DMS AND RFID AS AN INNOVATION IN THE ARCHIVING AND DOCUMENT MANAGEMENT IN THE COMPANY

Małgorzata Oleś[1]

Abstract

The aim of the article is to present created in the framework of research and development project management support system and the archiving of documents the organization. Archiving and document management are issues faced by all companies regardless of their size and specific action. Proper administration and control over the flow of documents within the organization affects its effectiveness. The article is aimed at presenting the results obtained during the active observation during the implementation of the production DMS system using RFID technology. There will also be presented to the positive aspects of implementation and discussed the advantages and disadvantages of systems DMS.

Key words: DMS, archiving, RFID.

JEL Classification: L86, O00, O31, O32.

1. Introduction

This article was developed as a presentation of the results of the project research and development, in which the system was developed to assist the work of the secret office implemented as a development project No. GOOD – BIO / 006/13143/2013 under the title "Electronic system lifecycle management of documents with different levels of sensitivity" in the context of the priority research area" Modern innovative technologies and solutions for detection, combat and neutralize the threat."

The main objective of the project is "Development of an innovative system of readers and IT services", within the priority research area "Modern innovative

[1] University of Warsaw, Faculty of Management / Uniwersytet Warszawski Wydział Zarządzania, e-mail: Malgorzataoles92@gmail.com

technologies and solutions for detection, combat and neutralize the threat." As part of this aim was developed marking system of electronic media and paper RFID identifiers and are designed appropriate devices for this task. The purpose of the article is to present the end result of the project is the prototype of the modern secret office, which uses the latest advances in RFID technology and adapted this technology to the functioning and management firm, giving the opportunity to work with documents having different levels of sensitivity. Achieving this goal is extremely important from the point of view of state security and defense, which is part of the research area related to the detection, combating and – above all – the neutralization of all kinds of threats, including in the area of economic and economic.

The project established an electronic system for generation, transmission, processing and workflow management with different levels of sensitivity. This system makes it possible to gradually displace traditional circuit-sensitive documents, carried out in paper form to a modern approach based on the exchange of electronic documents and digitized while ensuring confidentiality, non-repudiation and accountability of their circulation. Such a change of approach allowed us to achieve a new quality in the work of the organizational units Gestora / Beneficiaries are responsible for the implementation of these processes, and also allowed for the measurement of their efficiency and putting on the basis of further organizational improvements.

The planned end result of the project is the development and execution system and physical tracking of media express or implied, electronic and paper, including in the secret at the border areas of security and access control of people and methods to protect documents from unauthorized copying. Identification media and documents takes place independently of their number and mutual position.

The development of a modern system of marking of electronic media and paper documents identifiers and RFID design or develop appropriate equipment for this task, require the following specific objectives:

1. Development of remote identification of carriers of explicit and implicit labels marked read-radio storage places and work in real time.
2. Development of an automatic inventory of classified documents and classified and arranged in stacks contained in binders with automatic detection of changes in their position.
3. Developing a system for controlling the flow of media and public documents and classified between security zones with the module checks the eligibility of persons to the document explicit and implicit.
4. Development of electronic security media and documents from unauthorized displacement.
5. Automatic identification of media and documents not only in the storage area, but also in the workplace.
6. Development of security technologies to repeatedly copy the document explicit and implicit.

7. Develop methods of printing operations of the document explicit and implicit with a limited number of copies.
8. Identify the location of a single document, explicit and implicit to the nearest fixed position of the folder or volume.

Achieving individual specific objectives will be guaranteed the realization of the tasks defined in the project. The following description describes in detail the specific objectives and provides a list of tasks the execution of which is subject to the achievement of these objectives. Some of the tasks include the designed system and can be assigned to each of the specific objectives (these include the tasks related to the audit of reliability, efficiency, transience, security, etc.).

After analyzing the solutions available on the market, it seems that it will be possible to use the results in practice, administrative and economic systems for monitoring and documentation media explicit and implicit in real time.

Every day we use information technology in our private and professional life. Some estimates indicate that since the 1980s about 50 percent of all new capital investment in organizations has been in information technology. Yet, for technologies to improve productivity, they must be accepted and used by employees in organizations. Explaining user acceptance of new technology is often described as one of the most mature research areas in the contemporary information systems (IS) literature (Venkatesh, Morris, Davis and Davis, 2003: 426).

In the literature of the subject, it is pointed out that information technology is influenced by many factors, from the employees of the organization to the policy. Encouraging innovation in small enterprises has been at the heart of policy incentives owing to the important role that small enterprises play in economic development. Despite their important role, innovation in small and micro enterprises has received only scant attention, while the majority of studies have focused on innovation in large and medium-sized enterprises (Forsman, 2011: 739).

The level of innovation in information technologies is influenced by many factors, but the technology itself influences the innovation of our environment. Prior information systems research highlights the vital role of information technology (IT) for innovation in firms. At the same time, innovation literature has shown that accessing and integrating knowledge from sources that reside outside the firm, such as customers, competitors, universities, or consultants, is critical to firms' innovative success (Trantopoulos, Krogh, Wallin and Woerter, 2017: 287).

2. Management and document archiving

2.1. Functionality of the RFID technology

The rapid development of the information society – a society in which an extremely valued commodity has become particularly good assets which informa-

tion is led to the development of technologies that facilitate the acquisition and processing of various types of data, including personal data. Many of the technological innovations is a potential threat to our privacy, and one of the technologies whose development entails serious consequences for the protection of personal data is the RFID, or identification using radio waves. This technology which is at the beginning only alternative to barcodes almost imperceptibly grown into an important part of our everyday life, and a large impact on its spread are rapidly falling costs of production of RFID tags (Orłowski, 2008; 23).

RFID (Radio-frequency identification) is a system of radio frequency identification. The idea behind the operation of the system is to keep a certain amount of data in convenient devices, transceivers, whose generic name English is a tag – the Polish name for this tag. Then, the data they contain is read in an automated manner at the right (convenient) time and place in order to obtain the desired result for a given application.

An RFID system consists of two components (Szczurkowski, 2010: 45):
— marker placed on an object identified (tag),
— reader, which is meant to read on the tag data.

Depending on the construction of the system can read tags from a distance of up to tens of centimetres or a few meters away from the reader antenna. Data transmission does not require that the tag is visible, as is the case with bar codes, which the described technology is often compared.

The method of action (Koontz, 1990: 4):

Step 1 – the reader sends a beam of a radio wave is excited in the identifier inductive current that powers the electronic ID.

Step 2 – charged identifier sends back to the reader a unique code assigned by the manufacturer or data previously stored by the user.

Step 3 – if you want to save the data to the identifier is a radio wave beam is modulated accordingly. In fact, the transmission itself is somewhat more complex manner among others. reading or writing of data are verified in return (used algorithms control the correctness of the read / write data).

RFID tags are advanced technical labels which contain an electronic memory chip and an antenna, via which the emission of data. RFID tags, depending on the type of application are in different sizes and are made of different materials, paper and plastic. Their construction depends on the requirements in the frequency range in which the device is operated (Kuc, 2005; 179–180).

Tag receives signals and sends them back to the reader. Data transmission is reciprocal as opposed to power and timing, which are held only from the reader to the data carrier, or tag.

ID is equipped with a memory from 64 bits to 128 bits. Nothing stands in the way that they are higher values. There identifiers with greater capacity exceeding

64 KB, but a few hundred bits is the maximum requirements for standard applications (Kałużny, 2008: 34).
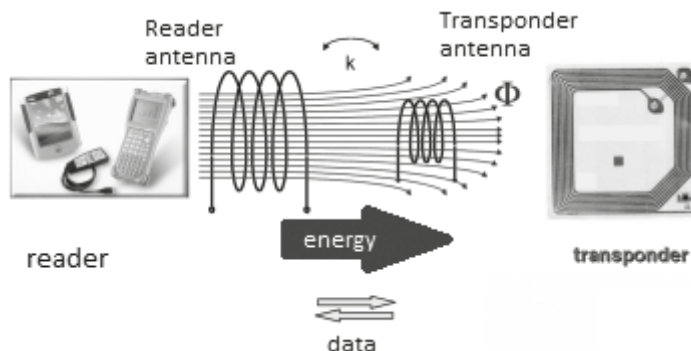

Fig. 1. Diagram of the RFID
Source: own elaboration in the context of research and development project

An RFID tag is built in memory (tag memory) or from the memory and CPU (processor tags) and an antenna mediating transmission of data. The whole is placed in a compact housing. The casings may be made of both paper and plastic. When dealing with a label, chip and antenna are embedded on a thin film combined with the top layer of the label (Nowak, 2007: 6).

2.2. Functionality of archive

In the proposed system will use a remote radio frequency identification technology (called.: Radio-Frequency IDentification – RFID) and DMS (Document Management System). Marking media and documents to be used appropriate tags, which, depending on the assumptions can be active, passive or semi-passive. Also, a method of recording data determines their nature, may be read-only tags with a single record or multiple record. However, notwithstanding the possibility of recording the serial number (ID) is not modified (Stoner, 2001: 588).

The use of modern RFID technology with designed and implemented a computer system supporting workflow management, has enabled automatic asset inventory clearances. This applies to both single items and collections of documents (stored in folders, binders, or other office equipment, adapted for this purpose). The system keeps track of changes in the position marked copies (within the zone located in the office) and keep available information as to their location and / or status (Kawa, 2005: 13).

Designed system allows monitoring and analyzing the (current and retrospective), the flow of media and public documents and classified both within a separate area of safety (eg. Office), as well as any changes resulting from the change of zone

(input / output), which is presented in the figure below. Any change in the position of objects will be connected with the people who will make these changes. Depending on the rights of such persons, shall be taken the appropriate response of the system (in the absence of rights of a person to the document will be generated automatically alert – his way of generating and transmission will be based on the requirements of future users of the system). Depending on the requirements Gestora / Beneficiaries will also be possible to use biometric technology, which will provide an "association" with the user identifier. While issues related to the rights of users to a particular type of document will result from the records system for the management of permissions.
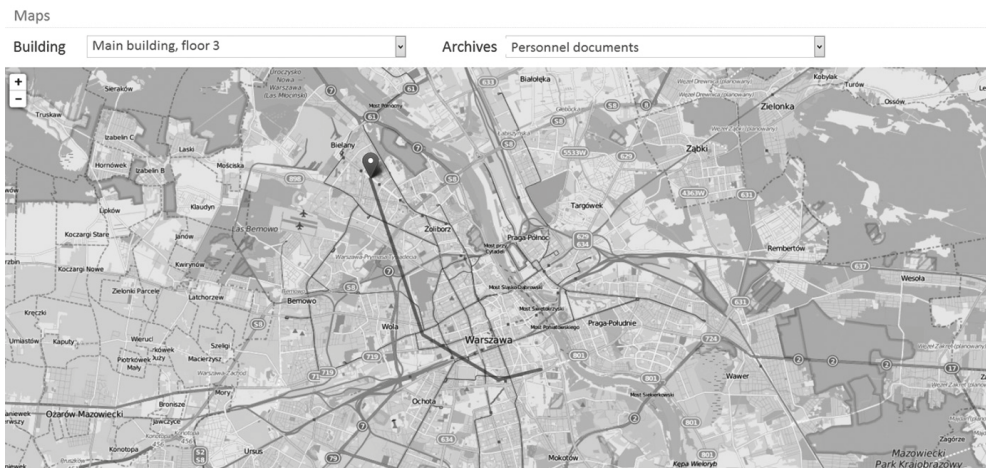

Fig. 2. Tracking of document

Source: own elaboration in the context of research and development project

W In case of unauthorized movement, depending on the assumptions made, the system will respond automatically. Used for this purpose will include the lock, which will be installed at the Zone (input / output) and will be allowed to scan the entire surface of "excess" border zone. The use of RFID tags, antennas suitable quality to enable them to read and automatic identification of users, will give a total of a full picture of the "movement" media or documents.

The use of RFID technology and DMS combined with suitably prepared workstations allow full identification of media and documents not only in storage, but also in all workplaces. Properly designed furniture (equipped with suitable antenna enabling identification documents) are equipped workstations in the defined safety zone.

It is assumed the use of the most advanced technologies associated with the use of RFID tags and appropriately adapted copiers. Used copiers are equipped with antennas, which provide the ability to monitor and manage the creation of the following copies of documents (explicit and implicit). Depending on user permissions

and document type, the system will allow or deny execution of another copy. Also, copies of the document are made on paper carriers, which are automatically recorded in the system, as another copy of the document implicit (or explicit), which fully allows you to manage all copies of the document. Of course, this applies to situations where a copy will be performed within the limits of the security zone (Majewski, 2011: 41–42).

Designed system, supporting workflow management, allows you to monitor the number of printed documents (depending on the nature of the document and the conditions resulting from the requirements Gestora / beneficiaries).

Full identification of the position of individual copies of documents, including: the accuracy of the location folder or volume, is closely connected with the objective of inventory. The use of specialized equipment office equipment (lockers, desks) allows you to monitor the movement of documents within the zone and the input / output outside the safety zone. The computer system supervising these devices are responsible for how monitoring and reporting the situation in "real time".

2.3. Module rights

The system lifecycle management of the document consists of: system Aurea BPM, archive documents (Archer-DMS) and module permissions. The document life cycle management is responsible for (Fig. 3):
— automation and support business processes related to the work of the secret office,
— storage of documents with varying degrees of sensitivity,
— storage of documents with varying degrees of sensitivity,
— store data about users using secret offices,
— storage and transfer of rights related to the handling of documents with varying degrees of sensitivity,
— giving and sending permission to use the documents for your office to CrossTalk and Canon.

3. Innovation of the archive

Innovative solutions developed resulting from the project can be divided into several areas:
— information safety,
— the efficiency of current service documentation,
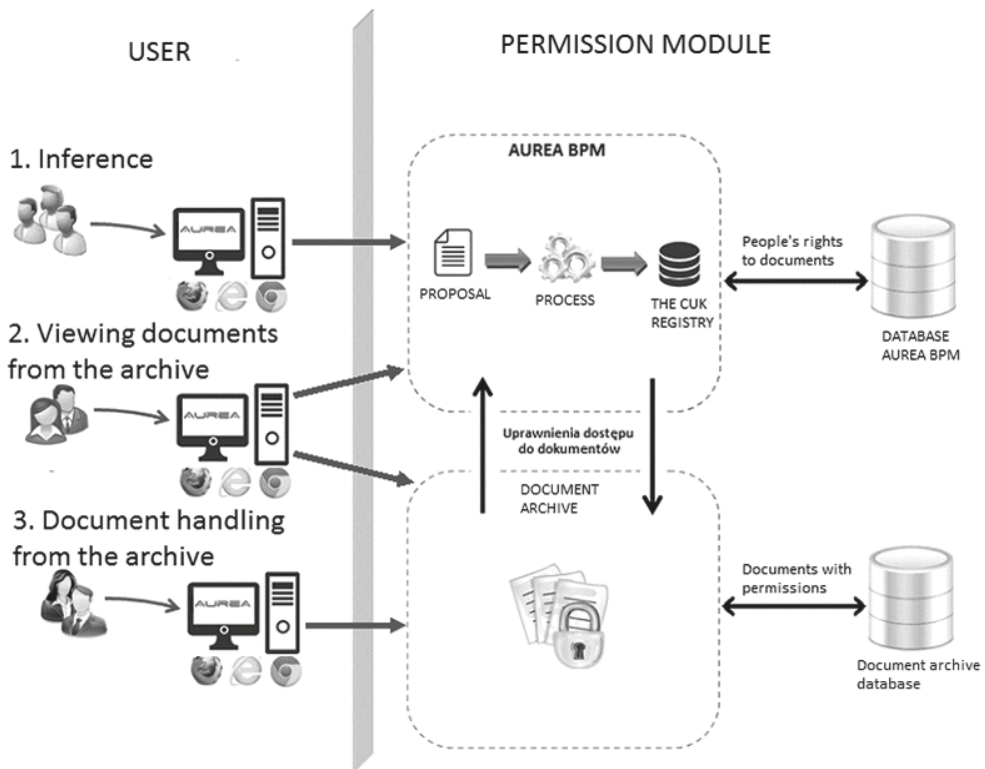— reliable surveillance system.

Fig. 3. Module rights
Source: own elaboration in the context of research and development project

3.1. Information security

The potential for improving the safety of both the same access to classified information and prevent accidental loss of important documents is best revealed in the case of these data, which are under special legal protection. This applies mainly to documents from the "secret" or "top secret". As a gestor of the project Internal Security Agency is both an institution established to monitor and control access to this type of information in the Polish Republic. The law of 5 August 2010 Protection of Classified Information, which defines the principles, types and manner of the clearance procedures and procedures for physical security and data communications, replaced in force since 1999, the previous adjustment. The protection of classified information is based on several basic principles that are binding regardless of changes made to the detailed solutions.

Giving some classified information classified as "secret" or "top secret" due to the need for protection against serious or very serious injury to the Polish Republic. Access to such data can be obtained only people trustworthy and properly checked.

In the current state there are several mechanisms to maintain security secret offices and access control for particularly important and sensitive data.

a. The first is of course the same supervision bed, that proper verification of persons having a right to acquaint themselves with the content of such data.

b. Another is the kind supervision of the archives and offices in the form of a monitoring system I / O, visual monitoring, archiving programs or books kept in a classic paper form.

Each of these mechanisms has strengths and weaknesses while none undoubtedly does not track the specific document in real conditions. The logic of the present solutions instead focuses on guarding the people and not the documents themselves. The solution proposed in the framework of the proposed project reverses this kind of approach. Without significant changes to personify significantly improves the control of in-kind by marking individual copies of the document and enable the tracking of certain technical conditions. In a sense, virtually never ceases to see the document during its download from the place of storage. No doubt such a possibility as far limited to certain realities of RFID systems (coverage antenna) significantly improves the security documentation.

3.2. Operating efficiency

In conjunction with the already used methods of archiving system significantly improves document workflow processes. Eliminates or reduces the need for manual / written record of each copy of the documents collected from the archives or accurate recording of phrases.

Scanner "x-ray" folder or cardboard documentation automatically registering the individual tags and transmit directly into the operating system data on the contents of the package.

If the box is eg. a few dozen files, and each includes a document marked with a system not only identifies them in a matter of seconds, but also through the program will provide information about some important facts. Eg. a document storage location, degree of confidentiality during the download, the person pickup documentation. On closer analysis, the program can also answer the more detailed questions, such as. Frequency downloads a copy of the document, the amount of duplication (XERO) or places where appeared document during his loan from the office or depot file (of course, assuming that these sites were equipped with the antenna system).

This degree of automation of manual processes significantly reduces the amount of manual labour archivist or employee's office, who in the current conditions, a substantial proportion of such information must be supplemented in writing.

Operating systems of electronic surveillance and searches of documents that synchronize usually barcode labels of records in a document repository, allow easy access and shortening the search time of each backup. But still they require some

physical activities, like manual scanning the barcode while lending or view documents. Also, they do not indicate the exact content, which often has to be verified.

The idea behind the tag is the integrity of the document. It cannot be removed without destroying the paper document. Hence where the antenna detects a signal marker there also is a document. This system concept provides a completely new, previously unattainable possibility to shorten service time.

3.3. Reliability of the system

W In any security system the human factor is the weakest and yet the most important link. The use of electronic supervision of documentation largely eliminates the human factor to ensuring the security system. Thanks to an innovative, innovative approach, builds based on previously unattainable technical capabilities, can be ensure the improvement and safety of classified documents. When combined innovative and unique on the market, the technical capabilities of the hardware of RFID, especially HF antennas, with the solutions currently functioning have a very powerful and sealed system. Automate the tracking of the documents submitted, the appropriate organizational conditions may constitute a specific doubling (reserve) records resulting from human activities. Such an approach repeatedly increases the level of control over documentation implicit. Illustrate this in more detail, if the document is downloaded and this fact will be recorded in writing, in summary form, numerically according to the records act. Additionally, the system automatically does the same, that is, taking a mark signal is recorded download the document via a visualization (in addition hour, the person to whom, and various other information), which is presented in the figure below. By controlling access to electronic archives room or the office we know who is at a given time was within it, and thus he could have access to the documentation. The result of the project which also records who is currently using it, or who personally collected the documents from the cabinet archiving and to whom they are transferred. All the elements of supervision, both operating as well as entirely new subject of the project will give a new quality. Significantly at the same time it eliminates the likelihood of errors and fraud. Innovation Office classified equipped with systems based on RFID, coupled with the extensive program to support, along with dedicated infrastructure supportive are the solution so far is not achievable on the market. The result proposed in this project with innovative solutions and RFID technology allows you to create a tool with a very wide application, giving you unprecedented access control and surveillance documents and media with different levels of sensitivity.
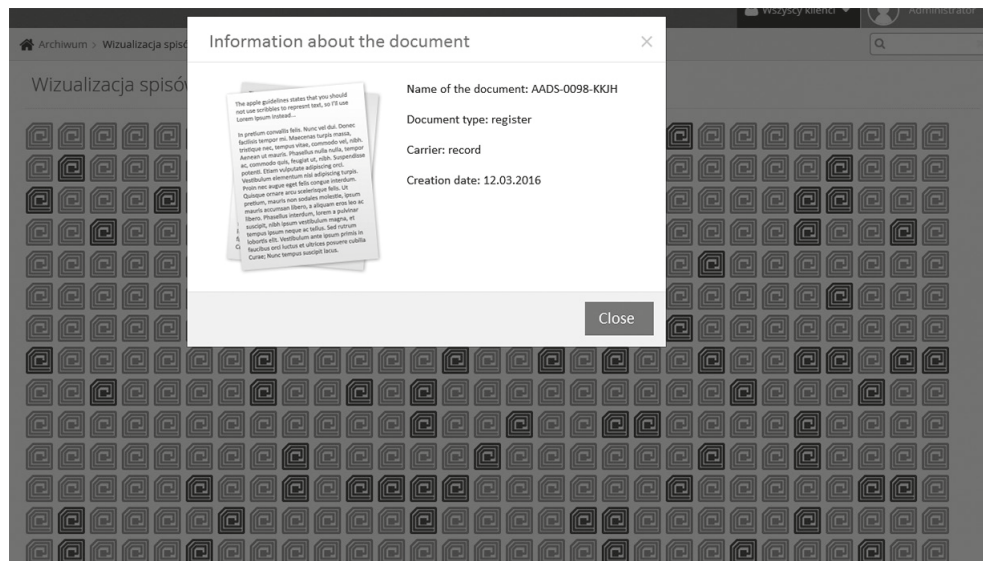
Fig. 4. Visualization of documents
Source: own elaboration in the context of research and development project

4. Expected results in the future

Ability to implement the developed prototypes will provide significant effects in terms of increasing the level of security related to the circulation of documents and media containing data (and hence, the information) with different levels of sensitivity. The increase in the level of control the circulation of such documents may also translate into increased confidence of third parties to state authorities. Both increase the security level of the same documents and data storage media, as well as raising the level of security associated with the access of authorized persons will improve the quality of the entire process associated with their circulation. The tangible result of these actions will reduce the (ultimately complete elimination of) the number of incidents related to the "leakage" of documents and data including information about the different levels of sensitivity. It is of great importance from the point of view of state security and defense, arising even from contemporary terrorist threats. Poland, as a member of the European Union and the North Atlantic Pact, is obliged to keep a special effort for the protection of sensitive information processing.

An additional advantage of the proposed solutions in the area of defense and security, in addition to providing better control over the storage and documentation of classified, will be to ensure the traceability of the flow paths of media and public documents and classified between security zones indicating the persons entitled to use the documentation. Mapping circuit protected in this way, the documents will, in the event of an incident on the effective investigation of the causes of and per-

petrators. Under the planned economy, the solution can be used in enterprises and institutions, which are stored documents with different levels of sensitivity. The main customers of the system will, of course, state administration bodies of the units subordinate to the Ministry of Defence and the Ministry of the Interior at the helm. An important field of application for the results of the project will also be an area of justice and the institutions of the broader health care. An important aspect of the social application of the proposed solutions will increase the confidence of third parties (citizens, cooperating institutions) to the state authorities.

5. Conclusions

Technological innovations and novelty which presents the system are important drivers of economic progress, productivity growth, and long-term performance. Researchers and practitioners have therefore been interested in understanding the processes through which these innovations evolve over. In recent years, the technology and innovation management literature has increasingly drawn on path theory to examine technological innovations in different contexts. In particular, path constitution has emerged as a rich and promising perspective to make sense of these complex change processes (Singh, Mathiassen and Mishra, 2015: 643–644).

Firms commonly invest in information technology (IT) to innovate processes and achieve enterprise-wide cost reductions. A recent survey of more than 2,000 chief information officers (CIOs), representing a total IT budget of 230 billion USD, placed cost reduction, efficiency, operational results, and business processes improvement among the top 10 business goals for IT investments. Case reports add that firms frequently use IT to exploit their environment for ideas and technologies that will allow them to achieve these goals (Trantopoulos, Krogh, Wallin and Woerter, 2017: 287).

As part of this project has been developed marking system of electronic media and paper RFID identifiers and are designed appropriate devices to achieve that task. The end result of the project is the prototype of the modern secret office, which uses the latest advances in RFID technology and DMS and adapted to this technology, mode of operation and management firm, giving the opportunity to work with documents having different levels of sensitivity. Achieving this goal is extremely important from the point of view of state security and defense, which is part of the research area related to the detection, combating and – above all – the neutralization of all kinds of threats, including in the area of economic and economic. The project established an electronic system for generation, transmission, processing and workflow management with different levels of sensitivity. This system makes it possible to gradually displace traditional circuit-sensitive documents, carried out in paper form to a modern approach based on the exchange of electronic documents and digitized while ensuring confidentiality, non-repudiation and accountability of their circulation.

The project was developed unified process model lifecycle management of documents with different levels of sensitivity. The planned end result of the project is the development and execution system and physical tracking of media express or implied, electronic and paper, including in the secret at the border areas of security and access control of people and methods to protect documents from unauthorized copying. Identification media and documents takes place independently of their number and mutual position. After analyzing the solutions available on the market, it seems that it will be possible to use the results in practice, administrative and economic systems for monitoring and documentation media explicit and implicit in real time.

The system for archiving and managing corporate documents is dedicated to all companies and institutions that need to archive documents. Thanks to the system it is possible to transit your documents with on-line access, archive payroll documents, organize the entire collection, conduct professional destruction documentation on all types of media. Moreover, the system can automatically generate all kind of reports and statistics.

As part of this project:
— An configuration environments for prototype systems lifecycle management of documents and manufacturing environment. It was purchased the necessary hardware and software necessary to properly set up three demonstration environments. On the purchased equipment were installed operating systems, databases, application servers and the system of business process management.
— are analyzed and designed software interfaces for data transmission to electronic repository system lifecycle management of documents. The assessment is the analysis of existing methods of data transfer between devices and radio frequency identification system workflow. Technological standard is developed and implemented software modules are transmitting data.
— Designed and implemented a management module powers of the public documents and classified information. Module is being developed taking into account the rights held by the employees of the Secret Office authority to handle documents with different levels of sensitivity.
— Implemented processes are automated document processing with different levels of sensitivity. They are implemented specific business processes related to the lifecycle management of documents with different levels of sensitivity and their treatment based on models developed by WAT.
— Developed a subsystem control the flow of media and public documents and classified between security zones together with visualization module of their movement at the level of a single document. Key feature of the proposed solutions is to ensure the traceability of the flow of classified documents and classified between security zones, in the context of people who are in temporary possession of these documents.

— Are integrated components of the system are reviewed and proposed solutions. Integrated all system components are developed methods of verification of the system as a whole and are carried out final testing system.

References

1. Forsman H. (2011). Innovation capacity and innovation development in small enterprises. A comparison between the manufacturing and service sectors. *Research Policy*, 40(5), pp. 739–750.
2. Kałużny P. (2008). *Techniki inwigilacji*. Warszawa: Wydawnictwo Naukowe PWN, s. 34.
3. Kawa A., Wieczerzycki W. (2005). *Technologia RFID podstawą funkcjonowania społeczeństwa informacyjnego i elektronicznej gospodarki*, s. 13.
4. Koontz H., Weihrich H. (1990). *Essentials of Management*, New York: McGraw-Hill, p. 4.
5. Kuc R.B. (2005). *Kontrola w zarządzaniu przyszłością*. Warszawa: Wydawnictwo menedżerskie PTM, s. 179–180.
6. Majewski J. (2011). *Innowacyjne rozwiązania RFID w systemie WMS MaGS1 wdrożone w magazynie Franspol-u*, Logistyka nr 5, s. 41–42.
7. Nowak I. (2007). *E-biblioteka*, *czyli RFID w książkach*, *Logistyka*, 6.
8. Orłowski A. (2008). *Analiza tendencji rozwoju technik RFID oraz laboratorium badawcze technik RFID*, s. 23.
9. Singh R., Mathiassen L. Mishra A. (2015). Organizational path constitution in technological innovation: Evidence from rural telehealth. *MIS Quarterly*, 39(3), pp. 643–665.
10. Stoner F.A.J., Freeman E.R., Gillbert R.D. (2001). *Kierowanie*. Warszawa: PWE, s. 588.
11. Szczurkowski M. (2010). *Roz. Zdalna identyfikacja radiowa obiektów w oparciu o RFID. Wytwarzanie i sterowanie polami magnetycznymi dla radiowej identyfikacji obiektów RFID.* Rozprawa doktorska, Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakowie, Wydział Elektrotechniki, Automatyki, Informatyki i Elektroniki, 45.
12. Trantopoulos K. Krogh G., Wallin M.W., Woerter M. (2017). External knowledge and information technology: implications for process innovation performance. *MIS Quarterly*, 41(1), pp. 287–300.
13. Venkatesh V., Morris M.G., Davis G.B., Davis F.D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), pp. 425–478.

DMS I RFID, JAKO INNOWACJA W ARCHIWIZACJI I ZARZĄDZANIU DOKUMENTAMI PRZEDSIĘBIORSTWA

Streszczenie

Celem artykułu jest zaprezentowanie utworzonego w ramach projektu badawczo-rozwojowego systemu wspomagającego zarządzanie i archiwizowanie dokumentów organizacji. Archiwizacja i zarządzanie dokumentami są zagadnieniami, z którymi stykają się wszystkie przedsiębiorstwa niezależnie od wielkości oraz specyfiki działania. Odpowiednia administracja i kontrola nad przepływem dokumentów w organizacji wpływa na efektywność jej działania. Artykuł ma na celu zaprezentowanie wyników uzyskanych podczas czynnej obserwacji podczas wdrożenia produkcyjnego systemu klasy DMS wykorzystującego tech-

nologię RFID. Ponadto zostaną zaprezentowane pozytywne aspekty wdrożenia i omówione wady i zalety systemów klasy DMS.

Słowa kluczowe: DMS, archiwizacja, RFID.

Klasyfikacja JEL: L86, O00, O31, O32.