

## Article

# Factors Affecting the Efficiency of Teaching Process in Higher Education in the Republic of Serbia during COVID-19

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**Abstract:** From the moment the Republic of Serbia declared a state of emergency in the summer semester of 2019/2020, higher education institutions (HEIs) used various teaching models from Distance Learning Systems (DLS), online platforms and modern information and communication technologies (ICT), to sending materials via student e-mails and notifications via faculty portals. Using survey research as a method, the paper describes the experiences of teachers and associates at HEIs in Serbia (780 respondents) regarding the efficiency of provided education services. In this article, we used the method of content analysis and participatory observation, as well. We analysed the attitudes of teachers and associates apropos the efficiency of providing educational services through the work from home (WFH) model and distance learning (DL) and other models used in response to COVID-19 epidemiological measures in education. During the WFH setup, we looked for factors that affect educational efficiency. When it comes to the statistical technique, factor analysis was selected. Technology, managerial support, and work-home conflict are all expected to impact process efficiency, so these were the first criteria considered when selecting potential factors. Principal Component Analysis (PCA) was used as the extraction method, and the Varimax rotation method was also used. We discarded all factors with eigenvalues below one. Four factors caught our attention: School management support, Family-work conflict, Home infrastructure, and Technology choice. The results showed that F1 (School management support) is positively correlated to F2 (Family-work conflict) and efficiency and negatively correlated to F3 (Home infrastructure). Conversely, F2 is negatively correlated to F3 and positively correlated to efficiency. The F4 factor shows no significant correlations to other factors.

**Keywords:** distance learning systems (DLS); higher education institutions (HEI); work from home (WFH); human resource management (HRM); COVID-19; principal component analysis (PCA)



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## 1. Introduction

The COVID-19 pandemic forced many countries to take urgent measures, but it also caused an explosion in the online education system, which emerged as a necessary response to the health crisis [1]. One month after the official declaration of the COVID-19 pandemic, over 1500 research papers dealing with the topic of online education in the circumstances of the newest health crisis had already been uploaded to the Web of Science database. The majority of these papers put emphasis on describing different practices around the world regarding the implementation, but they also highlighted the corrections of the education system under these new, extraordinary conditions. In April 2020, it was estimated that 91.3% or approximately 1.5 billion students from different countries would be prevented

from participating in regular activities, i.e., attending and listening to lectures (traditional instruction) because of the COVID-19 virus [2]. A noticeable shift from traditional to online education, without any prior preparation, certainly marked the first but also the second year of the global pandemic [3]. The confirmation of the pandemic forced many students to return to their homes or home countries and to attend lectures via digital means. Online teaching and learning are the only alternative solutions in the implementation of teacher and student activities from the teaching activities set that have not undergone a reduction or interruption, and that is the main reason why this form of teaching was most widely used. Numerous issues regarding WFH in the education sector have become the subject of research from different demographic, psychographic and behavioural aspects in a short time [4].

The COVID-19 pandemic caused major disruptions in the work of educational institutions and visibly affected the work of students, teachers and educational institutions because, in certain periods, complete or partial closure of schools, colleges and universities around the world was imposed [5]. Due to the lack of information about the potential duration of the pandemic, many educational institutions quickly resorted to online teaching using various technological tools to maintain teaching continuity [6]. It is interesting to note that before the beginning of the COVID-19 pandemic, very few educational institutions had functioned exclusively or partially on the principles of online education. The latest health crisis has, in a short time, forced many educational institutions to adapt their activities to online teaching. Nevertheless, it is not always easy to successfully digitalise teaching [7].

During the 2019/2020 summer semester, from the moment of declaring a state of emergency in the Republic of Serbia, teaching in higher education institutions was implemented through different teaching models, from online platforms, modern information and communication technologies (ICT), to sending materials to students via e-mail, and notifications via faculty portals during the 2020/2021 winter semester, and finally, the latest transition to an online and blended teaching model. Different teaching methods and educator approaches had varying effectiveness and student acceptance. As there is certain research on students' attitudes [8] regarding the educational services received in this period [9], but not the attitude of educators, the contribution of this research lies in the fact that the paper examines the attitudes of educators, i.e., teachers and associated in higher education institutions (HEI) in Serbia.

It was necessary to draw on a wide range of academic, scientific and public sources in order to get a complete picture of the research topic. A survey was conducted in Serbia among teachers and assistants in higher education institutions (HEIs) during the pandemic to gather data and information on how teachers and assistants perceive the efficiency of the teaching process they performed, along with various factors and variables. The results will be presented within the result chapter, while in the discussion chapter, those findings of the secondary and primary research will be summarised.

The main assumption this paper starts from is that there is a relatively small number of measurable factors that affect the effectiveness of the teaching process. Factor analysis was used for testing these assumptions, as well as other derivatives.

## 2. Literature Review

### 2.1. COVID-19 Impact on Higher Education in Serbia

The COVID-19 pandemic has not only caused health problems but has also given rise to numerous economic challenges. The governments of most countries in the world implemented the so-called social distancing in the form of corrective societal measures, which had the greatest implications on people's mobility [10]. As a result, in a short period of time, the general manner of social and professional life has been irreversibly changed. For the first time in modern history, due to lockdown measures, high-skilled workers were mostly forced to work from home, and some encountered technological performance challenges unprepared for the first time. It is important to note that in this case, we do not have traditional WFH but enforced work from home during the pandemic, which requires

a far more complex analysis compared to regular working conditions [11]. In this sense, it is very important to examine the urgency of the transition to online teaching based on the quality criteria that will be presented in the paper.

The cancellation of fairs, festivals and various music and sports events, as well as educational activities, had far-reaching consequences at the global level, in addition to health challenges [12]. The three industries with the lowest share in WFH activities are: (1) agriculture, forestry and fisheries; (2) tourism and the hospitality industry; and (3) construction, as opposed to (1) finance and insurance; (2) information and communication technologies; and (3) education—the three industries with the largest share in WFH jobs [13].

The President of the Republic of Serbia declared a state of emergency on March 15, at a time when, according to official data, there were 48 confirmed cases of infection with COVID-19 and no deaths [14]. On Monday, 16 March, all schools, universities and preschool institutions were closed due to the state of emergency, while all sports events and public gatherings were banned.

Different higher education institutions in the Republic of Serbia reacted to the state of emergency with different levels of alacrity. Those few among them that possess distance learning platforms and software for communicating with students, as well as lecture archives, were able to respond quickly and provide their students with quality materials and an adequate alternative to face-to-face lectures in classrooms and lecture rooms. Some faculties succeeded in organising some form of “teaching” such as sending presentations and other materials to students, where the organisation itself fell on the shoulders of teachers, but most did not manage even that, as evidenced by student statements and comments on various forums and portals, as well as survey results [9,15,16]. The combined (blended) model of teaching implied traditional instruction combined with elements of online instruction. Some faculties promptly informed students about these changes on their official websites. All forms of direct teaching (lectures and practical classes), as well as consultations with students, were realised through the means of electronic communication. The colloquia and exams at all levels of study were postponed at all higher education institutions in the Republic of Serbia until the conditions for their realisation were met [17]. Various surveys examining student satisfaction with the educational services received during the state of emergency were conducted. The OECD report on the effects of the COVID-19 pandemic on the economic development of Serbia shows that in late March 2020, as many as 67,000 workers already worked from their homes [18]. In the Republic of Serbia, teachers are elected to different academic titles according to the Law on Higher Education (assistant professors (docents), associate and full professors, professors of applied studies, senior instructors and instructors, as well as skills teachers and language teachers) [19]. This was indicated, given that all aforementioned categories were subsequently included in the online survey.

One of the first surveys was published on the NajStudent.com website (in the period between 21 April and 27 April), where 1447 students answered questions about the effects of the pandemic on their studies. The results of this survey indicate that the reactions of different faculties to the pandemic varied, sometimes greatly, and that the choice of a communication channel with students often fell on teachers. Some professors sent different materials in PDF and ppt format to their students via e-mail or uploaded them to the faculty websites, while one-third of the professors held online lectures, and 16% held consultations on fixed dates. The majority of students (70%) declared that these changes negatively impacted their knowledge acquisition, almost one-quarter did not feel that there was a big difference compared to regular lectures, and only 8% stated that they acquired knowledge more easily this way.

Another significant piece of research in the same organisation was conducted on a sample of 1955 respondents in August 2020, and it was concluded that, in addition to the organisation of online studying, the pandemic also greatly affected the students themselves. Judging by the respondents' answers, more than half lost their study sense, and the other effect of the pandemic was that they needed more time to master the material due to the

lack of lectures and practical exercises. Two-fifths of the respondents stated that they miss contact with their fellow students, while only 21% stated that this situation gave them more time for studying.

## 2.2. Human Resource Management in Education and Work from Home

Human resource management in educational institutions has become particularly complex since various factors now affect individual behaviour. The productivity of teachers and associates largely depends on their educational and pedagogical capacities [20].

Human resource management as a scientific discipline and practice provides valuable advice and guidelines regarding the organisation of functions and processes. If the organisations follow this advice and guidelines, combining them with the best practices and lessons learned, they increase their success in achieving organisational goals and specific business goals. Human resource management in education must consider different variables in developing an optimal model of functions and processes due to different models of financing their operations, management models, regulatory constraints, etc. [21].

The complexity of human resource management and its significance for modern business demand that all activities related to human resources must be carefully planned and planned in detail. Any human resource plan must be aligned with organisational strategies and aimed at achieving and maintaining long-term competitive advantage [22].

In the Republic of Serbia, teachers are elected to different academic titles according to the Law on Higher Education (assistant professors (docents), associate and full professors, professors of applied studies, senior instructors and instructors, as well as skills teachers and language teachers) [19].

The quality of the teacher workforce should be increased in order to improve the educational standard. To achieve a higher educational standard, it is important to define the factors that improve teachers' work. In order to efficiently achieve the goals and tasks of quality educational standards, teacher performance management plays a crucial role because it represents a continuous process of identifying, evaluating and developing teacher performance. It is also well known that human resources play a decisive role in the performance of educational organisations [20]. In order to improve teacher quality, a good system of performance management, i.e., planning, monitoring and supervising the needs of schoolteachers, is necessary [23].

According to the Cambridge Dictionary, teleworking is "the activity of working at home, while communicating with your office by phone or e-mail, or using the internet" [24]. Teleworking is also commonly called telecommuting, remote work, future of work, telework, teleworking, working from home (WFH), work from anywhere (WFA), flexible workplace, mobile work, remote job, etc. [24].

Work from home (WFH) is a type of employment where an employee fulfils their basic work duties while staying at home and using information and communication technologies (ICT). It requires the shared responsibility and commitment of both the employer and the employee in order to ensure the continuity of business and employment. "Work from home" is a phrase that has been used extensively since the beginning of the COVID-19 pandemic and generally refers to the situations in which employees perform their work tasks outside the company's offices. Savić points out the basic postulates of WFH: (1) a person is an employee of the given company or a member of the given organisation; (2) the person carries out business activities given by the company or specific business tasks; (3) business operations are carried out outside the company's offices, and (4) the employees use telecommunications to communicate with their superiors [25].

With the emergence of the COVID-19 pandemic, human resource management in many organisations has been given new responsibilities, from dividing employees into essential and non-essential workers to taking care of the physical and mental health of employees who were forced to take up the telework model.

The development of ICT has enabled and facilitated alternative forms of employment, including WFH or teleworking. These expressions are often used interchangeably and refer

to new models of employment outside the employer's offices or one's workplace. However, there are certain differences between these terms. For example, some refer to temporary arrangements, whereas others refer to long-term arrangements. WFH refers to telework from one's home, and the difference is that telework may involve different locations away from the primary workplace or the company's offices (such as mobile work). Long-distance travel refers to the replacement of telecommunications with travel [26].

In teleworking, it is necessary to create flexibility in order to balance work and private life. In most cases, thanks to the available technology, employees who work from home can now more easily meet their deadlines and communicate with the world of work outside their office. Many companies, especially during COVID-19, realised that many workers, primarily white-collar workers, can work from any location, although this form of employment brings numerous challenges.

Employees need to look at all aspects of their job and find a way to remain productive, as well as learn how to collaborate with colleagues with whom they have no personal contact. Telework may influence mental and emotional health because employees are often exposed to stress, fatigue, isolation and burnout. Employees need to carve out a place for themselves and become indispensable even when they are out of the office, to cope with a burnout in a healthy way, to be focused despite the distractions at home, to set boundaries between their job and personal life, to harmonise the demands of parenthood, build partnerships with their virtual teams and superiors, be productive, help other associates who work from home, and manage conflicts [27].

The global COVID-19 pandemic has caused physical distancing primarily for health-care purposes. Many companies were forced to reduce their business activities or adapt to the new situation by having their employees work from home. For some activities and workers, this was easy, but many areas of work are faced with the complex problem of the impossibility of dislocating work. For those whose basic work activity is working from home, it is extremely important to evaluate both the benefits and the virus containment policies [28].

The transition from office work to working from home was much more noticeable among those workers with higher education and better income. It was also more visible among clerks than labourers, national minorities, unskilled workers and those with lower income in the first wave of the pandemic. Titan et al. [29] also pointed to the previous claims, adding that women (30%) were more likely to switch from traditional to work from home jobs during the pandemic than men (25.6%). The same group of authors noticed that the industries that recorded the largest increase in the transition from traditional to work from the home model are IT, financial/insurance companies, companies that provide architectural services, and managerial jobs. For many workers who, due to the nature of their job, were offered the possibility of working from home, in addition to avoiding physical contact to a significant extent in order to protect themselves from COVID-19, it was also possible to continue with their business activities without salary reductions, which is a significant advantage over those workers who perform traditional jobs, such as traditional sales, services (doctors, dentists, hairdressers, beauticians, etc.), and various transport services.

### *2.3. Distance Learning and e-Learning*

When it comes to the use of ICT in education, and given that the world of the 21st century is undergoing sudden changes, there is a strong need for the use of information and communication technologies (ICT) in education. The use of ICT in educational processes is still at a very low level in many countries, and it is, therefore, necessary to train teachers in ICT so as to prepare for skill-based re-engineering of society. ICT is the most efficient tool for rapid dissemination of information and knowledge transfer, decentralisation of work, and development of the workforce; however, it is also expensive. With the help of ICT, a teacher becomes a facilitator, supervisor, and leader in classroom teaching. However, the mandatory acquisition of ICT skills by teachers should be a priority despite the fact

that, in many countries, teachers do not even possess the basic knowledge of hardware and software, i.e., information technology [21].

In terms of the evaluation of distance education, the most optimal element is the Community of Inquiry (CoI) theoretical framework and its significance for remote education [30]. This model is useful for designing blended learning environments that redefine today's higher education. According to Garrison, the Community of Inquiry is a group of individuals who collaboratively engage in purposeful reflection in order to personal meaning and confirm mutual understanding. The Community of Inquiry theoretical framework represents a process of creating a deep and meaningful (collaborative-constructivist) learning experience through the development of three interdependent elements—social, cognitive and teaching presence [31].

Social presence represents the student's ability to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop interpersonal relationships by way of projecting their individual personalities. Teaching Presence is the design, facilitation and direction of cognitive and social processes for the purpose of realising personally meaningful and educationally worthwhile learning outcomes. Cognitive presence is the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse [31].

Distance learning is a relatively new learning concept in higher education in the Republic of Serbia, where information technologies are a kind of mediator between the instructor and students who do not have to be physically present on the premises of the educational institution. This form of learning can be a supplement to traditional learning, or it can replace it completely, which is something we are all witnessing in the pandemic conditions of business, but also in education. Starting from March 2020 until the present day, distance learning has been implemented in most higher education institutions in Serbia, with the exception of education of study programs that require instructors to be physically present in the classroom in order to hold practical classes/exercises.

There is a difference between distance learning and online learning (e-learning). While completing their digital lessons and assessments in the classroom with an instructor, students can be together with online learning (eLearning). Students who have enrolled in distance learning courses complete assignments and check in digitally while working online from home.

As a result of their ability to facilitate distance interaction via virtual networks, social networks, forums, and virtual reality (VR) facilities, e-learning and distance learning have become a necessity in today's hectic society. Virtual reality simulations can be used in distance learning and e-learning in the future to place students in realistic situations. They can use a gaming platform where the action is not performed using the mouse but by structuring and procedurally editing comments in a way that ICT students can use [32].

There is no doubt about the importance of the distance learning system, where students do not lose anything when it comes to teaching quality, but they are able to adjust it to their own rhythm, time and location of attendance. Reports indicate that only a few higher education institutions in Serbia have applied for accreditation of distance learning programs and courses [33], giving the impression that there is more than enough room for their implementation in the near future. Certainly, the biggest challenges exist in the field of organisational activities, which are predominantly rooted in the traditional (face-to-face) approach to teaching.

Universities must embrace new technologies and develop new methods of training and teaching to meet the expectations of millennials and the technological revolution [34]. Research from Romania conducted among students showed that students find that immersion of Virtual Reality (VR) and Augmented Reality (AR) in the process of presenting the information and knowledge acquisition can be considered as a method of improving the quality of higher education [35].

### 3. Materials and Method

#### 3.1. Method

The data required for the study will be gathered through the use of content analysis, participatory observation and survey research. The observed changes that served as the basis for developing the questionnaire will be recorded based on the analysis of the content and observations with participation.

There are two time periods covered by this study: summer 2019/20 semester, during which the COVID-19 pandemic was declared and schools, faculties and preschools in the Republic of Serbia were closed, and the winter 2020/21 semester, during which most higher education institutions used an online or combined teaching mode. Participants in the study shared experiences with distance learning and work-from-home scenarios, and the results of a comprehensive survey that looked at the experiences of other teachers and colleagues in Serbia are an essential part of the study. The 780 respondents to the survey were faculty teaching staff from Serbian higher education institutions. The questionnaire was distributed via the ResearchGate community, the business social network LinkedIn, and the education e-mail addresses of all Serbian higher education institutions. The survey's results will be analysed with descriptive statistics and the SPSS program. The Likert scale was used for the questions, with answers ranging from one to five [36].

We examined teachers' and colleagues' perceptions of the efficiency of providing educational services via the work from home (WFH) and distance learning (DL) models, as well as other models. During the WFH setup, we looked for educational efficiency factors. When it comes to the statistical technique, factor analysis was selected. Assuming that technology, managerial support and work-home conflict would all impact process efficiency, these were the first criteria considered. The extraction methods were PCA and Varimax rotation.

We sought to ascertain which factors affect the educational process's efficiency in the WFH setting. The statistical technique chosen was factor analysis. The items that could be considered factors were chosen with the expectation that technology, managerial support, and work-home conflict would all have an effect on the process's efficiency.

Principal Component Analysis was used for extraction, and Varimax with Kaiser normalisation was used for rotation. We discarded all factors with eigenvalues less than one. Four factors have been identified: (F1) School management support, (F2) Family-work conflict, (F3) Home infrastructure and (F4) Technology choice.

We have formulated four hypotheses:

**Hypothesis 1.** *Academic workers endured WFH during the COVID-19 pandemic more efficiently thanks to the support of their school management.*

**Hypothesis 2.** *Academic workers have efficiently harmonised their private life and worked from home during the COVID-19 pandemic.*

**Hypothesis 3.** *Academic workers efficiently used the existing home IT logistics/infrastructure for WFH during the COVID-19 pandemic.*

**Hypothesis 4.** *Availability of IT resources for WFH did not threaten the effectiveness of academic workers during the COVID-19 pandemic.*

The research hypotheses are based on examining the balance between the instructor's work and private life, experiences related to the effectiveness of online student learning (seen from the standpoint of the instructor), and support of the higher education institution's management where the instructor works, i.e., selection of the necessary DL technology and home infrastructure needed for work from home.

In the following subsectors of this chapter, we will explain the factors that we have observed and the hypotheses that we have formulated.

### 3.2. School Management Support

The COVID-19 pandemic has caused significant changes in the activities of all educational institutions. The importance of prompt reaction of the school management in such situations was extremely important [37]. The senior school management was expected to successfully handle various regulations in a short time, as well as business procedures in emergency situations, while also communicating internally with the employees and externally with students and their families. For school managers, the main focus was adaptation aimed at a safe, shared and efficient work zone during the pandemic. Given the strategic task that schools and their administrators normally have during the pandemic, it was raised to an even higher level [38,39].

In the conditions of the COVID-19 pandemic, school managements had a decisive role in overcoming the hardest first weeks and months during the complete lockdown, when the potential duration and scope of the health crisis were uncertain. The leaders of academic establishments had to handle the conditions and manner of work carefully, as well as continuous and up-to-date communication with their instructors carefully and like good hosts [40]. Pandemic conditions forced school managements to enforce a stronger hierarchical discipline to ensure that the effectiveness of teaching was not seriously disrupted [41]. It is believed that the management of higher education institutions that managed to increase the motivation and engagement of their teachers in online instruction during the COVID-19 pandemic has made a genuine sustainable contribution to education [42].

The role of management of higher education institutions during the COVID-19 pandemic largely refers to the technical-technological infrastructure on which online teaching is based and which was either missing or insufficient in certain situations. In addition, management support was sometimes lacking because the information on distance education was not conveyed in a clear and timely manner [43]. Notwithstanding the above, it is believed that most teachers had visible support from their employers [44], usually in the form of intensive workshops and training courses that trained them for implementing online teaching in a short time.

When it comes to management support, it is certain that many educational institutions in the early months of the COVID-19 pandemic were faced with the impossibility of conducting traditional instruction in laboratories and specialised classrooms, which is necessary for certain professions that require face-to-face contact (medicine, dentistry, acting, chemistry, electronics, etc.), unlike many other fields with so-called social orientation that experienced positive effects of online learning (foreign language learning, journalism, law, media, etc.) [45].

### 3.3. Family–Work Conflict

In the period since March 2020, when the global COVID-19 pandemic was declared, WFH did not imply daily work from home [46]. In the past year and a half, many workers were suddenly forced to work from home on a daily basis, which greatly threatened their work–home balance [47]. As a result of numerous changes that arose due to the emergency situation, there has been a marked decline in the efficiency of workers who switched to work from home [48]. The biggest imbalance caused by WFH seems to arise from a smaller or narrower workspace at home, i.e., the fact that the kitchen or the living room often represented one's workspace [49]. Moreover, we should not overlook the fact that several family members often shared the same space for their private, educational or professional activities. The fact of the so-called shared roles, i.e., situations when an academic worker working from home performed the role of a teacher, cook, cleaner, etc., in addition to their professional role, should also be taken into account [50]. All these things have been and still are potential triggers for stress, reduced satisfaction with work performed, increased exposure to negative news, etc. [51,52]. It is evident that the preparation of online classes in a relatively short period of time was more time-consuming than traditional instruction [53]. There is an interesting study that points out how female instructors in higher education

institutions decreased their publication of scientific papers by 50% due to, it is believed, additional responsibilities in the work-from-home conditions [54].

### 3.4. Home Infrastructure and Technology Choice

High-skilled workers and clerks were suddenly forced to use technology they had largely never used before in their work and which, in many cases, they were encountering for the first time. Due to the fact that entire companies were literally sent home to do their jobs, it is important to examine how employees, especially those in higher education institutions, accepted the challenges with online learning as “business as usual” with the support of existing technology. Universities with their managerial and teaching staff always represent the basis of available knowledge and skills provided through the use of new digital technologies as an effective pedagogical tool [55].

A recent study [56] showed that there are several elements that affect the quality of online teaching. They include efficiency (ease of access to necessary information), student–teacher interaction (use of different discussion forums), inclusion (special attention is paid to individual student needs) and self-learning (maximum support to students to prepare independently for exams, but with well-prepared exam materials).

Other authors note that previous experience of both teachers and students is crucial for online teaching [57,58]. Popa et al. [59] examined factors that can improve online teaching, concluding that more adaptable instructors were able to seek the improvement of digital support, which they later used to improve their teaching practice in pandemic conditions.

Other researchers [60] underline the importance of personal skills of both teachers and their students, and in addition to the interaction between them, they focus on the availability and accessibility of learning resources, as well as external conditions of teaching and learning that can leave quite a mark. Given the present pandemic conditions that resulted in online instruction, instructors were often forced to change the way they communicated with their students, which was often mentoring and advisory in nature, even when it comes to the traditional adoption of the material [61]. Despite numerous benefits, there are researchers who also examined the disadvantages of online teaching, primarily emphasising poor technical-technological requirements that have to be met [62,63].

## 4. Results

### 4.1. Research Process and Design

A survey questionnaire was created using Google Forms software in order to conduct the research. We distributed the survey to members of the scientific community via ResearchGate and the professional community via LinkedIn. Additionally, teachers and associates received an e-mail with a link to the survey’s electronic form. The questionnaire was sent to all of the faculties’ and universities’ publicly available e-mail addresses, as well as to all of the faculty and university websites. Teachers’ and associates’ satisfaction with various aspects and agreement with cognitive attitudes were assessed using a five-point Likert scale and a numerical assessment scale [36].

In the following subsegments of this chapter, we will present data and variables that we have gathered. We will examine the adequacy of the sample and its representativeness. The socio-demographic characteristics of the sample will be presented, after which the results of the factors analysis will be provided.

### 4.2. Data and Variables

According to the data of the Statistical Office of the Republic of Serbia for 2019/20, there were 122 public higher education institutions and 62 private higher education institutions, or 184 in total. Eighty-two faculties were public, whereas 84 were privately owned. When it comes to colleges, there were 54 in total, 40 of which were public and 14 private ones [64,65].

In the Republic of Serbia, during 2019/20, 16,201 teachers and associates were employed in higher education institutions, so the size of the population was 16,201 (11,823 teachers and 4378 associates [64,65], as shown in Table 1.

**Table 1.** Teaching staff in the Republic of Serbia in 2019/20 [64].

| Category                  | Teachers |        |        |
|---------------------------|----------|--------|--------|
|                           | Total    | Male   | Female |
| Total                     | 16,201   | 11,823 | 4378   |
| Doctorate holders         | 11,024   | 10,372 | 652    |
| Masters and specialists   | 3098     | 1041   | 2057   |
| Without an academic title | 2079     | 410    | 1669   |

Regarding sample adequacy and representativeness, in 2019/20, in the Republic of Serbia, there were 16,201 teachers and associates, so the size of the population is 16,201 [64,65], the sample comprises 780 respondents, the confidence level is 95%, the confidence interval is 3.6%, and therefore, the sample is adequate. When it comes to sampling representativeness, the entire sample consisted of teachers and associates from Serbia who worked at faculties and colleges in the Republic of Serbia during the two observed semesters, so the sample adequately represents the entire population. Thus, it can be said that the sample is representative, i.e., that it realistically reflects the actual structure of the population. It can also be argued that the sample is adequate because it is large enough.

With the confidence interval of 0.95, the risk of error is  $\alpha = 0.05$ . The confidence interval of 95% was chosen because it provides the highest confidence and relative accuracy of the assessment at the same time. Thus, we make claims with the confidence of 95%, i.e., there is a 5% risk of error.

A total of 780 respondents participated in the survey—466 male (59.7%) and 314 female (40.3%), which indicates a marked dominance of the answers given by male respondents at higher education institutions in the Republic of Serbia. The age distribution of respondents shows a dominant group of career-pursuing respondents in the 31–45 age group, consistent with the professional status of the research group. The majority of the respondents are doctorate holders (63.7%), followed by graduate (21.5%), postdoc (5.8%), master's (5.6%) and finally undergraduate (3.3%). The major fraction of respondents is doctorate holders (63.7%), as expected in higher education. Table 2 shows the academic rank distribution that allows us to register that the majority of respondents are university professors (55.3%), followed by teaching assistants (24.0%).

**Table 2.** Academic ranks distribution.

|                      | Academic Rank |         |
|----------------------|---------------|---------|
|                      | Frequency     | Percent |
| University professor | 431           | 55.3    |
| College professor    | 87            | 11.2    |
| Instructor           | 39            | 5.0     |
| Senior Instructor    | 6             | 0.8     |
| Teacher              | 12            | 1.5     |
| Language instructor  | 18            | 2.3     |
| TA                   | 187           | 24.0    |
| Total                | 780           | 100.0   |

The previous table demonstrates that little changed in what could be labelled as “classic ranks distribution in 20th century higher education.” University professors, both tenured and non-tenured, accompanied by their teaching assistants, are still making up

the dominant cohort (close to 75%) of all respondents. The work experience of respondents indicates a fairly balanced distribution, with an evident drop in the 15–20 years of experience group.

Table 3 displays differences in the scientific expertise distribution of respondents. A vast majority (over 40%) comes from the realm of humanities, which may be important in understanding the final results. Only a small fraction of respondents are from medical and artistic areas.

**Table 3.** The scientific expertise of respondents.

|                        | Scientific Expertise |         |
|------------------------|----------------------|---------|
|                        | Frequency            | Percent |
| Natural sciences, math | 124                  | 15.9    |
| Technology             | 240                  | 30.8    |
| Humanities             | 335                  | 42.9    |
| Medical                | 45                   | 5.8     |
| Art                    | 36                   | 4.6     |
| Total                  | 780                  | 100.0   |

Table 4 shows a very high dominance of universities towards colleges (approximately three-quarters of respondents come from universities).

**Table 4.** Type of the respondents' institutions.

|       |            | Institution |         |       |
|-------|------------|-------------|---------|-------|
|       |            | Frequency   | Percent |       |
| Valid | University | 599         | 76.8    | 76.8  |
|       | College    | 181         | 23.2    | 100.0 |
|       | Total      | 780         | 100.0   |       |

The questionnaire comprised a large number of questions, but for the purpose of rationality, the paper addresses only questions relevant to the research subject. Table 5 shows questions and variables of interest.

**Table 5.** Questions and variables analysed.

| Q No. | Variable                                                                                                                                                                                     | Code         |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Q16   | Choice of IT devices in WFH for online learning and communication with students and fellow teachers                                                                                          | WhichDev     |
| Q17   | Adequate Internet speed at home                                                                                                                                                              | IntFast      |
| Q18   | Own IT device for WFH                                                                                                                                                                        | OwnDev       |
| Q19   | Technology and software for online teaching used by the higher education institution where I work are of high quality.                                                                       | TechQual     |
| Q20   | Possessing adequate IT technology in the form of software, hardware, and high-speed network (by both educators and students) is very important for the process of online teaching.           | ITech        |
| Q21   | Support was provided by the management of the higher education institution, as well as the necessary resources for online teaching and WFH during the COVID-19 pandemic.                     | ManSupp      |
| Q22   | Usefulness of technical-administrative and other staff in aiding in online teaching during WFH                                                                                               | Useful       |
| Q23   | Management of the higher education institution organised an online staff meeting during the pandemic with clear instructions on how classes should be held in emergency circumstances.       | Instructions |
| Q24   | Style, frequency and manner of online communication with the management, technical support and other teachers influenced the effectiveness of team cooperation during the COVID-19 pandemic. | Efficient    |
| Q25   | During occasional visits to the school, the management ensured a safe stay in the facility.                                                                                                  | MasksDisinf  |
| Q26   | HR department informed us about relevant news during the pandemic.                                                                                                                           | News         |
| Q27   | Online work with students during the COVID-19 pandemic was more stressful than traditional instruction.                                                                                      | Stress       |
| Q28   | Satisfaction with the results of online teaching during the COVID-19 pandemic                                                                                                                | RUSatisf     |
| Q29   | The balance between work and private life was maintained while I worked from home.                                                                                                           | Balance      |
| Q31   | The conditions for uninterrupted work from home during communication with students were provided.                                                                                            | Terms        |

We tried to determine which factors influence the efficiency of the educational process in the WFH setup. Factor analysis was chosen as a statistical tool. The items that might represent factors were chosen to start from the idea that we expect technology, managerial/organisation support and work–home conflict to influence the efficiency of the process.

#### 4.3. Factor Analysis

The extraction method used was Principal Component Analysis, and the rotation method was Varimax with Kaiser normalisation. All factors with eigenvalues of less than one were discarded. We detected four factors, later identified as: (F1) School management support, (F2) Family–work conflict, (F3) Home infrastructure and (F4) Technology choice.

Detected factors, as described in Table 6.

**Table 6.** Items per factors.

|     | Rotated Component Matrix |        |        |        |
|-----|--------------------------|--------|--------|--------|
|     | Component                |        |        |        |
|     | 1                        | 2      | 3      | 4      |
| Q21 | 0.786                    | 0.114  | −0.118 | 0.008  |
| Q23 | 0.780                    | 0.100  | 0.068  | −0.046 |
| Q22 | 0.739                    | 0.122  | 0.009  | 0.098  |
| Q24 | 0.698                    | 0.121  | 0.118  | 0.024  |
| Q25 | 0.631                    | 0.104  | −0.123 | −0.081 |
| Q19 | 0.610                    | 0.270  | −0.133 | 0.188  |
| Q26 | −0.566                   | 0.084  | 0.124  | −0.028 |
| Q29 | 0.176                    | 0.735  | −0.184 | −0.055 |
| Q27 | −0.039                   | −0.720 | −0.041 | 0.057  |
| Q28 | 0.112                    | 0.674  | 0.009  | 0.141  |
| Q31 | 0.162                    | 0.596  | −0.407 | 0.034  |
| Q18 | −0.050                   | −0.047 | 0.749  | 0.051  |
| Q17 | −0.046                   | −0.113 | 0.727  | −0.064 |
| Q20 | 0.022                    | 0.189  | 0.030  | 0.757  |
| Q16 | −0.043                   | 0.134  | 0.042  | −0.720 |

Items constituting factors are listed as follows.

#### Factor 1 (F1): School management support

Items constituting the factor are shown in Table 7. Items range from direct academic and technical support provided to institutional help regarding coping with pandemics.

**Table 7.** Factor 1: School management support.

|     |                                                                                                                                                                                               |              |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Q19 | Quality technology and software used by the higher education institution                                                                                                                      | TechQual     |
| Q21 | Support was provided by the management of the higher education institution, as well as the necessary resources for online teaching and WFH during the COVID-19 pandemic.                      | ManSupp      |
| Q22 | Usefulness of technical-administrative and other staff in providing assistance in online teaching during WFH                                                                                  | Useful       |
| Q23 | Management of the higher education institution organised an online staff meeting during the pandemic with clear instructions on how classes should be held in emergency circumstances.        | Instructions |
| Q24 | Style, frequency, and manner of online communication with the management, technical support and other teachers influenced the effectiveness of team cooperation during the COVID-19 pandemic. | Efficient    |
| Q25 | During occasional visits to the school, the management ensured a safe stay in the facility.                                                                                                   | MasksDisinf  |
| Q26 | HR department informed us about relevant news during the pandemic.                                                                                                                            | News         |

### Factor 2 (F2): Family–work conflict

Items constituting the factor are shown in Table 8. As expected, family–work conflict constituted one separate factor.

**Table 8.** Family–work conflict.

|     |                                                                                                         |          |
|-----|---------------------------------------------------------------------------------------------------------|----------|
| Q27 | Online work with students during the COVID-19 pandemic was more stressful than traditional instruction. | Stress   |
| Q28 | Satisfaction with the results of online teaching during the COVID-19 pandemic.                          | RUSatisf |
| Q29 | The balance between work and private life was maintained while I worked from home.                      | Balance  |
| Q31 | The conditions for uninterrupted work from home during communication with students were provided.       | Terms    |

### Factor 3 (F3): Home infrastructure

Items constituting the factor are shown in Table 9. This is the simplest factor regarding the structure and obviously represents the home infrastructure.

**Table 9.** Home infrastructure.

|     |                                 |         |
|-----|---------------------------------|---------|
| Q17 | Adequate Internet speed at home | IntFast |
| Q18 | Own IT device for WFH           | OwnDev  |

### Factor 4 (F4) Technology choice

Items constituting the factor are shown in Table 10. This factor describes the concrete choice for a device to be used in the home-based teaching setup.

**Table 10.** Technology choice.

|     |                                                                                                                                                                                   |          |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Q16 | Choice of IT devices in WFH for online learning and communication with students and fellow teachers                                                                               | WhichDev |
| Q20 | Possessing adequate IT technology in the form of software, hardware and high-speed network (by both educators and students) is very important for the process of online teaching. | ITech    |

Regarding the efficiency, we have used two items (Q32 and Q30) and calculated their mean.

The factors were averaged over corresponding items instead of z-scores to preserve the original Likert-scale measurement quality for a more straightforward interpretation. The descriptive statistics for factors are displayed in Table 11. It is evident that the original measurement scale was preserved.

**Table 11.** Descriptive statistics for factors.

|    | Descriptive Statistics |         |         |        |                |
|----|------------------------|---------|---------|--------|----------------|
|    | Range                  | Minimum | Maximum | Mean   | Std. Deviation |
| F1 | 3.57                   | 1.29    | 4.86    | 3.5223 | 0.77001        |
| F2 | 3.25                   | 1.75    | 5.00    | 3.7888 | 0.56793        |
| F3 | 1.50                   | 1.00    | 2.50    | 1.1103 | 0.29980        |
| F4 | 3.50                   | 1.00    | 4.50    | 2.9942 | 0.36225        |

Afterwards, the correlations for four factors and the efficiency measure were calculated. Table 12 displays the results (Pearson correlation coefficients, statistical significance at  $p = 0.01$  level was indicated by bold typeface).

**Table 12.** Correlation coefficients for factors and the efficiency measure.

|            |                     | Correlations |           |           |        |            |
|------------|---------------------|--------------|-----------|-----------|--------|------------|
|            |                     | F1           | F2        | F3        | F4     | Efficiency |
| F1         | Pearson correlation | 1            | 0.257 **  | −0.123 ** | 0.060  | 0.142 **   |
|            | Sig. (2-tailed)     |              | 0.000     | 0.001     | 0.092  | 0.000      |
| F2         | Pearson correlation | 0.257 **     | 1         | −0.202 ** | 0.046  | 0.150 **   |
|            | Sig. (2-tailed)     | 0.000        |           | 0.000     | 0.196  | 0.000      |
| F3         | Pearson correlation | −0.123 **    | −0.202 ** | 1         | −0.047 | −0.017     |
|            | Sig. (2-tailed)     | 0.001        | 0.000     |           | 0.187  | 0.631      |
| F4         | Pearson correlation | 0.060        | 0.046     | −0.047    | 1      | 0.053      |
|            | Sig. (2-tailed)     | 0.092        | 0.196     | 0.187     |        | 0.139      |
| Efficiency | Pearson correlation | 0.142 **     | 0.150 **  | −0.017    | 0.053  | 1          |
|            | Sig. (2-tailed)     | 0.000        | 0.000     | 0.631     | 0.139  |            |

\*\* The asterisk symbol indicates statistical significance at 0.01 level.

## 5. Discussion

The main premise of this article was that there are only a few measurable factors that influence the effectiveness of teaching. These assumptions and derivatives were tested using factor analysis. The study collected data through content analysis, participant observation and survey research. The content analysis and participant observations were used to record the observed changes that shaped the questionnaire. An extensive survey of teachers and colleagues in higher education in Serbia was conducted as part of the study. The survey had 780 respondents from Serbian higher education institutions. The aim of the study was to determine what factors affect the educational process in WFH. Factor analysis was chosen as the Technology, managerial support, and work–home conflict were all expected to have an impact on the process’s efficacy. Extraction was done using PCA, and rotation was done using Varimax with Kaiser normalisation.

In addition, the research hypotheses examined the instructor’s experiences with online student learning (from the instructor’s perspective) and the management support provided by the higher education institution where the instructor works, i.e., selection of the necessary DL technology and home infrastructure needed to work from home.

Firstly, we have identified four factors affecting the efficiency of the process. These factors, (F1) School management support, (F2) Family–work conflict, (F3) Home infrastructure and (F4) Technology choice, are in good accordance with our initial idea, as we expected technology, managerial/organisation support and work–home conflict to influence the efficiency of the process.

Moreover, from obtained results, it was clear that F1 (School management support) is positively correlated to F2 (Family–work conflict) and efficiency and negatively correlated to F3 (Home infrastructure). Additionally, F2 is negatively correlated to F3 and positively correlated to efficiency. The F4 shows no significant correlations to other factors. It seems that the efficiency of the process is predominantly influenced by the first two factors ((F1) School management support, (F2) Family–work conflict).

More hours spent at home with one’s family and more time for fun, as well as more opportunities to work with children from home, are just some of the benefits of WFH identified in previous research studies [66]. It is interesting to note that the percentage of workers in the public sector who work full hours from home is generally low [67]. This paper indicates that in higher education institutions in the Republic of Serbia, more than half of academic personnel used the WFH model in the specified period as opposed to the traditional, face-to-face model of education.

The paper confirms the main advantages of WFH from the aspect of academic workers, and they largely refer to more free time (due to the lack of commuting between one's home and educational institutions) teachers could use for various purposes (not necessarily work-related). The research in this paper confirmed that over 85% of the respondents coped well, both with academic and other obligations, while they implemented the WFH model. Other researchers obtained similar results, reporting a higher efficiency rate in those who worked from home [68], despite the fact that 70% of the respondents went to work when needed. Papers on a similar topic from the USA and Finland show that the longer the commute, the stronger the desire for WFH [69,70].

Contrary to the above, WFH undoubtedly leads to increased working hours in many situations, which can implicitly affect one's work-life balance [71]. The results of our research unequivocally show a relatively balanced relationship between the private and professional life of the teachers who implemented WFH teaching. The results of our colleagues from Slovenia indicate higher stress levels in students compared to their teachers during the COVID-19 pandemic [72].

The core fears of academic workers during WFH teaching referred to whether students would respond adequately and demonstrate enough commitment in the new situation of the COVID-19 pandemic. Reporting in this paper has shown that the educator-respondents expressed a very clear attitude with regard to reduced student interest to get involved in the learning process, which is in opposition with the results of another study [73].

On the other hand, the main disadvantages of the WFH model for teachers in higher education institutions are associated with often limited knowledge of online teaching techniques, lack of traditional practical segments in teaching, as well as the insufficient scope of social interaction. Considering the WFH teaching model and the use of ICT tools, a study has shown that the application of ICT technologies balances out one's private and professional life, which has already been discussed [74]. The implementation of ICT is necessary and fundamental to the functioning of WFH during the pandemic [75].

The paper concluded that a staggering number—two-thirds—of academic workers had no previous experience in the use of the necessary ICT tools for WFH during the pandemic. However, the use of new online teaching platforms in these extraordinary circumstances has brought respondent satisfaction to 75%, and a similar percentage expressed their desire to continue in the same manner in the post-COVID period, thus acknowledging that their subject/course is adaptable to the latest online teaching techniques. Their colleagues, educators from German universities who participated in research in 2020, during the first wave of the pandemic, expressed a similar opinion, confirming that theoretical instruction could largely be covered through online lessons [76]. Professors from Spanish higher education institutions revealed that most of them would happily continue with the so-called blended teaching in the future [77]. Certainly, a full transition to online teaching at universities is very unlikely, just as returning to the way things had been at universities around the world before the COVID-19 pandemic is impossible.

The support of the management of educational institutions in crisis situations is of vital importance [78]. This was confirmed by academic workers who participated in our research, who agreed that in most cases, such support was inadequate, unlike the support of non-academic staff, which was assessed positively. When it comes to guidelines quality, 50% of the respondents assessed them positively, whereas a significant 25% did not.

Satisfaction is of utmost importance in online teaching at higher education institutions. A study has confirmed that there are three factors relevant for examination: student satisfaction, instructor satisfaction and institutional satisfaction [79]. Satisfaction with an online education system is important for all three parties because it strengthens motivation and engagement in all areas of education [80]. In this paper, we focus on a more complex analysis of instructor satisfaction and the effects of the COVID-19 pandemic on online teaching.

## 6. Conclusions

Academic workers from the faculties and higher education institutions in the Republic of Serbia showed that they were more involved in the WFH teaching model than the traditional model during the COVID-19 pandemic. A small percentage worked exclusively in the WFH model or in the traditional model, while the majority of the respondents combined both models, going to work (educational institutions where they teach) when necessary. During WFH classes, the respondents mostly stated that they were able to successfully realise both their academic and other daily obligations. The WFH teaching model has inevitably given rise to the problem of family–work conflict. The balance between the two is presented in the paper.

The research was also based on examining the technical (logistical) support to the WFH teaching model. As the majority of university instructors had no previous experience with ICT tools before the COVID-19 pandemic, it is interesting that they still successfully responded to sudden technical-technological changes in the way teaching is implemented and that they expressed satisfaction with the use of online platforms. Moreover, most academic workers believe that their subject or course is entirely suitable for uploading to an online platform.

When it comes to the support of school management, teachers at higher education institutions in Serbia did not assess it very highly. Most of them stated that they did not receive adequate support from the management, unlike the support of non-academic staff. When it comes to instructions for holding online classes, most respondents are satisfied with the instructions they got, although not completely. The communication with the school management was satisfactory.

The situation regarding WFH during the COVID-19 pandemic was particularly pronounced in the field of higher education, where at one point, there was a sudden surge from zero to full engagement of academic staff from their homes. Since in the meantime, the situation with the pandemic continues, with no definitive end in sight, the only certainty is that WFH and online education will continue to be implemented in real time. All data presented in this paper and similar studies will, thus, have a significant impact on future trends in WFH, even more so because, in the early days of the COVID-19 pandemic, it was believed that WFH would be necessary only during the emergency situation, but it is becoming increasingly certain that certain forms of WFH will remain even after this situation has ended.

In the future, it is expected that the WFH model, together with the WFO (work from the office), will continue to be implemented. This model would reduce management costs, save commuting time and increase the efficiency of the available working hours of academic workers, who would be able to dedicate themselves more productively to the creation of a quality curriculum and its implementation. Challenges related to the pandemic situation should not be viewed only from the aspect of threats but also opportunities aimed at redefining teaching effectiveness, as well as presenting new sustainable academic practices.

For future research, other related fields like game-based learning and serious games must be observed (e.g., CMX MMORPG) and how they have been designed using relative design frameworks, evaluated with relative evaluation frameworks, and be utilised using learning analytics. The usage of advanced educational environments to properly train future professionals is essential, and game-based learning has a positive effect on student engagement [81]. This is often one of the explanations why Serious Games has started raising a good amount of interest in instructional settings. Serious Games in education combines the magnified motivation of scholars with the incorporation of all materials at intervals in the games' tasks. As a form of game-based learning, it has been used for learning in science, business, computer science, mathematics and biology [82]. An educational Massive Multiplayer Online Role Playing Game (MMORPG) named CMX in college environments assesses your efficiency in successfully teaching programming elements while entertaining and engaging students in an engaging environment [83].

In our research study, we have identified four factors affecting the efficiency of the process. These factors, (F1) School management support, (F2) Family–work conflict, (F3) Home infrastructure and (F4) Technology choice. By averaging factors to preserve the original measurement scale, we calculated correlations between factors and efficiency. Factors (F1) School management support, (F2) Family–work conflict showed positive and significant correlation with the efficiency. Thus, we conclude that the first two factors are predominantly affecting efficiency.

Additionally, the test showed that F1 (School management support) is positively correlated to F2 (Family–work conflict) and F4 Technology choice and negatively correlated to F3 (Home infrastructure). Furthermore, F2 is negatively correlated to F3. The technology choice did not show significant correlations to other factors in question. The School management support, Family–work conflict and Home infrastructure are interplaying and influencing the efficiency, so it might be useful to analyse their connection in more detail. A negative correlation between F2 and F3 opens the question of proper management of technical aspects of a home-based working place. Technology choice plays a role but seems to be isolated.

Every study and this one is no exception, has limitations. Our research's limitations are due to social desirability, generalizability, imprecise measures and unasked questions. Keeping in mind that this is an original research paper and not a review paper, acknowledging the past related work in the reference list must be limited. Nevertheless, recommendations for future research that builds on this study's findings must be included. Therefore, future research must be directed at proposing concrete measures for implementing the WFH model of teaching.

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