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The use of computer techniques in the implementation of the main task of a higher education institution in Poland. Economic versus financial dimension.

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***Abstract*— The article presents the basic levels and status of the use of computer techniques in the current model of higher education in Poland resulting from legal norms. The analysis takes into account the specificity of the economic and financial aspect of using these techniques, which is rarely discussed in literature. Moreover, an attempt has been made to indicate the most promising directions of increasing the economic efficiency of resources conditioning the use of computer techniques in the didactic process, taking into account the resources and the model of education created in the period of the pandemic.**

Keywords: Computer techniques in education, IT solutions in higher education, pandemics, online learning

I. INTRODUCTION

The aim of the article is an attempt to present a complete model describing the participation of computer techniques in the implementation of the main task faced by higher education institutions in Poland. It allows to reveal all significant fields of application of computer solutions in this area.

The analysis is conducted in the context of economic and financial thread conditioning the effectiveness of the use of these techniques, relatively rarely undertaken in the literature. The authors try to answer the question of whether and when the expenditures related to the introduction and use of computer techniques correspond to the actual outlays of forces and resources in the analysed area. They also try to indicate the conditions of such use of modern IT solutions, that they would actually increase the effectiveness of higher education functioning.

According to Article 11 of the current Act regulating the functioning of higher education in Poland ('Act of 20 July 2018 - Law on Higher Education and Science', 2021), the basic tasks of a higher education institution include, first and foremost, education at university level, education at postgraduate level or in other forms of education (including specialised education) and conducting scientific activity, providing research services and transferring knowledge and technologies to the economy. Moreover, a higher education institution should create conditions for disabled persons to participate fully in the educational process and scientific activity, educate students with a sense of responsibility for the Polish state, disseminate and multiply scientific and cultural achievements, and act for the benefit of local and regional communities.

The use of computer technology in the educational process means the application of computing technologies (software and hardware) for this purpose - both in stationary mode and online. Moreover, the most important conditions for the effective use of any technology is not only the availability of the right technical means, but also the right knowledge to use them effectively according to the adopted assumptions (Lichniak, 2009). Developing this thought in the context of the economic-financial thread, we can already say that the implementation of computer techniques generates two groups of outlays. These are expenditures on the acquisition, development, maintenance and repair of technical means in the form of computer hardware and software, as well as expenditures related to training or acquiring staff with adequate IT competences - IT specialists who operate the IT centre and computer hardware at the university, as well as the users of this hardware who use it for research, teaching, management and administrative purposes. A separate group is

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made up of expenditures on undertakings that make it possible to overcome the resistance of a frequently large group of employees against the implementation of IT solutions in the processes they carry out.

II. COMPUTER TECHNIQUES AND THE IMPLEMENTATION OF CORE TASKS IN HIGHER EDUCATION - BASIC MODELS.

Undoubtedly, the main among the basic tasks of a higher education institution is higher education. This is reflected in Article 9(1) of the Act containing a condition conditioning the existence of a higher education institution on the provision of studies in at least one field of study ('Act of 20 July 2018 Law on Higher Education and Science', 2021). Therefore, when constructing the basic models for the application of computer technology at a higher education institution, we will focus primarily on this area.

It follows from the aforementioned Act (Article 64, paragraph 2) that a given field of study can be conducted on a general academic profile and on a practical profile.

The condition of the general academic profile is assigning more than half of the ECTS credits to classes connected with scientific activities conducted at the university. This means that in this model of higher education studies, scientific research conducted at the university is an integral element of the educational process. Hence, from the point of view of the main task to be fulfilled by the university, the model of education of general academic profile should take into account computer techniques used in scientific activities conducted at the university in the analysis conducted. This argumentation is strengthened by par. 3 para. 5 pkt. 2 in the Regulation of the Minister of Science and Higher Education stating that the curriculum of studies on the general-academic profile should take into account the participation of students in classes preparing for scientific activities or participation in such activities ('Regulation of the Minister of Science and Higher Education of 27 September 2018 on studies', 2018). In practice, the implementation of this provision means that, for example, in a full-time bachelor's degree programme, out of 1800 hours, more than 900 hours of the study programme hours should be related to scientific activity conducted at the university or ensure students' participation in this activity. In this way, the legislator tries to ensure continuous implementation of the latest knowledge in didactics and prepares students for scientific activity.

The practical profile of higher education studies under the Law on Higher Education and Science (par. 3 sec. 5 item 1) should ensure the implementation of classes shaping practical skills, to which more than half of the ECTS credits from the study programme are assigned. This refers both to regular classes conducted within the university, as well as, respectively for Bachelor's and Master's degree studies, 6-month or 3-month in-service training (Article 67 para. 5 of the Act) corresponding to approx. 1050 or 525 hours of classes held in external business organizations, which should ensure the achievement of the educational results stipulated in the study curricula approved by the senates of the universities. Thus, computer techniques used in units accepting students for professional trainings become an integral element of achieving the main task set for universities in Poland - in the part in which they condition the acquisition of educational results provided for in the curricula.

To sum up - a short review of the main legal acts regulating the functioning of higher education in Poland points to the duality of the model of realisation of the main tasks set for universities in Poland, which in a different way determines the participation of computer techniques in its realisation and the economic and financial dimension of their use. This is shown in Figure 1.

As Fig. 1 indicates, four basic fields of using computer techniques in the realization of the main task of the university emerge from the analysis. These are solutions allowing to support didactics, scientific research and management of the educational process, as well as computer techniques used by external entities to the extent that they contribute to the realisation of students' professional practice.

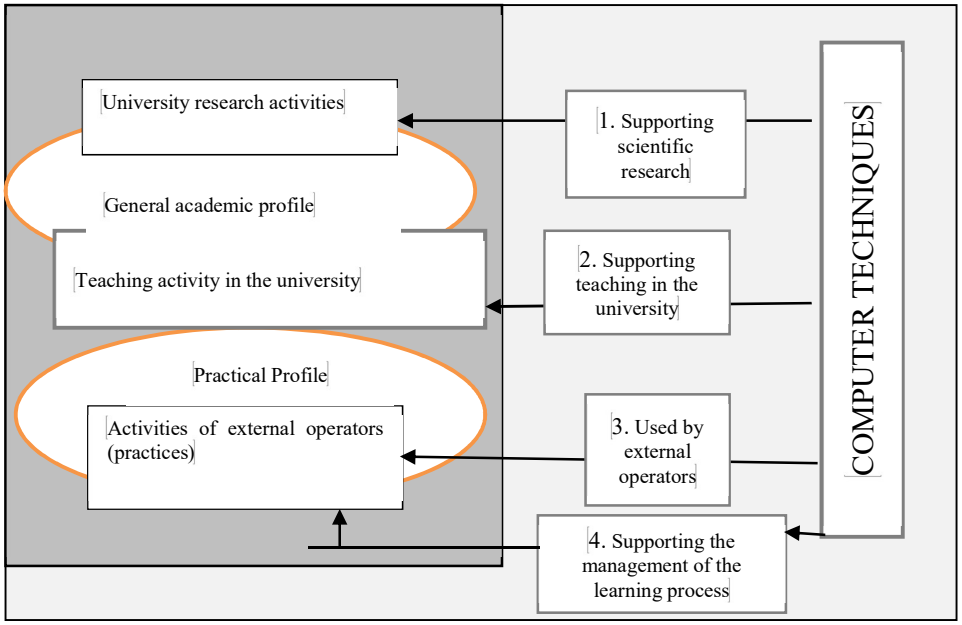
III. USE OF COMPUTER TECHNOLOGY IN THE TEACHING ACTIVITY OF THE UNIVERSITY

Computer techniques have entered widely into the teaching activities of universities. They have naturally become a tool enriching the classes conducted in the direct interaction of an academic teacher and students thanks to the use of multimedia techniques, which are a standard in almost every university. Thanks to the Internet connection, students can extend the knowledge acquired in the course of their studies independently and on their own initiative. Available software also makes it possible, with little effort on the part of the teacher, to verify on an ongoing basis the progress in learning expressed by the degree to which the learning outcomes have been achieved - e.g. the Kahoot application, free of charge in its basic version, available from 2021 in Polish (© 2022, Kahoot!, 2022). In this case, the cost of using the basic version of the software is zero. However, effective use of the software requires a suitably equipped environment: each student taking the test should have a smartphone or i-phone, and there should also be access to a high-speed Internet connection and a room equipped with a projector connected to a computer.

For the needs of stationary didactics, computer laboratories are created using standard software (e.g. office package), educational versions of specialised programmes used to train students in their use in future professional work, as well as - in software securing students' participation in research work.

A separate area of using computer techniques in the teaching activity of a university is distance learning. In this case it is computer hardware equipped with Internet connection and software in the form of educational platforms (including completely free of charge - such as e.g. Moodle (MoodleTM, 2022) and communication platforms e.g. Zoom (©2022 Zoom Video Communications, 2022), or Microsoft Teams - a solution allowing to chat, organise meetings, make connections and cooperate (© Microsoft 2022, 2022b).

FIG. 1. THE MODEL OF HIGHER EDUCATION IN POLAND AND THE USE OF COMPUTER TECHNOLOGY



Source: own elaboration based on current legislation

The economic and financial side of the use of computer techniques in the teaching activity of the university should be considered from the point of view of hardware, software, information and communication competence of the staff and the additional labour input necessary for the preparation and implementation of remote classes.

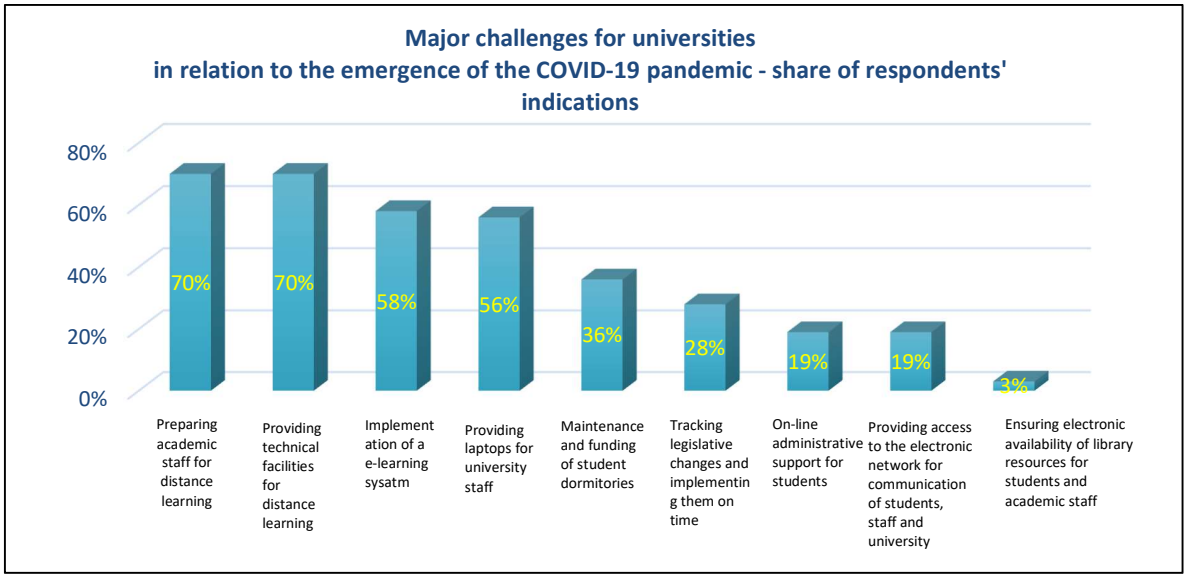
As far as the hardware is concerned, in principle it is available mainly through purchase: therefore, it can be said that the financial dimension of acquiring the resource coincides with its availability. The main problem related to the use of the equipment is its moral wear and tear resulting mainly from the increasing hardware requirements generated by the developing software, which generates the necessity of more frequent replacement of still technically efficient equipment and places increasing demands on the bandwidth of the Internet connection. Furthermore, the need to ensure universal access to the Internet in all teaching rooms at the university requires the development of internal network infrastructure. Currently, according to the latest research, most universities (97% of the surveyed population) have their own server rooms (Piotrowska-Albin et al., 2021, p. 19), which involves the need to purchase additional hardware and software (including anti-virus software) and employ IT staff.

As far as the use of software is concerned, in many cases it is available to the education sector free of charge or at a very reduced price. This results from the regularities governing the e-economy, which include, inter alia, copyability (where the cost of producing the first product (e.g. software) is high, while the cost of each subsequent copy is almost zero) and universality (nowadays, it is not the product with better functionalities that is more valuable, but the one used by everyone (Kelly, 2001, pp. 29-30)). The rationale behind the phenomenon of "free" products, therefore, is the desire to spread the use of - for example - a given software product. Educational or freely available free versions are either very limited or limited in time of use, or the terms of the contract assume that the delivered products will be used only for educational purposes. The university is often treated by software producers as an efficient source of free dissemination of the software in later professional practice: learning to use a given software requires a certain amount of effort, and it is good if it is done under the supervision of an academic teacher who, according to the curriculum, requires knowledge and skills to use its most important functions. Thus, this knowledge is complete and not selective, which means that in the future this very software will be preferred in all areas of its capabilities, because it will not require re-learning how to use other competing programs, even though they would work better in a given case. The aforementioned phenomena lead to a discrepancy between financial outlays of universities for acquiring resources in the form of software and the market value of these resources, which is generally higher.

The COVID pandemic, which lasted from March 2020, forced a change in the use of computer techniques in teaching - practically all universities were forced to switch to online education from March 2020 practically until June 2021. This created the need for widespread use of computer techniques in distance education. The HEIs were forced to face a number of challenges, the scale of which is shown in Figure 2. The biggest challenges for the HEIs surveyed proved to be the lack of preparation of staff for remote teaching (70%), provision of technical capacity for remote teaching (70%), implementation of a remote teaching system (58%) and provision of laptops for HEI staff (58%). Since the widespread necessity of remote teaching arose suddenly, the problem of preparing staff was often solved by trial and error within the framework of the

binding ordinances of the university authorities by the staff themselves in at least three areas: learning the principles of using the available educational platforms, transforming the content of lectures and other classes into an electronic form useful in the conditions of using the available specific distance learning tools, and in the area of developing an effective teaching methodology.

FIG. 2. MAJOR CHALLENGES FOR UNIVERSITIES IN THE WAKE OF THE COVID-19 PANDEMIC



Source: own elaboration based on (Piotrowska-Albin et al., 2021)

Viewed from a position of economic behaviour, the adaptations indicated above often entailed a large additional expenditure of time and effort on the part of the university staff teaching the classes. The pandemic situation led to the creation of a new resource in the form of the development of basic e-competences among teaching staff and e-materials for classes that would otherwise never have been created. Moreover, since the above-mentioned adaptations took place mainly within the framework of existing job duties, which means that they did not involve additional expenses for employers. So here again we see a discrepancy between the economic and financial dimensions of the transformations described above.

Of course, not all instructors took up remote teaching. According to the report Situation of students during the coronavirus outbreak Report from the survey conducted by the Independent Students' Association on the sample of 3426 respondents (88% - students of large public universities) to the question "have you come across a situation where the lecturer does not conduct classes remotely in any way?" as many as 53% of the respondents answered in the affirmative, of which 24% indicated that the situation concerned more than one case (Białas et al., 2021, p. 19). Of course, the reasons for this situation could have been different, nevertheless, on this basis it can be said that, in general, academic teachers of the majority have adapted their competences and materials to the needs of distance learning better or worse. The pandemic situation has created a new resource in the economy without generating expenditure adequate to its value.

In order to facilitate distance learning communication, many instructors have provided their own home Internet connections free of charge, and some have entered into additional contracts with a second operator, thus protecting themselves against unreliable connections. Moreover, for the purposes of online classes, academic teachers often made their own computer equipment, living quarters, electricity, heating etc. available. Some universities, in order to compensate for these burdens, granted small monthly salary supplements of various amounts, secured company laptops or offered separate workstations in the university premises for conducting remote classes.

As far as software is concerned, the completely free Moodle platform is in common use. The universities were assisted by manufacturers of remote communication platforms providing free access (e.g. Zoom - with a limited number of users up to 100 per session), or Microsoft Team.

To recapitulate, we can say that at the moment in Poland there are resources to ensure, in principle, the full realisation of all higher education courses in a remote form at the best technically available level. This does not mean that such a solution is sufficient. The learning outcomes achieved through the exclusive use of distance learning techniques in higher education are generally assessed to be significantly lower than those achieved through traditional forms of classes conducted face-to-face between the academic teacher and students. Thus, an anomalous situation has arisen, in which under the conditions of using an increased number of resources involved in the learning processes, worse results are obtained - the effectiveness of higher education is drastically reduced. This was reflected in the position of the Minister of Education and Science expressed already during the summer holiday 2021, according to which universities should eventually return to

normal stationary work (Sevastianovich, 2021b). From the point of view of economics, an increased amount of resources involved in a given process should result in an increase in the effect obtained in it. The opposite result can only arise in a crisis, in which a compulsion arises to use inefficiently the resources at one's disposal, often still burdened with many imperfections. These include the lack of a refined, universally accepted model of teaching which could effectively replace traditional lectures and exercises conducted at universities.

Currently, based on their own observations and the experience of the authors of this study, it can be said that the students, for technical reasons (blamed for this bandwidth) during the lectures, turn off individual cameras, which promotes significant distraction due to other activities unrelated to the class. At present, the requirement to answer simple questions about the current lecture asked to any person at any time in order to activate the attention of the audience by the instructor is not a standard. The introduction of such a requirement is not always well received. A similar situation is with the introduction of short quizzes, which additionally absorb lecture time, which according to the syllabus should be devoted to the presentation of the material.

Another group of problems is generated by the principle of providing teachers with the materials necessary to master the subject. This is because it contributes to the development of a belief among students that it is enough to master the provided package of materials just before the exam to pass it, which often turns out to be impossible in the absence of active participation in lectures. In general, students currently pay less attention to online classes. This seems to be confirmed by the results of the post-lecture tests which systematically verify the acquired knowledge. From our own experience, we can say that the previous year (2020/2021), when the widespread introduction of the remote teaching model was initiated in connection with the pandemic, the average grade from such tests on a five-grade scale fluctuated around 4.75. Currently, in the same subjects, on tests of comparable difficulty, students' average grade is even at the level of 3.95, with failing grades occurring, which was not observed in the previous period. Similar phenomena can be observed at other universities. Perhaps this is because students in online classes tend to be 'spectators' rather than active participants (Bartol, 2020, p. 27), and spectators who do not necessarily focus all their attention on understanding the facts presented on screen.

It seems a total misunderstanding to conduct credit classes and exams at a distance using the tools offered by educational platforms. There is no guarantee that the tasks have been solved independently by the examinee, i.e. without the help of forbidden materials or the participation of third parties. Therefore, the authors of the "Decalogue of Internet Education" published back in 2006 Therefore, the authors of the "Decalogue of Internet education" published back in 2006 not for nothing indicate that the learning process should be separated from the certification phase, i.e. credit and exams should be carried out in a conventional manner (Wieczorkowska and Madey, 2006).

In brief, it can be said that even looking only from the perspective of lectures, the pandemic situation has forcibly developed a not very effective model of distance education. Online classes require significant changes to the commonly accepted models of their delivery. This is particularly important when looking at the prospects for university development in the post-pandemic period (Figure 3).

It can be seen from the chart presented above that the greatest recorded influence was exerted by the pandemic in the area of implementation of computer techniques at universities, with as many as 67% of indications concerning organisation of more forms of remote education by universities. However, in the opinion of individual representatives of the world of science, a model assuming a return to stationary (conventional) studies in the main forms of classes should be preferred; only some forms of classes - e.g. diploma seminars - should be conducted remotely (Sewastianowicz, 2021a). This position seems justified: until mechanisms sufficiently motivating students to actively engage in the course are developed in the remote forms of teaching, the effectiveness of remote learning expressed by the ratio of achieved educational results to used resources will be lower than in the traditional educational process.

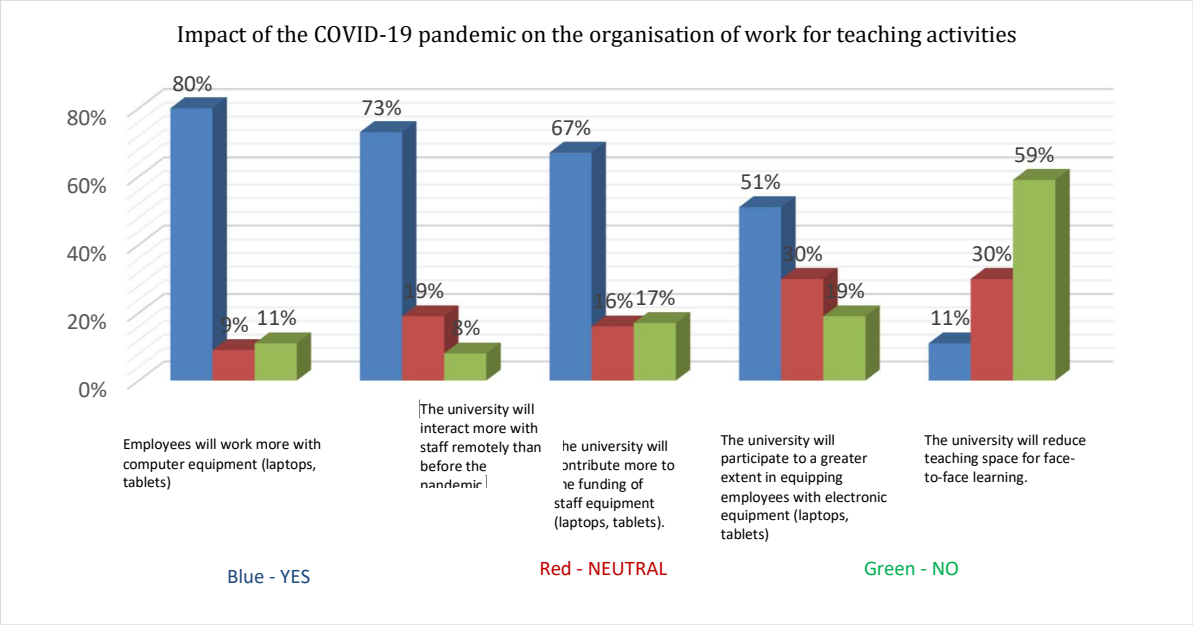
This depends on the quality and widespread acceptance of tools effectively motivating students to abandon the role of "spectators" and move to active participation, both in the technical dimension (e.g. the possibility to watch all participants of the classes on camera at the same time without "hanging" the Internet), and in the interpersonal dimension (e.g. the possibility to ask questions concerning the current classes to any participant of the lecture in order to check whether he/she follows the course of the lecturer's thoughts carefully, with the consequence of affecting the passing grade in the course).

The technologies and teaching techniques existing today do not allow for effective implementation of all classes in a remote mode. Most of the skills acquired during exercises, e.g. in laboratories, cannot be acquired via the Internet. You cannot learn to swim without going to a swimming pool. Therefore, a full transition to an online learning system is not possible in the current conditions. Lectures seem to be the most promising form of delivering classes using computer-based distance learning techniques.

This is confirmed by the current policy of most universities implementing classes in hybrid form (Yasnitska, 2021). Returning to the level of economic efficiency of teaching - in the conditions of the pandemic we have here an additional problem consisting not only in the increase of the expenses necessary to provide education, but also - in the preservation of a non-deteriorated effect in comparison with studies implemented in the traditional form.

In addition to the problems mentioned above, it should be pointed out that remote teaching has a positive financial and economic dimension. What was unavailable in the traditional form of teaching due to distance, time and travel costs becomes possible. This applies both to instructors and students.

FIG. 3. IMPACT OF THE COVID-19 PANDEMIC ON WORK ORGANISATION FOR TEACHING ACTIVITIES



Source: Own study based on the Report from the survey Higher education and technology Warsaw, May 2021. (Piotrowska-Albin et al., 2021)

On the one hand, obtaining an outstanding lecturer for an occasional or regular lecture for students (or university staff) becomes easier, because it can be conducted without the need for time-consuming and expensive travel of the lecturer. Nowadays, this practice is becoming much more widespread, because as a result of the pandemic, generally accepted and binding standards of such classes have been formed and established; both the form and the offer of remotely conducted lectures cease to surprise anyone. At the same time, thanks to the remote form of some classes, universities can reduce maintenance and operating costs of teaching space. On the other hand, the accessibility of the educational offer for potential students residing at a greater distance from the university increases due to the reduction of time-consuming and costly commuting, and - alternatively - the cost of living in the vicinity of the university.

Therefore, it should not be surprising that universities, while building a strategy for further development, take into account the fact of popularisation of digital competences among academic staff and the possibility of overcoming the organisational and financial limitations indicated above. This is confirmed by the international research "Leadership response to COVID-19" conducted by Banco Santander and the International Association of University Presidents (IAUP) among 700 university rectors in 90 countries: currently 70% of these institutions intend to implement a programme based on a hybrid model, assuming that classes will be delivered both in the full-time and online mode (Perspektywy, 2021).

IV. USE OF COMPUTER TECHNIQUES IN SCIENTIFIC RESEARCH RELATED TO THE STUDY PROGRAMME

It is worth noting that at present the importance of the research activity of the university in the teaching process is significant. The research activity should be connected with courses, the labour intensity of which is more than half of the total labour input necessary to complete a given course of study (more than half of the required ECTS credits).

Both specialised and standard computer techniques can help to fulfil this condition.

As for specialised techniques, they are usually dedicated to the study in question and are a prerequisite for the study. From the economic-financial point of view, in this case, it is already required to secure the appropriate resources at the survey design stage: the condition for obtaining the appropriate resources is to incur the relevant monetary expenditure for the purchase of the required computer equipment of the required class and to carry out the adaptation work. Often these works boil down to the construction of dedicated peripheral devices allowing for the acquisition of data of appropriate quality and to original software allowing for appropriate processing of the data available to the researcher. Free access to such specialised software is by definition impossible. The issue of creating and accessing databases is slightly different. On the market there is a number of companies such as IQS, ABR SESTA, INDICATOR and others (rpfb.pl © 2015, 2022) dealing with paid primary data acquisition using computer techniques. These companies obtain data by means of surveys and other research designed by the client or provide access to secondary data already in their possession. The economic-financial dimension

of activities in this area is determined by a number of factors and depends on the synchronisation of activities within the various research projects carried out by the university and on the conditions included in the university's contract with the research agency. If the contract states so, the acquired data may be used for the purposes of only one research project. This is negative if the data once obtained in this way could be helpful for other projects. Of course, in such a case a higher price should be expected, but not as high as in the case of a separate extended procurement of these and other data for another research project, especially if the research agency has to develop specialised dedicated IT solutions for this purpose.

Within the framework of simple research (in particular conducted by students), which is part of the teaching process, it is possible to obtain data using standard IT tools. For example, in the case of creating an e-questionnaire in Google forms, this possibility is completely free of charge (Google, 2022). Extensive instructions are also available on how to use this tool (Oskiera, 2022). Thus, the use of computer techniques in this area does not have any financial implications in terms of expenditure on additional software or on the services of research agencies. Those interested in accessing the training resources also obtain them virtually free of charge; the only cost is the need to view a few seconds of advertising.

Another example of standard software that allows for the needs of scientific research to obtain both primary data and to process the existing data is e.g. Statistica. In the case of this software, there is also a trial version and an academic offer containing favourable price conditions and a discount for training StatSoft Polska users of this software (StatSoft Polska, 2022). Information technologies that allow effective management of the research process play an important role in research. These include programs based on mind mapping techniques - e.g. MindMup (© 2013-2021 Sauf Pompiers Ltd, 2022), Mind Mapping - MindMeister (© 2022 MeisterLabs, 2022), or Coggle (©CoggleIt Limited, 2022). These are either free or commercial software and offer quite extensive instruction in use.

In addition, there is software at researchers' disposal to support the execution of the research project, e.g. the paid MS Project (© Microsoft 2022, 2022a), or the competitor to MS Project, the completely free ProjectLibre (© 2020 Projectlibre, 2022). A lot of time can be saved for researchers by software dedicated to bibliographic database management - e.g. completely free version of Zotero (Corporation for Digital Scholarship, 2022) or offering a free trial version of Citavi (QSR.International, 2022). It is particularly important when the same items need to be cited for articles addressed to publishers with different citation styles: the matching to a particular style is automated here.

In addition to standard publication databases (e.g. EBSCO), databases created by the scientific community, e.g. Mendeley (© 2020 Mendeley Sp. z o.o., 2020), play an important role; they allow you to organise the literature you collect and share the bibliographies you have collected. They can also be used to keep track of who is reading publications in our area of interest. It is worth pointing out that some of them are completely free of charge, but they gain their full functionality after logging on to a server which, however, provides limited space. As the work develops, the need for additional space increases, for which one has to pay (Głowacki, 2014).

In addition to the programs mentioned above, anti-plagiarism programs integrated with global databases and computer text editors play an important role in the verification of the correctness of research.

V. USE OF COMPUTER TECHNOLOGY IN WORK PLACEMENTS RELATED TO THE STUDY PROGRAMME

As we mentioned in the introduction, the practical profile in a given field of study requires that more than half of the ECTS credits which a student must acquire in order to fully complete the curriculum and graduate are allocated to courses forming practical skills. At least half of these credits are allocated to work placements of at least six months in undergraduate courses, i.e. approximately two out of the six semesters of the course.

As a rule, internships cannot be carried out remotely. Students will be expected to work in positions and under conditions appropriate to their future professional activities. Thus, it is assumed that they will, among other things, use similar computer hardware and software as in their future profession. In this context, software and hardware is made available for the needs of the didactic process, which is the responsibility of the university sending its students for placements. The terms and conditions of this provision may be specified in placement contracts. In practice, however, there is no provision for payment. The company accepting the student for the practical placement can compensate for this by the work performed by the student, or - given the current shortage of specialists in the labour market - by taking on the student after graduation as an employee who is fully prepared for the job in question. In sum, from an economic and financial point of view, for the university it comes down to the free provision of computer technology used in companies that take on trainees for the purposes of the teaching process formally carried out by the university.

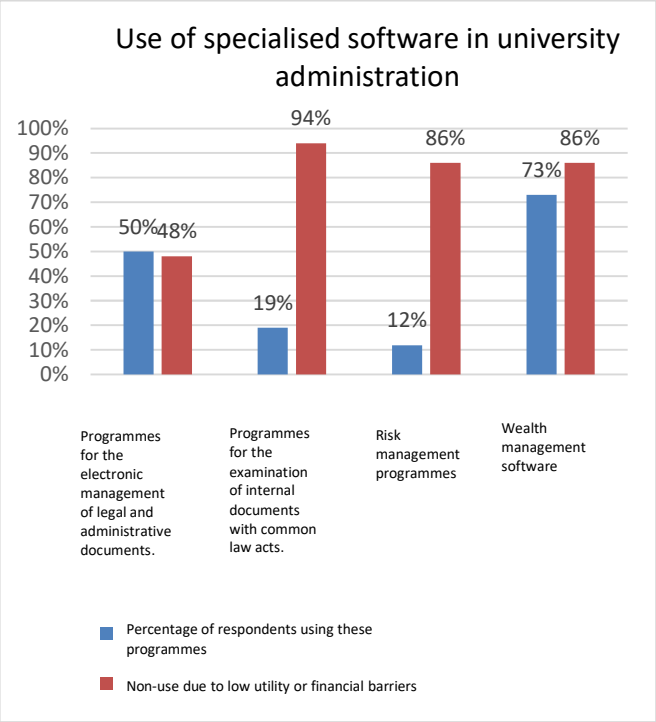
However, there are problems here too: students are not always allowed to do all the work related to their future profession. A trainee who is not actually a bank employee, for example, is not always allowed to use the software that handles operations carried out by the bank, if only because of banking secrecy, the possibility of making a loss-generating mistake, etc. In this context, the learning outcomes acquired in the course of an apprenticeship may be inferior to those of a new trainee employee, which reduces the economic efficiency of using computer technology in this form of training.

VI. COMPUTER TECHNOLOGY AND EFFECTIVE MANAGEMENT OF THE TEACHING PROCESS

As far as university management is concerned, IT solutions usually provide support for the functioning of collegiate bodies

in the form of e-communication (meetings of the senate, faculty councils, chairs online) and support decision-making in various areas (compliance of internal documents with the applicable law, communication with students on administrative matters, asset management, risk management). As of today, it is known that universities use the above-mentioned possibilities to varying degrees. Certainly, in the lockdown period, the possibility of remote organisation of meetings of various collegiate bodies was widely used in universities. As far as other tools are concerned, the survey conducted among 64 Polish HEIs shows that the most popular were decision support software for asset management and legal and administrative document management (Fig. 4).

FIGURE 4: USE OF SPECIALISED SOFTWARE IN UNIVERSITY ADMINISTRATION.



Source: Own study based on the Report from the survey Higher education and technology Warsaw, May 2021. (Piotrowska-Albin et al., 2021).

The explanation of the respondents as to the reasons for the relatively low use of software supporting university administration (risk management software, software for checking compliance of documents with the applicable law) seems puzzling. As a rule, the surveyed HEIs claimed that the reason is the ability to "cope" without such software or too high price. This leads to the conclusion that at present the usability/price ratio of such IT solutions is assessed by the respondents as too low.

From the point of view of didactic management, software supporting the work of deans' offices is extremely important. This is because it usually provides remote access to all documents, ensures that the distribution of hours is consistent with study plans and curricula and the planned staffing of classes, and organises the circulation of records of credits and examinations. At the same time, thanks to this software, lecturers gain access to course syllabuses, can propose changes and make corrections in accordance with the university's internal regulations. Virtual deanery software is therefore, from the point of view of teaching management, the heart of this activity. Good quality software supporting the work of the deans' offices is commercial software costing hundreds of thousands of zlotys. However, the benefits it provides to the university are also very high. Nowadays, in the era of shorter queues for entry and the widespread virtualization of many documents - including exam cards and indexes - it is difficult to imagine even a small university functioning without a virtual dean's office. The cost of this software and its implementation is becoming a necessary expense.

A significant problem associated with the use of this software are new functionalities resulting from changes in the law. As an example we can mention the high cost of adapting the software to the requirements generated by the introduction of the Polish Qualification Framework and its subsequent modifications. Moreover, changing this kind of software to another one also generates significant additional costs connected with adapting different requirements as to the format and scope of transferred data.

VII. CONCLUSION

In accordance with the existing model of higher education in Poland, the use of computer technology in the implementation of the main objective of the activity of higher education institutions should be considered multifaceted. These planes mainly boil down to four threads: didactics in the form of standard classes (lectures, exercises), scientific research, professional practice and organizational and managerial area of university operation.

The economic effectiveness of the functioning of the university understood as the relation of the obtained learning outcomes of the use of services or to the consumption of resources for this purpose does not coincide with its financial dimension. This is mainly due to the possibility of "free" copying of IT products in the form of software and conditioning the profitability of their production by the universality of use. Therefore, they are free of charge or made available at a significantly reduced price for teaching purposes not only for universities, but also for students. The widespread use of personal computers and the availability of the Internet in households have created the possibility to use computer technology, as it were, "by the way" for educational purposes, without incurring additional expenses for this purpose.

The need for a widespread transition to remote learning during the pandemic period has shown that, in principle, there is sufficient hardware potential in the economy to make this transition. The existence of free e-learning platforms and the free provision of communication platforms to universities resulting, among other things, from the phenomenon of ubiquity, made it possible to meet the needs of remote learning from the software side. The urgent need for remote implementation of didactics forced the instructors to develop educational materials in electronic form free of charge. On this basis, it can be said that we currently have enough of the

necessary resources to provide remote learning at a level achievable with the necessary technical resources, didactic preparation and shaped educational model. However, this level turns out to be insufficient: the educational results achieved in the online process are assessed to be significantly inferior to those achieved in traditional classes. Thus, the economic efficiency of forced online learning is lower, despite the involvement of much greater resources to achieve this, even if it refers only to lectures as the form of classes most suitable for distance learning. Of key importance here is the commonly developed model of remote learning, in which the student, although accepting the remote form of teaching, when participating in a large group increasingly often takes the attitude of a spectator, rather than an active participant in the classes. This is fostered, among other things, by technical limitations in the form of a lack of vision and sound due to the bandwidth of connections, but above all - in contrast to the traditional lecture - the lack of refined teaching methods and effective and widely accepted tools of the lecturer to motivate all participants of an online lecture to active participation.

It seems that solving this problem is one of the important challenges facing higher education - otherwise the resources which are positive "covidien" achievements will be lost: e-materials prepared for remote teaching and acquired teaching experience, as well as lecturers' skills in operating remote communication platforms will in many cases be irreversibly depreciated.

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