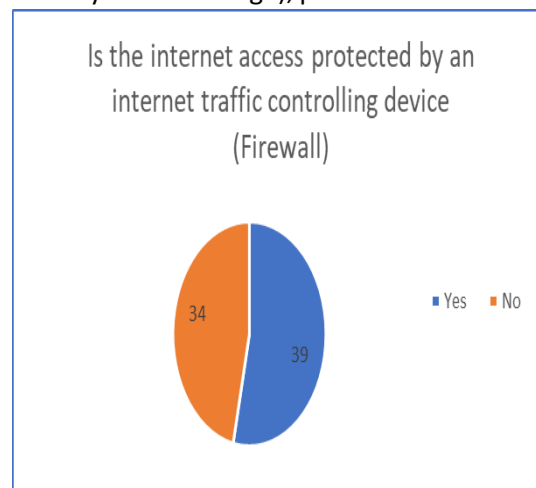
Communication and collaboration

In addition to the basic need for communication within the organization as well as with external stakeholders, in the digitization of business processes, the e-mail of each participant in the processes has a special significance due to the intensive needs of distribution of messages and notifications during each receipt of a task in the digital processing systems, or when changing the status of a work process. Therefore, the existence of a reliable e-mail management system is a necessity without which the digitalization of processes is not possible. Such a system should provide a high level of reliability

for use as well as confidentiality in the protection against loss of electronic messages, primarily for the purpose of ensuring uninterrupted service delivery through the digital platforms, as well as for the confidential storage of the messages in case they are used in certain evidentiary procedures.

The process of digitalization of operations with high digital intensity imposes the need of having more modalities for communication and collaboration with third parties, internally in the organization, but also with external stakeholders. Such systems should ensure the synchronous exchange of text messages, audio or video communication, i.e., they should support processes during which it will be possible to exchange information in real time or perform joint inspection of documents and situations.

Has the municipality provided official e-mail addresses to the employees	Percentage of use of official e-mail addresses for everyday work (Municipalities with provided e-mails)
19 No / 54 Yes	70%
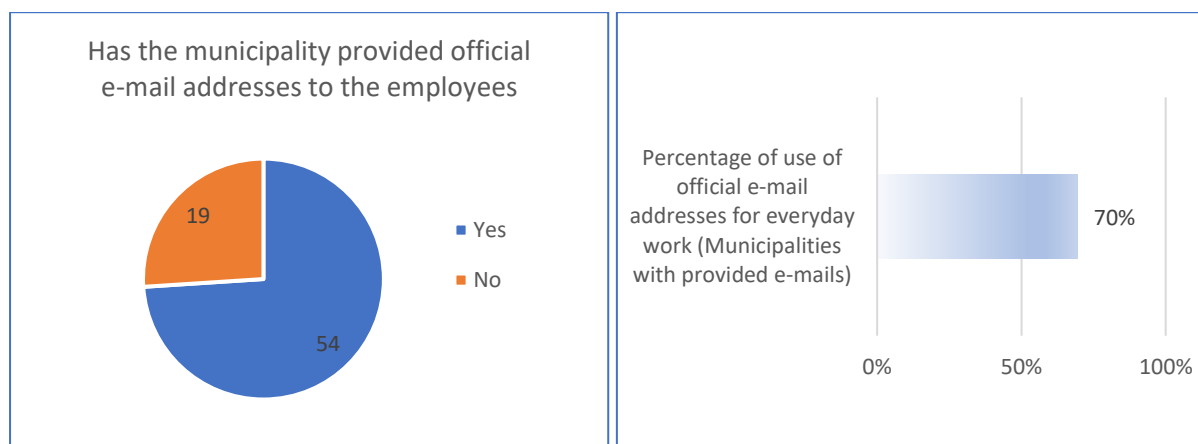
Despite the needs (noted in the report of the State Audit Office[3] in accordance with the public administration reform strategy), the municipalities have not yet fully provided the employees with official e-mail addresses. Therefore, more than a quarter, i.e., 26% of the administrative staff in the municipalities, still do not have an official e-mail. The situation is further complicated by the fact that only 70% of the employees who are provided with e-mail use it in their work. A serious risk for the electronic communication is the fact that the majority of municipalities have not provided options for protection against loss of electronic communication, i.e., 70% of municipalities are exposed to the possibility of irreversible loss of electronic communication in whole or in large part.

Is there a process for planned backup of the e-mail communication and recovery of messages in case of loss	Is a corporate system used for real-time communication via text, voice or video (MS Teams, Zoom, Google Meet or other)
22 Yes / 51 No	14 No / 59 Yes

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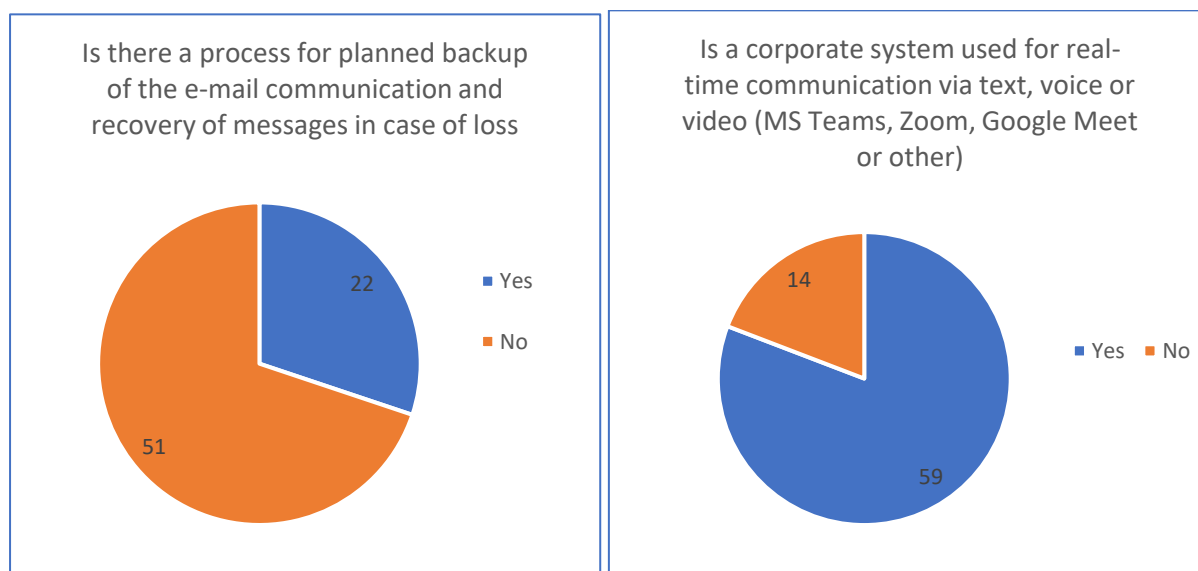
[3] FINAL REPORT ON THE AUDIT OF INFORMATION SYSTEMS, "The quality of services provided by LGUs through their WEB portals"
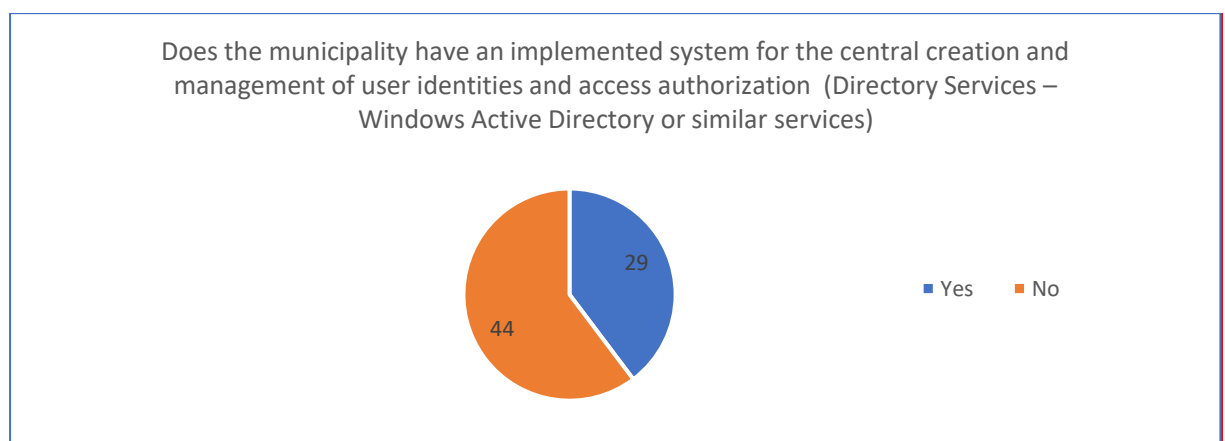
It is encouraging that 80% of the municipalities already use platforms for communication and collaboration through synchronous text messages and audio and video conferences, which significantly contributes to successful digital development. However, the obligation remains to provide these opportunities for all employees who are involved in the digital work process, and when choosing a platform, to use verified platforms from the aspect of secure communication without restrictions that can affect the operation, such as restrictions on the number of communications during the day or the length of the time for communication.

System for creating and managing user identities and access authorization

In the digital world, the digital identity of the user is the only one that is known and recognized, and therefore its confidentiality is key to enter into a valid digital interaction with an acceptable degree of confidentiality. Based on the digital identity, all authorizations are given to perform any digital activity or data access.

Creating and using individual user identities at the workstation (operating system) level does not provide an efficient and secure way of granting authorizations to access data and systems in a secure and traceable manner. Such access involves transfer of user credentials in the form of readable text that can be easily intercepted and downloaded without authorization. This access is also accompanied by complex procedures for granting access authorization to each user individually, which can relatively quickly lead to a state of untraceability and loss of control over the information about which user (still) has privileges to access data and parts of the system that they should not have at the given moment.

For these reasons, every organization needs to have an adequate system for control of the creation of user identities and control of access authorization. Such a system would enable transmission of an identity over the network in a form that is not readable even if it is intercepted, and it can grant access authorization at the level of groups of users. Membership in those groups can be made on a need-to access basis, and the need to access resources at a given moment can be controlled through monitoring and control of membership in those groups.

Does the municipality have an implemented system for the central creation and management of user identities and access authorization (Directory Services – Windows Active Directory or similar services)

29
44
■ Yes   ■ No

Currently, more than 60% of municipalities lack this type of user account creation and authorization control system, which poses a risk to the successful continuation of the digitalization of the business process.

Document management system

More often than not, the result of almost every administrative procedure is the preparation of some kind of document. Document management systems represent a platform that enables collaboration in
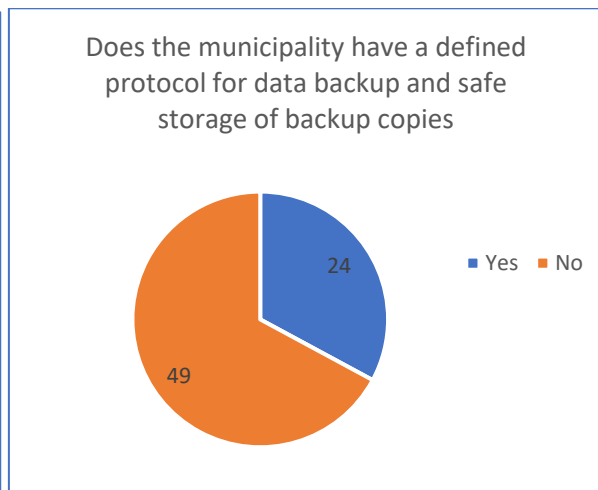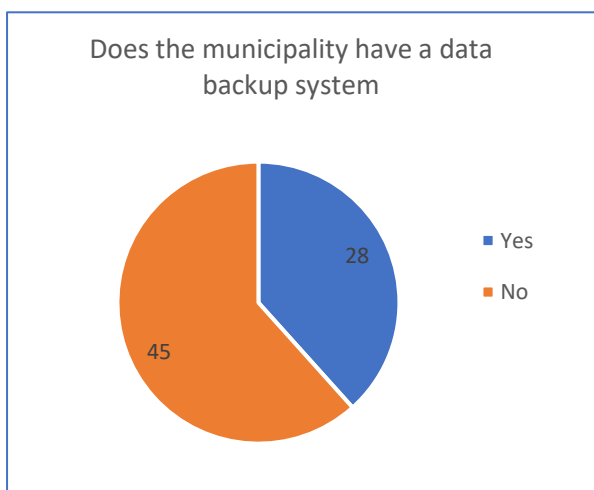
the preparation of documents, definition of automated multi-step work processes in which documents in serial or parallel flows are handed over for further manipulation by the next operator until the final completion of the procedure, versioning, establishing teams for collaboration, controlled access, as well as a host of other benefits. For a successful digitalization of the business process, having such a system is necessary for each of the municipalities.

Does the municipality have an implemented document management system (document-management)
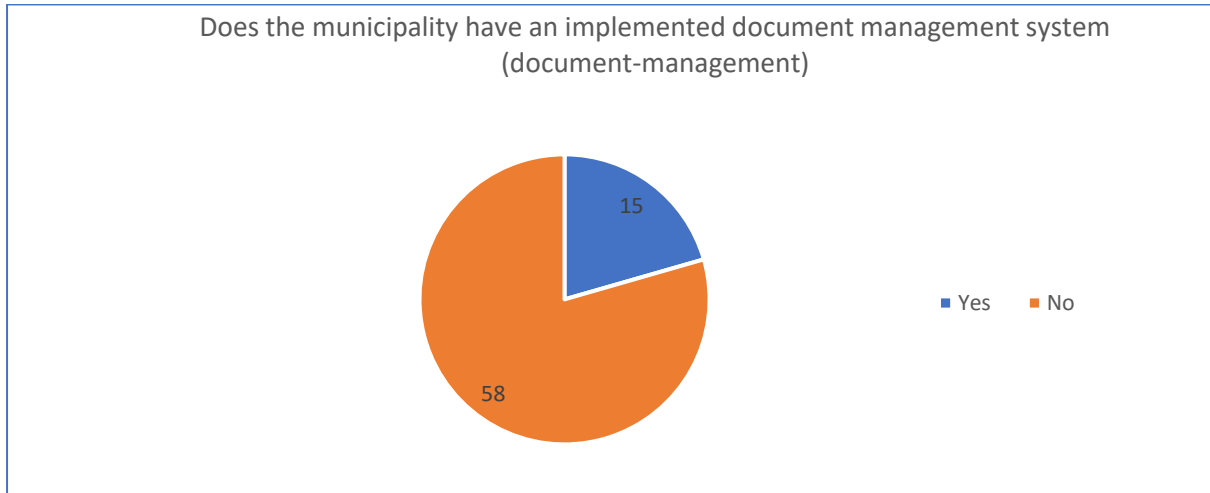
Most of the municipalities currently do not have such a platform, i.e., almost 80% of the municipalities lack the ability to systematically conduct collaborative processes.

Protection against loss of business data

Every digitalization process, along with the overall developed solutions for digital support of the business process, has as its ultimate goal the production of data in different formats, meaning that any potential loss poses a risk of the highest kind. Even if long-term storage of data in written form, i.e., in paper archives, is foreseen in the digitalization process, the amount of created data may grow after a certain period of operation to such a level that will render their recovery to the systems in a reasonable period of time virtually impossible. Therefore, having protective backup systems in the event of data loss (for various reasons) and the existence of protocols for their efficient recovery are not only important, but they are also one of the key elements that allow safe transition to a digital method of operation.

Does the municipality have a data backup system

Does the municipality have a defined protocol for data backup and safe storage of backup copies
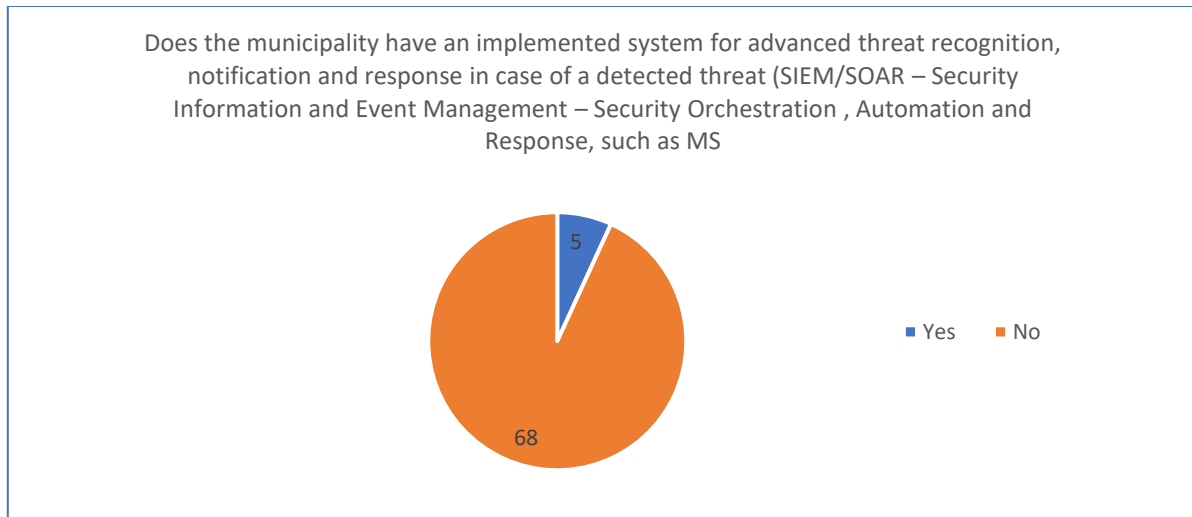
The established situation in the municipalities indicates that 62% of them lack adequate systems for protection against data loss, whereas over 67% do not have protocols that can ensure data recovery in case of data loss. This situation should be the subject of special attention and resolution before taking steps to introduce new systems to advance digitalization.

Advanced cyber threats detection and protection system

At the beginning of the summary of the results of this analysis, we mentioned the importance of having secure basic software for work and software for adequate protection against malicious codes and unauthorized system access. However, the growth of threats and the emergence of even more sophisticated methods for unauthorized access and compromise of systems require the use of even more advanced platforms for monitoring of activities in the system, as well as for identification and response in the event of detection of inappropriate activities in the systems.

The development of a centralized system(s) with a high digital impact and its potential ubiquity at the national level must be followed by the implementation of systems for advanced detection and protection against cyber threats.

Does the municipality have an implemented system for advanced threat recognition, notification and response in case of a detected threat (SIEM/SOAR – Security Information and Event Management – Security Orchestration , Automation and Response, such as MS


The use of such systems is currently not a common practice in the municipalities (fewer than 7% of LGUs have implemented a system of this type), but this is not a problem that needs immediate resolution due to the fact that the level of digitalization does not yet arouse the interest of malicious parties for targeted compromising activities. With the development of digitalization and reaching a level that will lead to system visibility, it will be necessary to implement systems that will provide an adequate response in the event of a threat.

System for digital and administrative operations

More than half of the municipalities (57.5%) have already faced the need for the digitalization of the administrative and archive process as a basis for the digitalization of requests for service received in the municipality through traditional channels and their forwarding to the digital processing systems, but also as a point for integrated registration of requests for service arriving through digital channels.

Does the municipality have a digital solution for archive and administrative operations
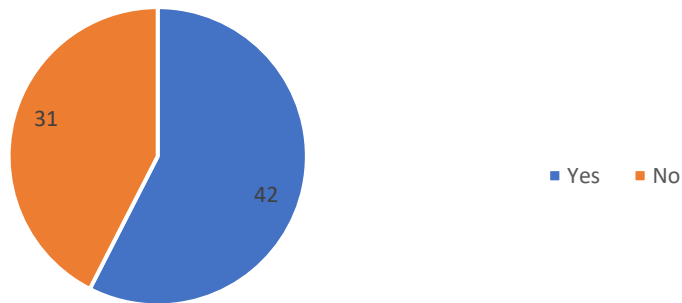

From the aspect of the service unification at the level of all LGUs and the application of principles of cost-efficiency, this tool, which by its nature should provide functionalities resulting from a legal solution, should be subject to centralization and placement in a central location in order to provide a simple and low-cost access to central digital service delivery systems, as well as efficient and cost-efficient access to the interoperability system.

Budgeting for IT needs

From the general situation established from the analysed data obtained from the local self-government units that answered the questions in the sent survey, it can be concluded that the amount of budget funds allocated by the municipalities for the digitalization process do not correspond to the needs for a significant step forward in this process.

Average coverage of costs for IT needs
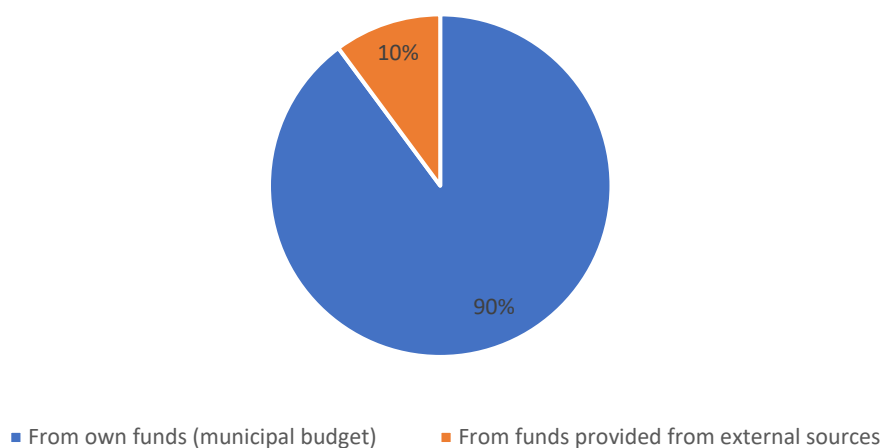
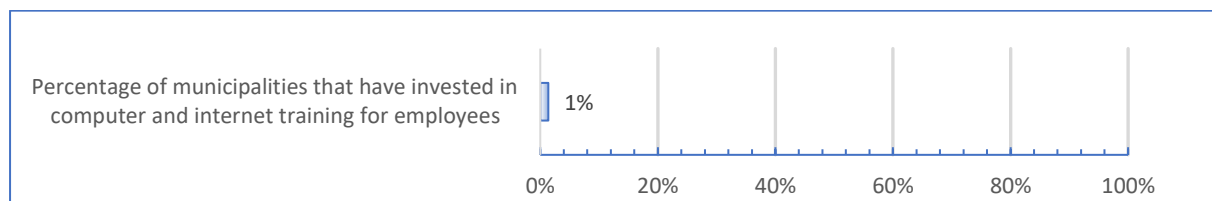For the IT needs of the municipalities, in addition to funds from own sources in the amount of 90%, additional external sources of financing are provided (in the amount of 10% of the investment), but the level of readiness for intensive digitalization is still significantly low. The current level involves the use of severely outdated workstations and basic software platforms that do not provide safe entry into
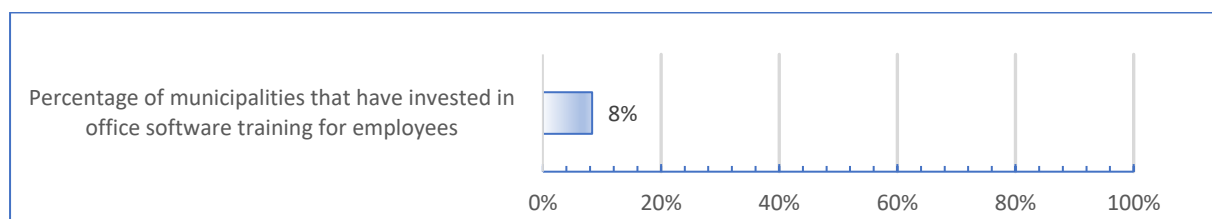
a high-impact digital work process. This situation requires serious systemic assistance for the LGUs in terms of funds and knowledge, in order to provide conditions for significant shifts in the process of functional digitalization. In order to achieve these goals, it is necessary to provide financial support on a larger scale over a longer period of time, which would, in turn, provide a basis for predictability of the necessary annual budget needs according to the principle of equal annual budget allocations with a planned budget growth of an acceptable percentage on a yearly basis. The financial support should not be on a one-time basis, but, according to the proposal, it should be divided into several years to help the practice of projecting a balanced annual budgeting.

Training of administrative staff in digital skills

Despite the possibilities for intensive development of digital systems and procurement of new and modern technical means, the human factor is instrumental to the success of the digitalization process. The readiness of users to efficiently and safely use digital systems is key to an efficient digitalization process. The state on the field currently indicates that the investment of the municipalities in improving the technical knowledge of their employees is at a very low level. Namely, only 1% of municipalities invested in training their employees to use newer versions of operating systems and Internet capabilities, 8% in using newer versions of office software, and 8% in IT security and recognition of security threats. This is a very low level of commitment and this issue should be given very serious attention. It is necessary to make a programme for regular upgrading of knowledge on all three topics, by conducting at least one training on each of the three topics in a period of 5 years.

Percentage of municipalities that have invested in computer and internet training for employees — 1%
(0% 20% 40% 60% 80% 100%)

As we have already mentioned, a successfully digitalized process must use technologies that are not outdated and are upgraded in regular cycles. For the successful performance of work tasks in the new digital work environments, employees must receive appropriate training to avoid a serious drop in productivity during periods of replacing technologies with newer ones.

Percentage of municipalities that have invested in office software training for employees — 8%
(0% 20% 40% 60% 80% 100%)

Users of digital systems are always the weakest security point of any system. Due to their simplicity and high impact, the techniques of misguiding users through the so-called social engineering and phishing techniques are often used as the basic method for unauthorized intrusion into systems. These techniques can relatively inexpensively secure user credentials for entering the system in order to commit further abuse. Unauthorized access through illegally obtained legitimate orders represents an additional problem for detecting abuse, because it can be difficult to identify even by sophisticated protection systems. For these reasons, it is mandatory that staff receive regular training on how to

recognize these phishing techniques, how to recognize malicious codes, and how to behave in the event of their occurrence.
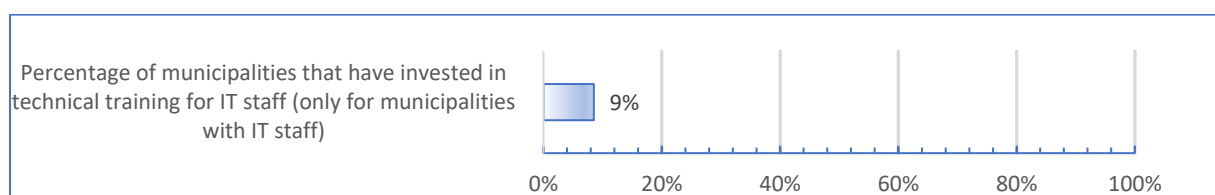
Percentage of municipalities that have invested in IT security training for employees — 8%
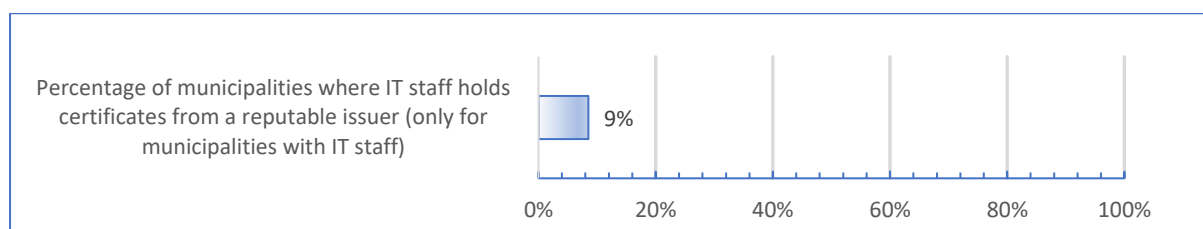
0%   20%   40%   60%   80%   100%
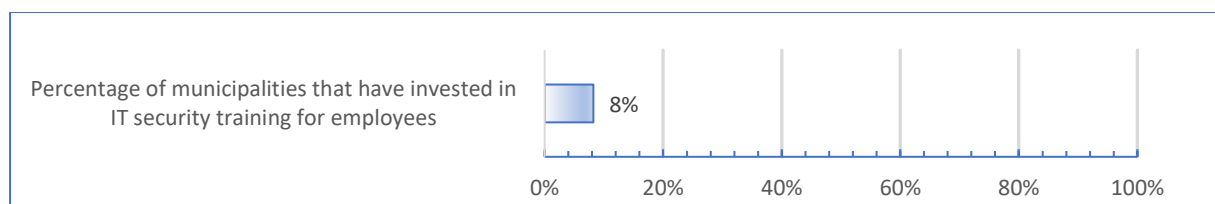
IT staff competence

The introduction of new systems aimed at the digitalization of the processes and their maintenance at a high safety level by the IT staff requires being up to date with all newly released versions of the applied software platforms used for the purposes of developing such digital solutions. Unfortunately, the data analysis indicates that neither in this segment a special focus may be discerned on the part of the municipalities in terms of preparing their IT staff for working with new platforms.

Only 9% of the municipalities that have IT staff have provided training for such staff, with an equal percentage of the staff having their knowledge validated via relevant certifications for the skills that they have acquired. As a reminder, 36% of the local self-government units do not even have their own IT staff.

Percentage of municipalities that have invested in technical training for IT staff (only for municipalities with IT staff) — 9%

0%   20%   40%   60%   80%   100%

Long-term efficient servicing of complex digital platforms is impossible without adequate qualified IT staff and therefore the process of ensuring continuous training of the IT staff should be constantly and repeatedly supported, with a greater frequency as compared to the trainings for the administrative staff. In other words, at least one training related to some of the applied products should be planned for the IT staff each year.

Percentage of municipalities where IT staff holds certificates from a reputable issuer (only for municipalities with IT staff) — 9%

0%   20%   40%   60%   80%   100%

GENERAL CONCLUSION

Based upon the analysis of the gathered data and the established situations, an overall conclusion arises that, at the moment, the municipalities do not possess the capacity required for a balanced development of digitalization, while only a small number of municipalities are actually capable of taking a significant step forward with a view to successful digitalization. Even the highest capacity

municipalities, having regard to their technical and financial potential, have not taken any substantial steps forward in terms of the digitalization of the services for the citizens as regards offering such services via digital channels.

It should be reiterated that in order to achieve any significant forward movement with a view to digitalization, it is necessary to have strong support for the municipalities in order to ensure a balanced development of the digitalization in a unified manner for all local self-government units.

An unacceptable number of municipalities are using obsolete workstations supported by software packages that are notably outdated or unsafe due to unregulated licence rights. The systems and the data are not properly protected and there are no systems put in place for user identity control and resource access rights. Document management is challenging for a large number of municipalities, whereas the staff is not provided with any practical training aimed at raising the level of IT competence.

The only element required for a successful digitalization that is present and that is characterized by various levels of quality is the provision of Internet connectivity in all municipalities.

Generally speaking, the state of play points to the fact that the existing budget capacities of the municipalities do not provide any possibilities for a significant advancement of the digitalization process at the level of all LGUs. Having regard to all of the afore-stated, the analysis enabled the identification of a need for substantial additional assistance by third parties in order to achieve the established goals, i.e., from the central government or from donors willing to support this process.

IMPLEMENTATION MODEL

Introduction

There was a high response rate for the submitted survey of above 90% by all LGUs (81) in the country. If we consider the fact that the municipalities that have not responded to the survey (8 as a total number, 2 larger urban, one smaller urban and 5 rural municipalities) cover 10% of the citizens of the RNM, it may be firmly accepted that the increase of the projected required resources by 10% will yield a relevant overview and projection of the resources required for digitalization at the level of all local self-government units, having in mind that the set of already obtained data also includes the data pertaining to the City of Skopje, which substantially differs in terms of its size as compared to the other units.

If we consider the fact that in the municipalities that have submitted replies to the survey there are 4155 persons using a workstation and are included in the municipal digital processes, we may project a figure of 4500 persons at the level of all local self-government units who should be comprised in the plans for a complete digitalization of the business process in all LGUs.

For the purposes of projecting the available IT staff, from the total number of 91 employees, we will exclude the number of IT employees in the City of Skopje due to the disproportion of its capacities in terms of the general municipal processes (10 IT employees) and we will increase it by 10%, whereby we will arrive at a figure of nearly 100 employees of an IT profile which may be relied upon organization-wide for providing internal support for the digitalization process.

Workstations

The workstation as a basic asset for being connected into a digital work process should be a device with a high confidentiality level and, in the event of any failure, it should incorporate a predictable process for reinstating it in a proper functional state. The optimum exploitation period could be defined as a period of 5 years. This period of 5 years constitutes an optimum balance between the need of confidentiality and the financial expenditures. Concurrently, the purchases should be made in accordance with the practice of procuring workstations that have a three-year warranty period and it is also recommended for them to be provided with an additional warranty period of 2 years. In this manner, the workstations will be provided with an additional coverage with support included in the purchase price and any possible technical issues with their components will not give rise to any additional costs. When purchasing the workstations, configurations should be selected that comprise the minimum required features and, in view of the experiences acquired in relation to the increased demand of capacities for each new version of system or application software, it has been recommended to purchase workstations with optimum features. Such basic features are defined as follows:

Minimum configuration	Optimum configuration
Processor: i3 or compatible	Processor: i5 or compatible
Hard disk: 256GB HDD	Hard disk: 256GB SSD
RAM memory: 8 GB	RAM memory: 16 GB
Network connection: LAN/Wi-Fi	Network connection: LAN/Wi-Fi
Web camera with a microphone	Web camera with a microphone

It is acceptable to procure configurations with higher performances, but it is not mandatory as such.

In terms of the procurement of the workstations, a protocol should be established about approximately unified annual costs, i.e., in the course of the period of renewal of 5 years, each year 20% new workstations should be procured in order to replace the old ones that are already in use. Pursuant to the projections, from the required 4500 workstations, it is recommended to procure 900 new workstations annually. The assessed value of the procurement of 900 workstations, which include the established specifications, the additional peripherals and an extended warranty period of 5 years, is in the range of up to EUR 1 million at an annual level.

Using 'software as a service' Modern Workplace packages from Cloud service providers

With the majority of the municipalities, it has been established that they are in a state of complete deficit, not only in terms of basic devices and software packages, but also in terms of adequate supporting systems that ensure a controlled and safe manner of digital operation. Furthermore, if we consider that fact that these municipalities are also the ones that are most seriously afflicted with the deficit of IT staff, it may be concluded that planning the development with a view to providing adequate infrastructure and solutions within the municipality is not an adequate solution that would yield long-terms results.

Cloud service provides offer multiple Modern Workplace packages based on the principle 'software as a service'. This means that there is a possibility to entirely transfer the setting of the platform and its maintenance and safety to the service provider, wherein the municipalities would only be using the possibilities offered by such platform. By subscribing to such a platform, the employees in the municipalities would be provided with access to the latest versions of the required services, based upon the principle of a monthly or annual subscription. It is recommended to subscribe to the standard packages, which include the following:

- access to the latest versions of operating systems
- access to the latest versions of office software
- high-quality antivirus protection of the workstations
- access to a user identity and authorization creation and management service
- safe data storage space
- electronic communication platform with a high guarantee for data preservation
- document work and collaboration platform – document management
- text messaging, audio and video conferences platform
- services for ensuring user and data protection with a high level of confidentiality and a wide range of other benefits
- guaranteed availability of the platform of at least 99.9%, which means that the downtime may be not longer than 4 hours at an annual level.

Such packages are arguably the only manner of resolving the basic needs for a functional and safe work environment for the major part of the municipalities; however, they are also recommended as a good practice even for those municipalities that have a high potential and possibilities for an independent servicing of such platforms within their own settings. Note should be taken of the fact that there are very few municipalities that are capable of fully responding to the requirements with the level of quality offered by the Modern Workplace platforms, wherein their number is less than 5% of the total number of LGUs in the country.

Having regard to the obsolete state of the majority of the workstations, as well as the projected 5-year period for entering a cycle of their regular replacement, it is not recommended to purchase Modern Workplace packages all at once. The procurement of such packages should be divided in five annual instalments, so as to create conditions for putting a sufficient number of new workstations into operation, which could efficiently use the provided possibilities. An initial procurement of 900 packages could be planned and in each of the subsequent three years it should be incremented by additional 900 new packages. In the fifth year, the current situation may be re-evaluated and, if it is established that some of the municipalities do not wish to use software as a Cloud service, the number of necessary licences could be reduced. Otherwise, with the last procurement of 900 new licenses the complete standardization of the Modern Workplace platform will be finished. The assessments pertaining to the proposed use value of the possibly usable versions of an operating system and an office package should also include a consideration of the fact that the Modern Workplace Cloud packages by far exceed the possibilities of the basic licences and they provide an end-to-end solution for all the components required for an efficient and safe work in an office environment, such as: premium quality e-mail service, a communication and collaboration platform, a safe document storage location without any risk of their loss, high-quality antivirus protection, additional safety solutions, document management platform, as well as a number of other benefits. It should be reiterated that these packages are only available based upon a subscription, which means that proportionate funds should be ensured for subscribing to such services in the long run, wherein the basic projection regarding the required funds should include the total number of potential users, i.e., 4500. The assessed financial demand for the subscription of 4500 users for a Modern Workplace package would be in the range of EUR 1.5 to 2 million at an annual level.

Monitoring and upgrading the Internet connectivity needs

Even though, at the moment, the situation with Internet connectivity may be assessed as acceptable at the level of all LGUs (with certain exceptions), it should still be in the focus during the

implementation of any new digital solution, which most often, as a rule, should be web based in order to provide a possibility for being used by multiple or all of the interested local self-government units. The current reliability of the Internet connection is due to the low level of digital interaction. Therefore, the needs may be expected to grow in the future, whereby it will be necessary to make an adequate assessment of any additional needs and capacity upgrades. From a mid-term perspective, it may also be planned to ensure redundancy of the Internet connection, especially at the moment when it is estimated that the quantity of available online services cannot tolerate any interruptions in the operation due to any loss of Internet connectivity.

Centralization of platforms and solutions for the digitalization of processes and services

The business process of the municipalities is based on the competences assigned to all the LGUs based upon the principle of symmetry. Accordingly, the work processes almost completely overlap for the most part. In line with the need for standardization and unification on the one hand, and cost-efficiency on the other, it is becoming necessary to develop centralized solutions that would be used by all LGUs.

For the purposes of developing such centralized solutions, one central location should be provided where a high-performance scalable platform would be placed, which supports the principles of virtualization and assigning resources to needs related to specific solutions. The solutions that would be developed should not be limited solely to the delivery of electronic services for the citizens, i.e. monitoring administrative procedures. The centralization of solutions should also pertain to providing centralized solutions for registering and collecting the municipal revenues, as well as for the digitalization of the internal decision-making processes within the municipalities.

To begin with, such platform is recommended to be located within the Association of the Units of Local Self-Government or at an alternative location which would be central in terms of publishing services. In terms of the platform, a location should also be planned and projected for ensuring business continuity in the event of a disaster. Best suited for such a location would be a platform provided by a Cloud service provider which ensures data storage on the territory of the RNM or the European Union.

The positioning of unique solutions for all LGUs provides a possibility for an equal inclusion of all LGUs in the service digitalization process at the same time and it does not condition such inclusion with any needs for high investments and available high technical capacities. In addition, it also enables increased cost-efficiency and profitability in the development and use of the solutions.

One of the first solutions that could be transferred onto a central location is the digital solution for administrative operations that would be located near the potential platforms for performing the administrative process and providing online services on the one hand, with a possibility of connection and data exchange with other systems via a single connection point in the state interoperability system, on the other hand.

Substantial amounts of funds should be planned for this purpose, depending on the plans and the given timeframes for the development of solutions for supporting the already mentioned processes.

Staff training plan

The planning of the budgets must inevitably comprise an item for refreshing and advancing the knowledge of the administrative staff. At least one one-day training should be planned for each employee at an annual level, wherein in three-year cycles each employee should be provided with the following trainings:

- computer use training (operating system and Internet)
- office and communication software training
- training in safe use of the IT systems and recognition of any security threats.

In line with the established number of employees using digital assets for work, it is necessary to provide the three listed trainings for 1500 persons each at an annual level.

The IT staff should also be included in the trainings planning in those municipalities where such staff exists. Each IT employee should be provided with at least one training in the course of the year, on a topic related to a newly implemented technology or a technology which is planned to be implemented. Based upon the projected figures pertaining to the current situation, a need arises for providing at least 100 training man-days in the course of one year, wherein, having regard to the fact that the standard practice is for the trainings to be organized in groups of 16 participants, the training of the IT staff may be delivered in 6 or more groups, depending on the number of technologies in which the staff will be trained.

Establishing a shared IT service centre for LGUs

In light of the need for a more intensive digitalization, the local self-government units are faced with two challenges. On the one hand, half of the LGUs do not have any or have a bare minimum of IT expertise, while, on the other hand, all of them together are faced with the challenge of implementing very complex technologies for ensuring a functional digitalization of their business processes and services. The current situation does not allow for any balance of the possibilities for a general joint progress in the digitalization process. The sole solution for resolving this problem is recommending the establishment of a joint centre for shared IT services at the level of the Association of the Units of Local Self-Government (or another institution deemed more appropriate), which will enable the provision of basic technical support for the LGUs that do not have the required capacities, while on the other hand it could grow into a higher expertise centre, capable of providing complex solutions for supporting the digitalization of the processes. This organization could also be deemed a suitable technical leader for planning, monitoring and implementing projects, in cooperation with external contractors. The establishment of such an organization certainly does not exclude the need for engaging third parties for providing support in the event of a need of more sophisticated expertise. If any of the LGUs have IT capacities that could be shared with other LGUs, for reasonable compensation as an incentive, they could make their IT resources available and thus contribute to the increase of the capacities of the shared IT operations centre.

Having regard to the fact that the establishment of such a support centre is accompanied by lengthy procedures related to systematization changes and provision of substantial budget funds, during the initial phase, the LGUs could apply the inter-municipal cooperation instrument as a transitional solution that would ensure a faster increase of the capacities of the municipalities that are faced with difficulties in their basic operations, as well as for the needs related to higher expertise for resolving strategic matters.

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

As a summary conclusion based upon the insight into the state of the local self-government, it may be deduced that, at the level of all LGUs, the degree of adequacy of the digital assets and platforms required for an efficient and safe digital support of the work process, is lower than 30%.

Currently, there are no adequate standards or policies put in place that would define the rules for the procurement of assets with specified features and the cycles for their replacement. At LGU level, there is no unified set of minimum required platforms which each LGU should possess for supporting its operation, which pertain to the following: safety, access control, communication, collaboration, document management, system and data protection, system availability.

Unless such standards and policies are established, under circumstances of asymmetry of the capacities among the LGUs, the identification of the deficiency degree at the level of an individual LGU constitutes an exceptionally difficult and time-consuming task.

In order to overcome such conditions, it is recommended for the LGUs at the level of the Association of the Units of Local Self-Government to work on the definition of the standards and policies for the procurement and management of fixed assets (hardware, basic software) and platforms, and adjust their operational practices in line with the defined policies. The definition of such standards and policies will also ensure additional benefits in terms of the possibility to conclude framework agreements on larger quantities of goods at preferential prices based upon the scope of the procurement, as well as a possibility for an easier maintenance and servicing of the surrounding settings on account of the adopted standardization.

The provision of advanced platforms for supporting the business process and safety under circumstances of asymmetry of the municipal capacities poses a challenge that cannot be resolved by means of providing each individual LGU with such capacities. A solution for overcoming this challenge would be to use the intermunicipal cooperation instruments and sharing the platforms as per the capacities of the municipalities with the LGUs that need such capacities, which once again implies an intensive engagement and investments in multiple regional centres. As the best manner for resolving the needs for ensuring a standardized approach to all required advanced platforms for a modern digital operation of the LGU, it is recommended to use the possibilities of subscribing to a Cloud service, such as software of the Modern Workplace service type. The use of such services significantly reduces the burden and, in some respects, it fully relieves the LGU IT services in terms of the maintenance and upgrades thereof. Having regard to the fact that the manner of subscription to such services is per user, conditions are created for equal opportunities and for the smaller municipalities to also be provided with access to platforms of a high quality at a proportionally lower cost as compared to the larger municipalities.

The established practice for putting in place or cloning identical or similar solutions in each LGU, or small groups of LGUs, constitutes a basis for churning substantial finances and depleting the already limited budgets of the municipalities. It is recommended to take measures for abandoning this practice and applying the centralization model to all used solutions of the same nature, based upon the principle of inter-municipal cooperation or, ideally, at the level of all LGUs. The benefits from the compliance with the centralization principles will become additionally evident at the moment when the intensive digitalization of the municipal services begins and they are published online.

The established lack of policies on training and knowledge advancement for the employees in relation to the new technologies, under circumstances of working with technologies which are subject to dynamic changes, carries a serious risk for the future of the business process in terms of the safe and efficient use of the technologies and the platforms. Despite the fact that the policy on providing regular training is a significant financial item (up to EUR half a million as per the previously proposed plan), it is recommended to establish adequate training policies and regularly implement them. Having regard that this is quite a large-scale operation, adequate higher-level coordination and provision of proportionate assets are required.

The established state of a serious deficit of technical staff (IT staff) poses a serious risk for the further digitalization process. The fact that as much as two thirds of the LGUs either do not have any technical staff or have only basic support provided by one IT employee, in the short to mid term, poses a serious risk upon the continuity of the business process, especially the commencement of a more intensive digitalization of the operation and the transition to online service provision. Therefore, it is recommended to immediately start considering manners of resolving these issues, via inter-municipal cooperation as the fastest solution, up until the moment of creating conditions for establishing a central IT support office at the level of the Association of LGUs, which, in addition to ensuring a higher level of technical support and expertise, could also be the main driver of the developmental plans at a national level pertaining to LGUs. The establishment of such an office should not be considered from the perspective of additional costs because in the foreseeable future it would take over activities that would lead to the reduction of other costs, such as training for the municipal administration, as well as reducing the needs for using higher expertise from external companies.

The analysis of the current budget allocations for LGUs against the established status leads to a firm conclusion that there is a prominent need for external assistance so as to ensure enhancement of the digital capacities of the smaller municipalities and, thereafter, attend to all deficiencies at the level of all LGUs. Even though the established indicator of 30% adequacy of the platforms at the level of all LGUs has not been empirically proven, as per the previously presented conditions we may deem it sufficiently relevant for assessing the needed budget support for the municipalities for the purposes of consolidating and strengthening their digital settings. Based upon the afore-stated elaboration, we may make an approximate projection of the required funds in the amount of EUR 5 million at an annual level, distributed as follows:

- regular renewal of workstations and basic hardware: up to EUR 1 million
- subscription to software packages such as a Modern Workplace service: up to EUR 2 million
- staff training: up to EUR 0.5 million
- central location for shared services: up to EUR 1 million
- establishing a central IT support office: up to EUR 0.5 million

The current allocations to the municipalities, having regard to the fact that their IT budgets also cover other operating expenses which are not subject to this analysis, would not cover more than 20% of the indicated amounts. Thence, the need arises for intensive support which should be provided from external sources, the central government or certain donors channelled through the Association of the Units of Local Self-Government or the Ministry of Local Self-Government as a representative of the central government. In the elaboration provided above, we have already indicated a transitional period of 5 years, during which such external assistance would be needed, until the complete consolidation of the digital work environments for all municipalities, as a period in which each LGU

should harmonize its budget expenses pursuant to the needs for operating with the newly established standards.