

RFID TECHNOLOGY, AS OBJECT OF RESEARCHES IN A GROUP OF YOUNG PEOPLE

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Abstract Article contains basic information about automatic identification systems and a wide range of applications, not only logistics. The research section concerns practical utility. People who took part in it are students from the technical school. Measurements were obtained in a special laboratory, equipped with professional RFID systems and programs. The results received draw from opinions and estimations of the work parameter. These aspects will sum up the research and compare results of work with different devices and software.

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1. INTRODUCTION

RFID technology was invented in the 1940s of 20th century, however common use started 30 years later. This system requires specialist instruments to conduct automatic identification, such as transponders and antennas sending and receiving information. Tag is composed of chip, antenna and outer casing, keeping the tag safe against external factors. There are several kinds of markers; one-time tags (e.g. stickers) and reusable. Other types of tags are based on internal construction; passive, semi – passive and active. Passive tags are not equipped with batteries and are activated with the help of electromotive power. Semi – passive and active tags have an internal source of power, however semi-passive still require external power. Active transponders emit a permanent signal. It has serviceableness in operations supervised by many signal receivers. RFID technology is supported by appropriate informatics fitted to the size of the company, its needs and level of RFID implementation (Grabia, 2006, pp. 29-31).

Automatic identification is being developed around the world, not just in Poland. That is way it was important to create standards and regulations and introduce these to other countries and international organizations. Nowadays, many standards are elaborated by ISO, EPCglobal, ETSI and FCC terms. They refer to communication between tags and receivers, coding and formatting method (e.g. ISO 18000) (Kanicki, 2012, pp. 497-503).

2. RFID – RANGE OF APPLICATION

RFID was originally used by the U.S. Army and agro industry to tag animals. Next step of RFID was implementation in sectors, where it is still used today. The value of investments in Poland is a small percentage compare to investments in USA, France or China. It is estimated, that in Poland less than half million dollars is invested into 75 to 100 projects – most of these are not linked with logistics. Operations supported by RFID include libraries, parking management, documents segregation, archive, stocktaking and animal tagging.

Currently RFID has many more applications compared to when it was invented. This technology is described as the business revolution, after the industrial and informatics revolution. The growth of automatic identification system is still taking place. Since the beginning, operations and processes are being found for optimization, not only sectors. The number of tags in the company is increasing, because of varied adoption.

The following picture contains information of RFID application taking into account of sector and goal of implementation.

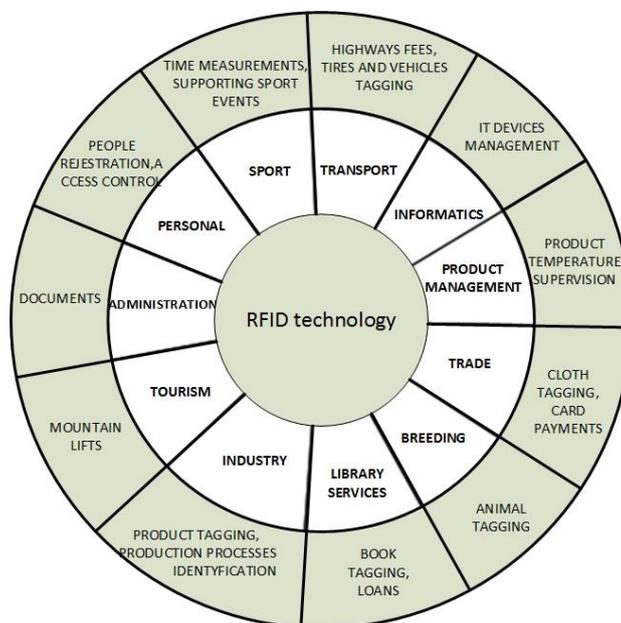


Fig. 1 Range of RFID application. Own elaboration

In modern businesses automatic identification system utilized mainly in logistics and branches bind with it. Examples of these are: transport, storage, production, and also operations, which support the main goal, such as highway fees or resource security. RFID is used by tire producers, e.g. Goodyear. Tire tagging foster exploitation and parameters describing it, e.g. tire pressure. Transport resources are also tag to defend from steals, but also to identify them during work in warehouse (Edwards, 2011, p. 19).

Identification takes important part in case of chasing products. It is the way for signify passports, documents, IT devices or books. This objects are harder to falsify and making the level of safety much higher. Trading companies are also using the RFID technology, mainly for delivery receive, avoiding thief, tracking temperature of transported goods and to control products availability. The system of identification is more common in everyday life, beginning with sport events, using mountain lifts, ending on work time controlling, access control and people localization (Wieczerzycki, 2012, p. 150).

The benefits of using RFID have influence on equipment, processes and software. Practical used shows wide range of economization. Technology supplies perfectly current processes. The strategic benefits are accuracy, precision, inventory balance reduction and increased product visibility compare with older techniques of identification. Another benefit is making work more efficient. Example of aspects, which will make business more profitable are growth of

number of assortment, amount of storage surface and warehouse moves increasing. These factors will enlarge value of RFID implementation and accelerate time of investments return (Jaworowska, 2012).

3. CASE STUDY

The purpose of this article is to make researches about knowledge and skills of RFID technology. The object of researches is a group of 93 students, from technical school of logistic profile. Students are in age between 16 and 20 years old.

The logistic profile of the school makes the students potentially employees in that sector in the next 4 years. They are obligated to pass their practical examinations in various companies. Further they must complete numerous trainings and courses organized by universities.

3.1. Work environment

Researches are conducted in professional laboratory and are prepared for logistic courses, including RFID technology. Students taking part must pass their courses in groups and RFID term last 10 to 16 working hours.

In the field of automatic identification system, following devices and software were presented:

- Devices: stationary RFID goal, Motorola MC919ZEU terminal and TSC-247 thermo transfer printer, passive tags,
- Software: Comax, Comarch Altum and Optima, Bartender.

Comax software belong to group of training and inducting programs. It gives students opportunities to lead warehouse operations mentioned at school or prepared in paper version. Comarch software is made for professionals. It gives ability to manage warehouses and financial module. This programs can be used by small, local business, as well as by the big production companies like: T-Mobile, Vodafone or Heineken. The software is compatible with Motorola terminal, which is often used as a set for automatic identification.

Thermo transfer printer has been implicated in case of paper label printing. Student can experience original labels from real companies. They can design the labels by using Bartender program, which shows what kind of information are consisting on logistic etiquettes.

3.2. Learning methodology

Learning in range of RFID technology is carry on in a particular way. The first part is theoretical introduction. The most interesting applications in modern

logistics are presented. Practical part begins with making simple warehouse management tasks using Comax software on main computer. All operations are presented on a projector. The next step consist of following operations by undertaken by students and their computer stations. They are also programming tags. After that students start their work on Comarch programs and Motorola terminal, based on prepared instruction. The great benefit of the software is intuitiveness. The last step is to design specific label in Bartender program.

3.3. Work parameter analysis

Researches will measure the level of assimilation new skills and adaptation in new IT environment.

Table 1 Questionnaire used to receive opinion data. Own elaboration

1.What is your opinion in level of advancement of the technology?	1 – low level of advancement, 6 – high level of advancement,
2.How many information were mentioned earlier, before the course ?	1 – none 6 – everything
3.How would you evaluate your work during first trial in Comax software?	1 – every phase of work had fails 6 – fail less
4.What is your opinion in range of application this technology?	1 – narrow application 6 – unlimited application
5.How would you evaluate your new skills?	1 – regular problems and misunderstanding 6 – I know technology very well (theory & practice)
6.How would you rank the assimilation of Comax software?	1 – hard in use 6 – easy in use
7. How would you rank the assimilation of Comarch software?	
8. How would you rank the assimilation of Bartender software?	
9.How would you evaluate RFID goal handling ?	
10. How would you evaluate Motorola MC919ZEU handling?	
11. How would you evaluate thermo transfer printer handling?	

Aspects of work, which will be describe are:

- Time needed till performing task without any mistakes,
- Number of trials needed to perform task without any mistakes,
- Total number of fails till performing task without any mistakes,
- Time need to perform task without any mistakes.

Executing task in Comax and Comarch software is to prepare receiving and sending goods documentary. In case of exercise on Comarch, additional work is to do financial documents (buying and selling invoices). Last phase of researches was

to fill questionnaire, which are source of conclusions. Query contains information such as: personal data, age of responders and opinions, which can be converted into statistics. Table 1 includes questions and range of answers placed in questionnaire.

3.4. Questioner and research measurements analysis

Answers received from the questioners was carefully converted, to get intended results. The final conclusions are averaged and included in the form of diagrams.

3.5. Survey researches

Researches were conducted on 93 peoples, 56 women and 37 men in age between 16 and 20 years old. About 39% are interesting in modern technologies. The biggest part of them follows news technology in logistics. Following diagram comprise data about questions answering tagged in table 1.

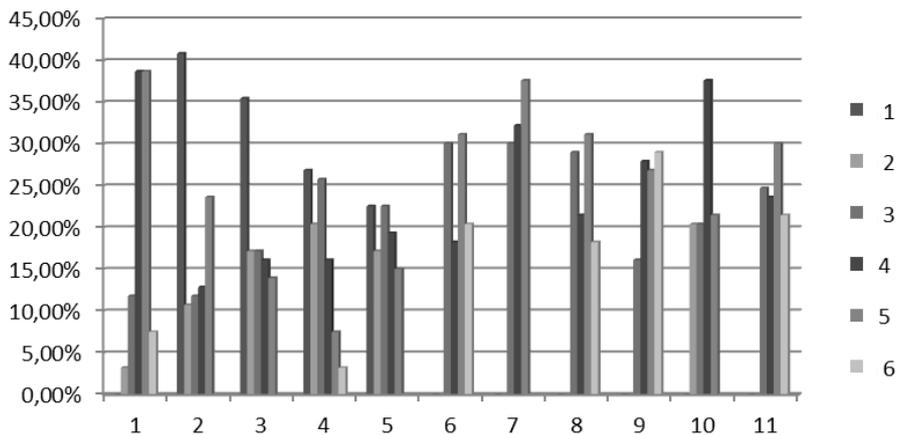


Fig. 2 Answers juxtaposition based on carried out survey. Own elaboration

Aspects, that were the lowest evaluated are related with questions number 2,3,4 and 5. Conclusions drew from these answers are as follows:

- Students weren't properly educated during school lessons. The reason of this can be yearly topic program which is prepared by their teachers and being specified by the ministry of education. Second reason can be weak IT support.
- Important problem is also weak ability to gain new skills. Most of students had problems during exercises on Comax software. Determinant of that occurrence can be lack of confidence and apprehension ahead of device destroying. Lack of confidence aspect can be also reason of low self-evaluation about new skills.

- Important case is limited vision of technology application. Despite of bringing up this affair, students have limited imagination and cannot build up their own opinion. Cause of that may be lack of engagement in new technology cognition and reluctance to self-development.

The highest valued aspects is used of The Comax and Bartender software. Also handling the RFID goal and thermo transfer printed were rate very high. Programs characterize the ease of programming and limited graphics. Graphic design of Bartender is similar to the standard one, implicated for example in Microsoft Office.

3.6. Research measurements analysis

Measured factors are:

- Time needed till performing task without any mistakes,
- Number of trials needed to perform task without any mistakes,
- Total number of fails till performing task without any mistakes,
- Time need to perform task without any mistakes.

The following diagrams contains data compared and gathered on work parameter analysis. Base of each diagram give an averaged values of survey.

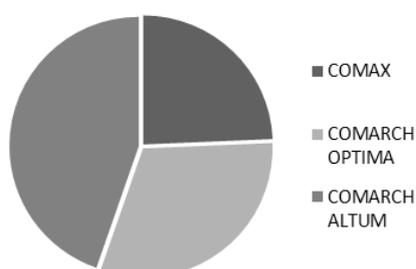


Fig. 3 Time need to perform task without any mistakes. Own elaboration

The drawings above are source of priceless information related with work of group of young people using new and still increasing technology. That exercises was performed requires more than average knowledge about computer usage. All troubles and problems arise during task executing, are justified the range of application of software by professional companies of different branches.

Diagram analysis point clear differences between usage of particular software. Processing warehouse management operations by using RFID technology and Comax program distinguish much less errors and definitely lower average time needed to acquaint with the program.

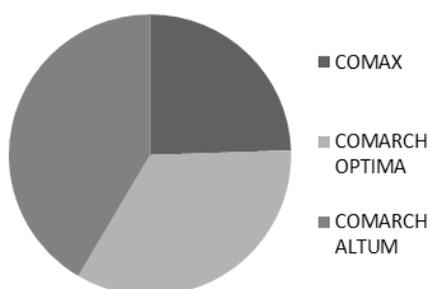


Fig. 4 Number of fails till performing task without any mistakes, Own elaboration

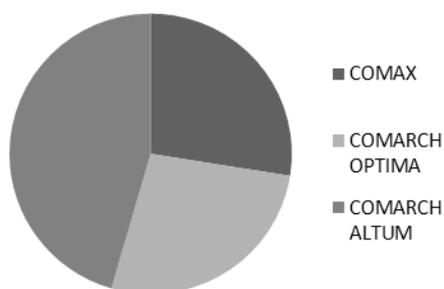


Fig. 5 Number of trials needed to perform task without any mistakes. Own elaboration

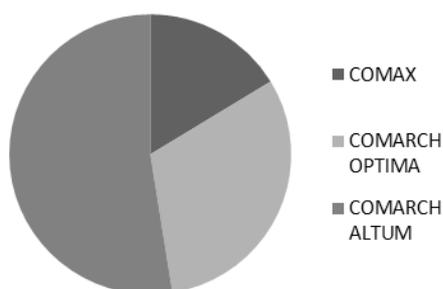


Fig. 6 Time needed till performing task without any mistakes. Own elaboration

Average amount of errors committed in Comax is lower than other programs. Because of that, Comarch software provides better functionality. It offers also module responsible for bookkeeping. Additional benefit is similar time of task executing with assumption, that exercise performed on Comarch software is much more complicated. Diagrams also show, that Comarch Altum is the most advanced program, what caused over average amount of errors.

4. CONCLUSION

The purpose of the article was performing researches on a group of potential employees in logistic sector. Students took part in special course prepared for technical schools. During course they have opportunities to experience not only to cognize theory, but also to feel RFID technology by practice. The school educational program require more experience gained in logistic companies.

Considerations concern skills, which are useful during RFID usage. Automatic identification system has a universal character and wide range of application. Students had opportunity to work with advance devices supported by modern software. The big advantage of available resources is their diversity and professional application.

The research shows significant difference between results of working with particular software. These dissimilarities depend on their service and range of functionality. Measurements made on Comax and Comarch Optima programs are very similar in respect of time needed to realize required tasks. Observations perform to identify skills, give very optimistic conclusions. It proves ability to work with a RFID technology by young people, who are still learning. Commonly said – young people don't have problems by using new technology. Research shows, that modern technology used by the companies do not cause many major problems either.

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BIOGRAPHICAL NOTES

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