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How does Digitalization Affect Lifelong Learning?

Nesrin MENEMENÇİ BAHÇELERLİ¹

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Abstract

Applying knowledge actively and continuously is necessary for lifelong learning. A lifelong learner is one who adds new knowledge, modifies existing knowledge, and gains the necessary knowledge to solve challenges. As a result, lifelong learning now requires technological literacy, or the capacity to access and use information using technology. Individual technical aptitudes and talents are crucial in this situation. In order for lifelong learning to be sustained, people must be proficient in using technology and have access to relevant information. Especially the lifelong learning processes of tourism industry employees, which is a labor-intensive sector, are important for tourism enterprises and provide competitive advantage. The aim of this research is to examine the impact of digitalization within the scope of lifelong learning in terms of tourism industry. The findings obtained by examining the literature in line with the keywords determined in the research conducted by document analysis technique are presented. In the research, it was concluded that tourism employees, which is a constantly developing industry, should be continuous learners and that digitalization provides convenience and easy access in the context of lifelong education.

Keywords: Digitalization, lifelong learning, education, tourism industry

1. Introduction

While this age of constant change is called the information age, societies that adapt to this change are called information societies. This renewal has made it imperative for individuals and societies to adapt to these changing conditions through continuous development. In our age where knowledge is differentiated every day, learning should not only be seen as an activity that contributes to the professional development of individuals, starting from childhood and including the youth period (Drude et al., 2019). In this context, the key to adapting to this rapid transformation of knowledge is possible through learning independent of time and space at all levels of life. The general characteristic of societies where this awareness is widespread is that they see learning as a lifelong process that takes place outside of institutions and organizations and is applied in different time periods (Carr et al., 2020).

The continuity and sustainability of learning is ensured only by developing lifelong learning skills to facilitate the individual's adaptation to the renewed age. Lifelong learning is defined as all of the educational activities that an individual addresses within the scope of individual, social or professional development in order to improve his/her knowledge and skills throughout his/her life (Allmendinger et al., 2019). At the same time, lifelong learning is a process in which individuals ensure the continuity of the education process in all social environments and in all parts of life without covering certain time intervals (Nygren et al., 2019). In other words, lifelong learning is the learning process that individuals develop throughout their lives based on their needs and skills.

Today, due to the rapid transformation and changes in economic, political, technological, cultural and social fields, people's education and training needs have also increased. In order for individuals to maintain their competitiveness in changing market conditions and to maintain their material position as it is, they need to have the qualifications to be employed and to maintain, renew and improve these qualifications. These variables, which last throughout the lives of individuals, and the requirements that become more important as time and development progress, lead to the emergence and proliferation of the phenomenon of "lifelong learning" (Korpi and Tahlin, 2021).

Lifelong learning refers to the learner's continuous exposure to new knowledge, skills, and abilities, as well as the ability to build new structures by combining existing knowledge and skills with newly acquired knowledge and skills (Akhmedov, 2022). In other words, it is a lifelong learning habit and behavior (Endres, 2021). The purpose of this study is to explore the impact of digitalization on tourism in the context of lifelong learning.

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1.1 The Need of the Study

The fact that the employees of the tourism industry, which is a labor-intensive sector, have lifelong learning behaviors provides a competitive advantage especially for businesses in this constantly developing industry. Digitalization for lifelong learning offers tourism employees the opportunity to improve themselves without time and space limitations. The research contributes to the literature in this direction by focusing on the role and benefits of digitalization practices for lifelong learning in tourism. The research contributes to the discussion of lifelong learning within the scope of inclusive vocational education for the training of tourism employees with the knowledge and skills needed by businesses in the tourism industry in a competitive environment. In addition, the research puts forward suggestions in the light of the data obtained.

1.2 Lifelong Learning

Education has maintained its importance in every period from past to present. What individuals learn at school may be sufficient to sustain their lives, but they also need to fill the gap that occurs over time in some way. The concept that emerged in order to fill this gap in individuals with the developing world is called lifelong learning (Gouthro, 2022). Lifelong learning is the education provided to individuals throughout their lives. Lifelong learning is defined as the voluntary self-change and development of individuals for personal or professional reasons (de Lima Flauzino et al., 2022). Lifelong learning is the purposeful learning activities that an individual receives in formal, non-formal and natural ways and develops himself/herself in terms of skills and knowledge in personal, cognitive, social and business life (Güleç et al., 2012).

Education is an effective element for both individuals and society. In an age that changes day by day, it should be the only indispensable element. Major countries that are aware of the rapid change are realizing that in order to increase competition and get ahead, it is necessary to leave the traditional education system and that the individual should learn lifelong learning in order to move forward and adapt to life more easily outside of formal education. The education process has come to be seen as a lifelong system that can be given and received regardless of age, language, religion, race and time (Gouthro, 2022).

1.3 Digitalization in Lifelong Learning

In today's digital or information age, it is necessary to use information and communication technologies together with the right methods to create learning processes that meet the needs of the age (Garzón Artacho et al., 2020). Since students are in a digital world in this age, it is emphasized that schools should be compatible with this process. It is stated that the use of technology in lessons will facilitate the lesson and support the success of the educational process and the use of new materials. In this context, the use of technology in education and the determination of this self-efficacy play an important role in the individual's lifelong learning skills (Garzón Artacho et al., 2021).

The opportunities offered by digital technologies in the context of lifelong learning are summarized as providing multimedia opportunities, facilitating lesson preparation and processing, making abstract concepts concrete, motivating students, educational management, providing audio-visual environments, saving time, providing ready-made materials, attracting students' attention, and keeping and accessing information about students (Eynon and Malmberg, 2021). Özgüven (2019) stated that digital technologies have an important role in the development of information literacy skills. Information technology use competencies, self-efficacy and the level of utilization of these technologies are important for increasing lifelong learning attitudes. Focusing on the development of children's ICT competencies provides opportunities to develop lifelong learning skills and not to be considered in the context of adult education.

2. Method

This paper presents a critical reflection on the literature on digitalization for lifelong learning in the tourism industry. In this context, documentary analysis was applied to reveal the main arguments of the research focus. In the research, literature review was conducted within the scope of the keywords determined for the research purpose. The keywords identified for the research purpose are digitalisation, lifelong learning and tourism industry.

3. Results

3.1 Impact of Digitalization on Lifelong Learning in Tourism Industry

In order to be successful in economic life in any field and at any level, people must be well trained in production and working life. It is an important responsibility of vocational education to train individuals who can adapt to the conditions of economic life. Vocational education is an education process that provides the individual with knowledge, skills, work habits and work responsibilities related to a certain profession in

business life and enables the development of the individual's abilities. The main purpose of vocational education is to provide the individual with certain qualifications in order to provide a good earning and to realise these qualifications in a way to keep up with the changes. The second is to ensure that the country's manpower needs are met efficiently. The fear of the 21st century people is to lose their jobs, to be unemployed without finding a job. In order not to lose the existing job, the best way to fight unemployment is to gain new skills and competence. For this, individuals should acquire continuous learning skills, and they should see learning not as a certain period of their lives, but as a lifelong process that is life itself (Albrecht et al., 2022).

In the tourism industry, digitalization has had a big impact on lifelong learning. Technology advancements have completely changed the way the tourist sector functions, requiring organizations to change and adjust to the new digital landscape. The following are some effects of digitalization on lifelong learning in the tourism industry: (Marx et al., 2021):

1. Access to online courses and resources: People can now more easily access online courses and instructional materials about the tourism sector thanks to digitalization. With the abundance of courses available on online platforms covering subjects like hotel management, tourism marketing, and sustainable tourism, students may expand their knowledge and skill set without being constrained by time or location.
2. Mobile learning: With the widespread use of mobile devices, digitalization has made learning more accessible and flexible. Mobile learning applications provide individuals with the opportunity to learn on the go, accessing educational materials, language learning resources and cultural information relevant to the tourism industry. This allows individuals to continue learning regardless of their location.
3. Virtual reality training: Digitalization has introduced virtual reality technology to the tourism industry, offering comprehensive learning experiences. Virtual reality allows individuals to experience real-life scenarios such as customer interactions or travel destinations, providing a more engaging and effective training method for roles in the tourism industry.
4. Social media and knowledge sharing: The widespread use of social media platforms has facilitated information sharing and networking in the tourism industry. Individuals can connect with travel influencers, industry experts and other participants to exchange ideas, stay up-to-date on industry trends and learn from each other's experiences. Social media platforms offer an effective source of information for lifelong learners in the tourism industry.

In the tourism sector, employees who fulfil the needs and wishes of tourists are an important part of the sector. Tourism employees are of great importance both on behalf of their country and the organisation they work for. The knowledge and skills of tourism employees are very effective in the formation of positive or negative opinions towards the country and its people. Therefore, tourism employees should eliminate the uneasiness of tourists with their knowledge and skills and their attitude towards people and send them off in a satisfied manner. In this context, tourism employees should be continuous learners (Buselic and Banko, 2021). The fact that tourism employees have the tendency and competence to learn throughout their lives contributes to the competitiveness of businesses in tourism, which is a labour-intensive sector (Morozov and Morozova, 2020). The key factors that constitute the lifelong learning tendencies and lifelong learning competences of tourism employees, which are formed by their desire to access information, continuous learning and openness to development, are important.

4. Conclusion

The development of information and communication technologies is affected by many factors. One of these is the tourism industry. In the information society, people's ability to be independent, proactive and lifelong learners directly affects the businesses and industries they work in. Due to the rapidity of change, the knowledge and skills acquired in a short time become insufficient or ineffective. Therefore, individuals with lifelong learning skills not only improve themselves but also contribute to the development of the industry.

Today, individuals must adopt lifelong learning to sustain personal and professional growth. In this context, the need for skills to track developments in their area of expertise, obtain and adapt information is crucial. Tourism employees are in constant interaction with guests. It is thought that tourism employees should have lifelong learning tendencies and competences in order to increase the quality of the service provided in the resulting interaction. This situation may make it possible for tourism workers to be an intercultural mediator in providing positive development in tourism and creating a positive image in the eyes of tourists.

As a result of the research, it is recommended that lifelong learning should become a way of life and be supported by trainings to increase awareness of its importance for career, and necessary studies should be carried out from an early age for the development of technology use in this direction.

References

- Akhmedov, M. M., Rozimatova, S. M., & Teshaboev, Z. A. (2022). An important factor for improving the educational process on the principle of "lifelong learning". *Galaxy International Interdisciplinary Research Journal*, 10(10), 671-676.
- Albrecht, J. N., Moscardo, G., & Dwyer, T. (2022). Learning about learning in tourism: Indigenous guide perspectives on their personal and professional development. *Journal of Hospitality & Tourism Research*, 46(2), 320-343.
- Allmendinger, J., Kleinert, C., Pollak, R., Vicari, B., Wölfel, O., Althaber, A., ... & Trahms, A. (2019). *Adult education and lifelong learning* (pp. 325-346). Springer Fachmedien Wiesbaden.
- Buselic, M., & Banko, D. (2021). The need to implement new skills in the tourism sector. *Economic and Social Development: Book of Proceedings*, 74-85.
- Carr, A., Balasubramanian, K., Atieno, R., & Onyango, J. (2020). Lifelong learning to empowerment: beyond formal education. In *Expanding Horizons in Open and Distance Learning* (pp. 69-86). Routledge.
- de Lima Flauzino, K., Manuel Pires Teixeira Gil, H., Sathler Tavares Batistoni, S., Oliveira Costa, M., & Cachioni, M. (2022). Lifelong learning activities for older adults: A scoping review. *Educational Gerontology*, 48(11), 497-510.
- Drude, K. P., Maheu, M., & Hilty, D. M. (2019). Continuing professional development: Reflections on a lifelong learning process. *Psychiatric Clinics*, 42(3), 447-461.
- Endres, T., Leber, J., Böttger, C., Rovers, S., & Renkl, A. (2021). Improving lifelong learning by fostering students' learning strategies at university. *Psychology Learning & Teaching*, 20(1), 144-160.
- Eynon, R., & Malmberg, L. E. (2021). Lifelong learning and the Internet: Who benefits most from learning online?. *British Journal of Educational Technology*, 52(2), 569-583.
- Garzón Artacho, E., Martínez, T. S., Ortega Martín, J. L., Marin Marin, J. A., & Gomez Garcia, G. (2020). Teacher training in lifelong learning—The importance of digital competence in the encouragement of teaching innovation. *Sustainability*, 12(7), 2852.
- Garzón-Artacho, E., Sola-Martínez, T., Romero-Rodríguez, J. M., & Gómez-García, G. (2021). Teachers' perceptions of digital competence at the lifelong learning stage. *Heliyon*, 7(7).
- Gouthro, P. A. (2022). Lifelong learning in a globalized world: The need for critical social theory in adult and lifelong education. *International Journal of Lifelong Education*, 41(1), 107-121.
- Güleç, İ., Çelik, S., & Demirhan, B. (2012). Yaşam boyu öğrenme nedir? Kavram ve kapsamı üzerine bir değerlendirme. *Sakarya University Journal of Education*, 2(3), 34-48.
- Korpi, T., & Tählin, M. (2021). On-the-job training: a skill match approach to the determinants of lifelong learning. *Industrial Relations Journal*, 52(1), 64-81.
- Marx, S., Flynn, S., & Kylänen, M. (2021). Digital transformation in tourism: Modes for continuing professional development in a virtual community of practice. *Project Leadership and Society*, 2, 100034.
- Morozov, M., & Morozova, N. (2020, January). Innovative staff training strategies for the tourism and hospitality industry. In *5th International Conference on Economics, Management, Law and Education (EMLE 2019)* (pp. 393-396). Atlantis Press.
- Nygren, H., Nissinen, K., Hämäläinen, R., & De Wever, B. (2019). Lifelong learning: Formal, non-formal and informal learning in the context of the use of problem-solving skills in technology-rich environments. *British Journal of Educational Technology*, 50(4), 1759-1770.
- Özgüven, Ü. (2019). *Öğrencilerin bilgi okuryazarlığı becerilerini geliştirmede kullanıcı eğitiminin rolü: Çanakkale Onsekiz Mart Üniversitesi örneği* (Master's thesis, Çankırı Karatekin Üniversitesi, Sosyal Bilimler Enstitüsü).

Vide Conferencing Technologies in Higher Education Settings: A Systematic Literature Review Based on the PACT Framework

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Abstract

The advantages of using videoconferencing in education has been reported by several studies, and further emphasized during the covid-19 pandemic where all universities had to shift to online learning. However, despite this attention, it is found that scant studies tried to analyze and understand videoconferencing tools in education based on a given framework or theory. This results in an incomplete picture of how such tools might reshape education. To address this research gap, this study conducts a systematic review to analyze videoconferencing tools in education based on the People, Activities, Context, Technologies (PACT) framework. The obtained results revealed that videoconferencing tools are mostly used in medical education with undergraduate students. Additionally, most of the targeted stakeholders are students, calling for more research to also target other stakeholders, such as administrators, teachers, etc. Finally, Zoom is the most used videoconferencing tool in education. The findings of this study can provide a roadmap on the future research directions to consider for a better adoption of videoconferencing in education.

Keywords: Video conference, university, online learning, PACT framework, communication technology

1. Introduction

1.1 Videoconferencing in Education

The majority of today's higher education students are members of Generation Z, colloquially called "Zoomers", are digital natives born between the mid-1990s and early 2010s. The term "Zoomers" did not originate from the video chat service Zoom. Rather, it is a creative adaptation of the term 'boomers,' intended to characterize the rapid and dynamic upbringing of Generation Z. This designation reflects the swift integration of technology and cultural changes during their formative years. They spend their entire lives surrounded by and using computers, video games, digital music players, video cams, cell phones, and all the other toys and tools of the digital age (Ceylan & Elitok Kesici, 2017). These technological advances inspired educators and researchers to investigate the advantages of using videoconferencing technology for teaching and learning (Anderson & Northcote, 2018). Video conferencing tools are defined as real-time audio and video means of communication between individuals from geographically different places (Mader & Ming, 2015). The affordance of videoconferencing in learning and teaching has been acknowledged, where during videoconferencing, learners have opportunities to receive authentic input, produce output, and receive prompt feedback (Yu, 2022). The use of videoconferencing has been further emphasized by the covid-19 pandemic, where all schools and universities switched to technology and online teaching in response to the pandemic and closure of schools and universities (Affouneh & Salha, 2021; Huang et al., 2020), in order to sustain education in crises (Tlili et al., 2023).

The use of the videoconferencing tools helps both teachers and students in their work, teaching and learning, which allows them to interact and learn (Sutterlin, 2018). The necessity to use Videoconference media in organizing meetings or briefings when working from home brings several opportunities and challenges (Parasian & Yuliati, 2020) at the same time.

1.2 Research Gap and Study Objectives

Twelve studies identified (Uerz et al., 2018) that technological competences are not enough for teacher educators to be able to use technology for pedagogical and educational purposes. Moreover, age and gender significantly impact the prediction of the level of pedagogical digital competence among teaching staff, whereas the educational stage in which they teach shows no effect (Guillén-Gámez et al., 2021). Therefore, for an

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effective and efficient use of digital technologies, which include videoconferencing systems just like in this present study, pedagogical and educational purposes need to be emphasized for both the generation Z and their educators in higher education. While different systematic reviews were conducted on the use of videoconferencing in education, they were focusing on a specific educational field or not framed within any model or theory, leading to incomplete results, or understanding of the effects of using videoconferencing in education. For instance, Rush et al. (2018) conducted a systematic review of videoconferencing systems compared to telephone in health care delivery, while Chippis et al. (2012) studied the effectiveness of videoconferencing on medical education through a systematic review. There is a need for reviewing both the technological aspects from interaction design or broader user experience perspective and the higher education pedagogical aspects. Thus, to contribute with both technological and pedagogical purposes of use in education, this present study reviews empirical studies on videoconferencing in higher education by applying the PACT framework (Benyon, 2019). PACT is an established framework in the fields of interaction design, user experience, and service design and innovation as a tool for supporting scoping studies.

2. Method

2.1 Study Selection

To identify the needed studies for the current systematic literature review, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed (Page et al., 2021). PRISMA provides a standard peer-accepted methodology that uses a guideline checklist, which was followed in this paper. Specifically, two electronic databases, namely DOAJ and ERIC, which are open and accessible in the field of educational technology were searched using the following search strings.

- Education: School, learning, university and teaching.
- Videoconferencing: Virtual conference, hybrid, online conference, Zoom, Teams, Google Meet/Hangout, WebEx, Adobe Connect, and Skype.
- Online application: Software, platform and system.
- Portable: Mobile and remote.
- Engagement: Interaction, communication and discussion.
- Learning Experience Design: Learning environment and flipped (classroom).

Additionally, the search period was set starting from 2017. The range of this study is close to Crompton and Burke (2020)'s recommendation, who recommended covering the last five years to see how technologies and pedagogies evolved. The final search was conducted on October 1, 2023 and led to 39 potential studies. After removing duplications, 34 potential studies were identified and went through the inclusion/exclusion criteria. A study was excluded if it: (1) was not in English; (2) did not use a videoconferencing system for teaching and learning; or (3) the educational setting was not in higher education. After the inclusion/exclusion filtering, 11 studies were analyzed, where the distribution of these studies by publication year is as follows: 2017 (n = 1), 2019 (n = 1), 2020 (n = 3), 2021 (n = 2), 2022 (n = 3) and 2023 (n = 1). Figure 1 presents the flow diagram of the study selection process.

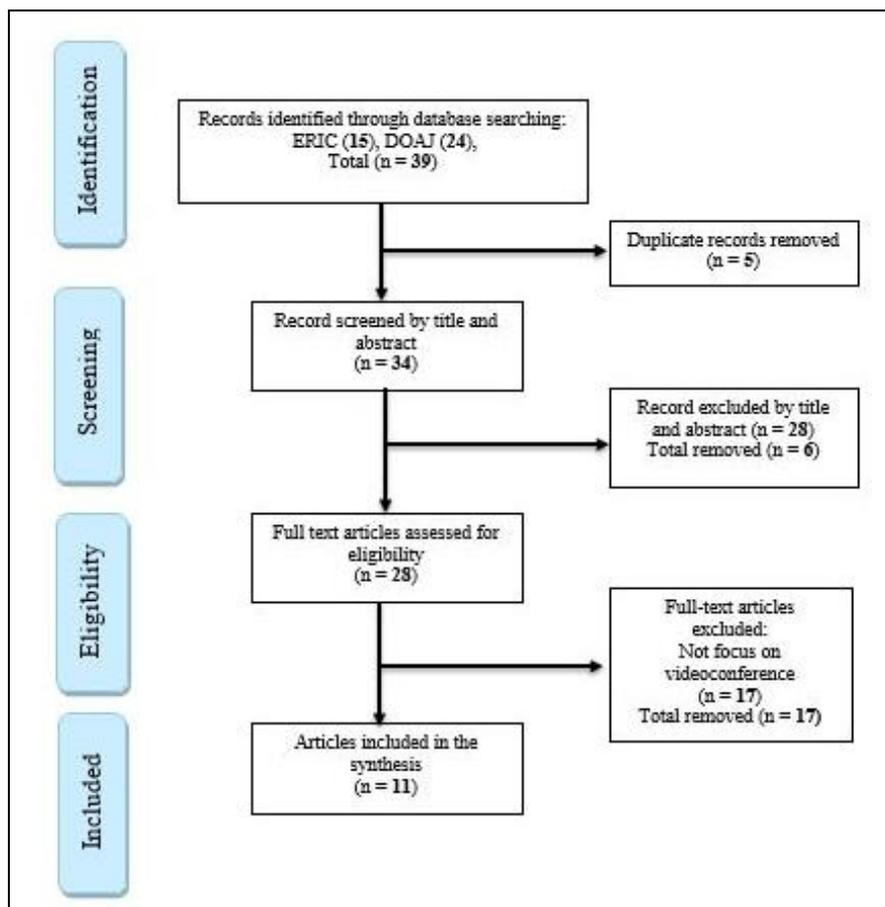


Figure 1. PRISMA flowchart of study selection process

2.2 Method for Analysis

The papers were coded based on the PACT framework (People, Activities, Context, and Technologies). A PACT analysis means that identification of the different activities that people conduct in different contexts using different technologies. Moreover, People use technology to undertake activities in contexts, while technology is used to enhance a wide range of people undertaking various activities in different contexts. If the technology is changed, then the nature of the activities will also change (Benyon, 2019). Additionally, using the PACT framework facilitates the process for data interpretation and understanding. Weekly meetings were held during the coding process, where any disagreements were solved through discussions.

3. Results and Discussions

Eight papers had didactical design context as they used frameworks to develop and implement the educational and the training materials, and interventions. Three papers presented multiple perspectives of teachers and students over videoconferencing systems, and one paper focused on presenting a case study of using videoconferencing. None of the reviewed papers considered instructional design models, which leads to the presence of using technology in the activities. The videoconferencing systems were used as means of teaching, learning and communication in seven studies, and they were the target and the aim in the rest of the studies. Videoconferencing systems were used by medical staff to treat, facilitate and to evaluate people like patients in faraway places. In organizational contexts, the videoconferencing systems were used to investigate the leadership status in the online environments. To shed light on the PACT components and the interaction among them, each component is discussed in the following sections. The full coding of the papers is presented in Appendix 1.

3.1 People

Table 1 reveals that different samples in higher education settings were targeted when discussing videoconferencing tools in higher education. Based on Table 1, it can be seen that videoconferencing tools have been mostly used with undergraduate students instead of graduate students. This could be attributed maybe that

these students need more engaging tools and methods to keep them motivated while learning. Additionally, it is seen that most of the targeted people in higher education are students and limited studies targeted other stakeholders, such as administrators and teachers. Therefore, future research should do one step further to cover more stakeholders, hence providing a complete picture of how videoconferencing can shape higher education and the perception of different stakeholders towards it. Finally, Table 1 shows that most of the studies investigated videoconferencing tools in higher education with limited sample size, raising concerns about the validity and reliability of the obtained results. Future researchers should pay attention to the research methodology when discussing videoconferencing in higher education so that they can obtain generalizable and reliable findings accordingly.

Table 1. Sample in each study

Study	Sample
MacLeod et al. (2019)	15 undergraduate medical education students, 18 faculty members, administrators, and audiovisual professionals.
Nichols et al. (2022)	139 instructors and students, specifically 3 instructors, 136 undergraduate students (47 females and 89 males)
Stokes et al. (2017)	6 teachers and 191 undergraduate medical students
Khalil & Cowie (2020)	16 doctoral students
Pennella & Bignami (2021)	3 university students (young adults)
Hilyard et al. (2020)	24 adolescents
Kelly et al. (2020)	3 undergraduate students
Oducado et al. (2021)	597 undergraduate nursing students
Blake et al. (2022)	25 university employees, 8 men, 17 women, administrative, professional, and managerial (IT and technical staff).
Griffin et al. (2022)	3 teaching staff working as a team.
Susila et al. (2023)	20 university lectures

3.2 Activities

In this section, activities are discussed from two perspectives; the first perspective is the learning activity, i.e., how videoconferencing tools were used in learning (see Table 2). The second perspective is the research activity conducted in each study to validate the results (see Table 2). Based on Table 2, it is seen that videoconferencing was used in learning activities for different purposes, including socializing, supporting students, discussing a given phenomenon, among others. However, it is found that limited information exists about the best practices of using videoconferencing in education. Specifically, online learning can be synchronous, asynchronous, flipped, flex, station rotation, among others (Ashraf et al., 2021), it is therefore important to investigate in which learning model and format videoconferencing can lead to significant positive learning outcomes. It is suggested that future research directions investigate this line of research. In terms of the research activity, it is found that qualitative research design was mostly followed, including conducting interviews, observations, etc. While qualitative results can help to draw conclusions about a given phenomenon, it is recommended that future research studies conduct mixed methods where qualitative and quantitative data are triangulated to obtain more reliable results that can be generalized.

Table 2. Conducted research activity in each study

Study	Learning Activity	Research Activity
MacLeod et al. (2019)	Connecting learners in multiple environments outside the traditional classroom or clinical environments.	A description of a series of practical tips for those working in the context of a videoconferenced distributed medical education program. In addition, the authors conducted an ethnographic study from 2013 to 2016 that included a critical analysis of 65 institutional documents, policies, and videos; more than 100 hours of observing videoconferenced distributed medical education classrooms; and 33 interviews with medical students, faculty members, administrators, and audiovisual professionals.
Nichols et al. (2022)	Participation in synchronous online lectures.	Investigation of three life sciences classrooms that utilized synchronous online lectures during the pandemic. Observing each class throughout the semester, quantified participation behaviors, and investigated the role of student gender. Comparing final course grades by gender.
Stokes et al. (2017)	The description of the partnership between two	Evidence-based internal medicine, residency curriculum and twenty-four videoconference teaching sessions were conducted and support the Guyana's Internet Medicine academic half-day and is characterized by

Continued. Table 2

	universities in medicine programs.	mutually beneficial, resident-led videoconference teaching sessions. Twenty-four videoconference teaching sessions were conducted over eight months.
Khalil & Cowie (2020)	Knowing the reflections during videoconferencing meetings.	Building understanding with participants, exchanging nonverbal cues between researcher and participants, considering socio-cultural aspects of the participants and gathering important information of the participants' feelings, thoughts and behaviours.
Pennella & Bignami (2021)	Socializing and communicating in videoconferencing environments.	Conducting free counseling and psychological support service, to frame clinical interventions and to reflect on these interventions through videoconference. Making a clinical case
Hilyard et al. (2020)	Testing the feasibility of a protocol that used in medical and clinical context.	Conducting group therapy and individual videoconference sessions.
Kelly et al. (2020)	Supporting students learning when using online environments.	Videoconference appointment options with learning advisers and librarians, and peer-to-peer virtual guides to online learning
Oducado et al. (2021)	Understanding the reasons that exhaust students in videoconferencing meetings.	The determination of the predictors of videoconference and the effect of videoconference in exhaustion and fatigue among nursing students.
Blake et al. (2022)	Testing the quality and the kinds of leadership services.	Exploring workforce experiences of the rapid implementation of a SARS-CoV-2 asymptomatic testing service (ATS) and to produce four overarching themes regarding workforce experiences: (1) feelings relating to their involvement in the service, (2) perceptions of teamwork, (3) perceptions of Asymptomatic Testing Service leadership, (4) valuing the opportunity for career development.
Griffin et al. (2022)	Exchanging best practices during online learning.	Informing practice while contributing to scholarly knowledge through offering spaces for students and staff to teach and learn Master's (MSc) in Global Challenges for Sustainability locally and remotely. Reviewing working documents, reports on what happened during delivery, including artefacts and general usage statistics, and a group reflection
Susila et al. (2023)	Training teachers on operating Zoom and using it for online learning	Identification and determination of participants, identification of needs, preparation of the equipment needed, giving invitations training participants targets, and training implementation activity.

3.3 Context

When investigating the learning context where videoconferencing tools have been used (see Table 1), it is found that they were used in different educational and work contexts and mainly in medicine education and medical practices (e.g., MacLeod et al., 2019; Stokes et al., 2017; Hilyard et al., 2020 & Oducado et al., 2021). This could be explained with virtual cultures having great benefits for medical students and health education. In the reviewed paper the advantages of using video conferencing have been stressed in order to save time, money and also the lives of many people by providing instance support for emergency cases. The advancements in information and communication technology present an opportunity for cognitive behavioral therapists to service patients or clients in remote areas through videoconferencing (Matsumoto, Hamatani, & Shimizu, 2021). Videoconferencing is proposed as an innovative telerehabilitation approach for stroke survivors (Tarihoran et al., 2023). Videoconferencing systems offer several advantages, particularly improved provider diagnostic accuracy and reduced readmission rates (Rush et al., 2018). However, the use of videoconferencing for nursing and medical education should be encouraged along with guidelines for the use of videoconferencing (Chippis, Brysiewicz, & Mars, 2012).

3.4 Technology

In terms of technology, Figure 2 shows that Zoom (e.g., Nichols et al., 2022; Oducado et al., 2021; Susila et al., 2023) was the most used videoconferencing tool, followed by Microsoft Teams (Griffin et al., 2022) and Blackboard (e.g., Kelly et al., 2022). Several studies highlighted the advantages of such tools, including saving time, improving learners' engagement, and increasing learner and teacher self-confidence.

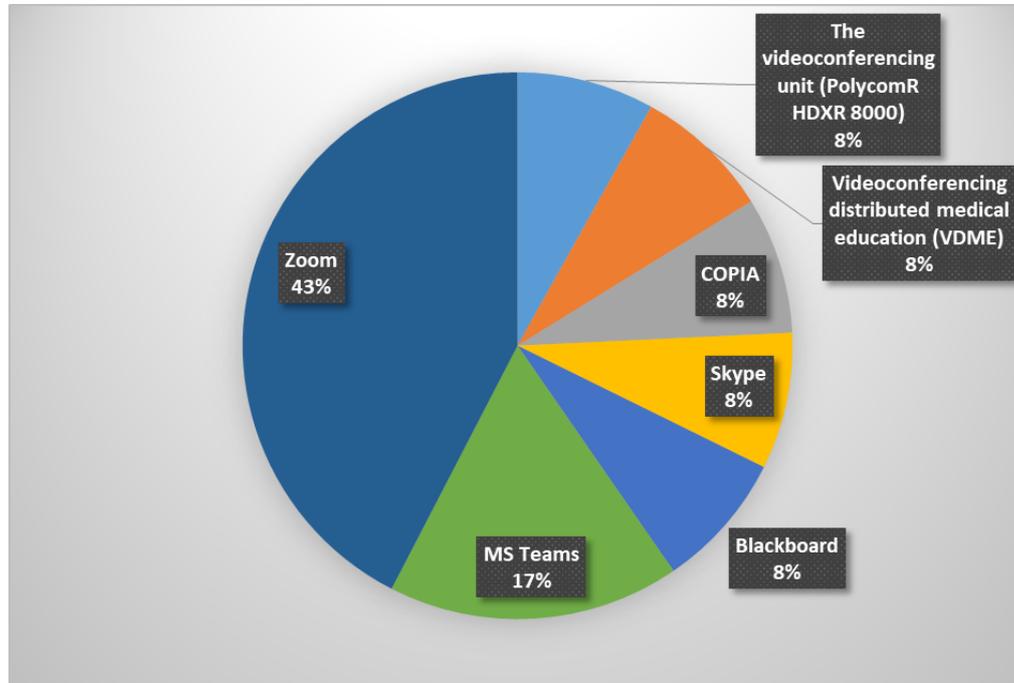


Figure 2. Distribution of videoconferencing tools

Siddiqui and Ahmad (2022) compared Google Meet, Microsoft Teams, and Zoom, as teaching and learning tools due to systems requirements, teaching and learning features, and security features and the study showed that Zoom was a better option for educational purposes. Leporini, Buzzi and Hersh (2023) investigated the accessibility and usability of the desktop and mobile versions of Zoom, Google Meet, and MS Teams and they concluded that Zoom was preferred to Google Meet and MS Teams. Cavus and Sekyere-Asiedu (2021) further conducted a comparative research method to compare nine features of the different videoconferencing tools which are maximum participants, meeting recording duration, security, chat/screen sharing, meeting duration, archive meeting, trial version, account creation to use and mobility. Table 3 relies on these nine criteria to conduct a comparative study of the videoconferencing tools identified in the 11 reviewed studies. Particularly, it is seen that, in addition to the paid license, these tools offer a free license, however with limited functionalities that might hinder the learning process. Therefore, universities from under developing countries might face the challenge of adopting such videoconferencing tools due to the limited financial funds. Therefore, future research directions should investigate open source tools and technologies, as these tools can help to ensure educational inclusivity and adaptation based on the needs of students, teachers and even universities (Zhang et al., 2020).

Table 3. A comparison of the used videoconferencing tools

Features / Platforms	Google Meet	Microsoft Teams	Go to Meetings	Cisco Webex Meetings	Zoom Meetings	Click Meetings	Big Blue Button
Maximum participants	100	300	250	100	100	25	100
Meeting recording duration	Limited	Limited	40 min	24 hours	30 min	30 min	unlimited
Security	✓	✓	✓	✓	✓	✓	✓
Chat/screen sharing	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
Meeting duration	60min	24 hours	40min	50 min	40min	40min	60min
Archive meeting	✓	✓	✓	✓	✓	✓	✓

Continued. Table 3

Trial version	Unlimited	6 months	14days trial	7 days trial	unlimited one-on-one meetings	30 days trial	7 days
Account creation to us	Not required	Not required	Not required	Not required	Not required	Not required	Not required
Mobility	Yes	Yes	Yes	Yes	Yes	Yes	Yes

On the other hand, students, teachers and users have faced several challenges while using videoconferencing tools, such as the feelings of loneliness and isolation since social interaction is very rare online and needs more efforts to be significantly visible (Massner, 2022). Some students and members of the staff mentioned that using videoconferencing was not a personal choice and, therefore, increased the resistance to using it and find it challenging (Riedl, 2022). Others suffered from technology fatigue (Hilty et al., 2023) while the rest concentrated on the lack of infrastructure readiness (Singh et al., 2021). Mukan and Lavrysh (2020) indicated several challenges faced by teachers when they used videoconferencing systems such as class management, educational materials transformation for the online mode, working with different abilities among students, and assessment.

4. Conclusions, Limitations and Future Directions

Videoconferencing systems are being investigated rapidly as they are the main platforms of online learning and teaching. Research on videoconferencing systems showed different gaps in their functionalities and the ways they were used. Particularly, Zoom is still dominant among these videoconferencing systems. The art of instructional design is still far away from the effective use of VC systems calling for more research in this regard. In light of this research, PACT model did not fit properly in the process of online learning. PACT could be one of several frames that should be studied and presented in a wide range of contexts including videoconferencing systems to reveal, for instance, why students with different cultures might perceive videoconferencing systems differently, especially in terms of using particular functionalities (e.g., turning on or off webcams while learning) (Salha et al., 2022).

Despite that this study presented solid findings that might help to understand the use of videoconferencing in higher education, it still has some limitations that should be acknowledged. For instance, the findings of this study are limited by the searched databases and keywords. Therefore, future research could complement these finding by covering more electronic databases.

References

- Affouneh, S., & Salha, S. (2021). What can we take from the pandemic to the future of Education? *Bulletin of the Technical Committee on Learning Technology*, 21(3), 13–14.
- Anderson, A., & Northcote, M. (2018). Australian studies of videoconference and video-assisted instrumental music teaching: What have we learned? *Australian Journal of Music Education*, 52(1), 3–18.
- Ashraf, M. A., Yang, M., Zhang, Y., Denden, M., Tlili, A., Liu, J., ... & Burgos, D. (2021). A systematic review of systematic reviews on blended learning: Trends, gaps and future directions. *Psychology Research and Behavior Management*, 1525-1541. <https://doi.org/10.2147/PRBM.S331741>.
- Benyon, D., (2019). *Designing user experience*. 4th edition. Pearson Education.
- Blake, H., Somerset, S., Mahmood, I., Mahmood, N., Corner, J., Ball, J. K., & Denning, C. (2022). Workforce Experiences of a Rapidly Established SARS-CoV-2 Asymptomatic Testing Service in a Higher Education Setting: A Qualitative Study. *International journal of environmental research and public health*, 19(19), 12464. <https://doi.org/10.3390/ijerph191912464>.
- Ceylan, V. K., & Elitok Kesici, A. (2017). Effect of blended learning to academic achievement. *Journal of Human Sciences*, 14(1), 308-320. doi:10.14687/jhs.v14i1.4141
- Chipps, J., Brysiewicz, P., & Mars, M. (2012). A systematic review of the effectiveness of videoconference-based tele-education for medical and nursing education. *Worldviews on evidence-based nursing*, 9(2), 78–87. <https://doi.org/10.1111/j.1741-6787.2012.00241.x>.
- Griffin, D., Gallagher, S., Vigano, V., Mousa, D., Van Vugt, S., Lodder, A., Byrne, J.R. (2022). Best Practices for Sustainable Inter-Institutional Hybrid Learning at CHARM European University. *Educ. Sci.*, 12, 797. <https://doi.org/10.3390/educsci12110797>
- Hilty, D.M., Groshong, L.W., Coleman, M. et al. (2023). Best Practices for Technology in Clinical Social Work and Mental Health Professions to Promote Well-being and Prevent Fatigue. *Clin Soc Work J*, 51, 211–245. <https://doi.org/10.1007/s10615-023-00865-3>.

- Hilyard, A., Kingsley, J., Sommerfield, D., Taylor, S., Bear, N., & Gibson, N. (2020). Feasibility of a Randomized Controlled Trial of Paediatric Interdisciplinary Pain Management Using Home-Based Telehealth. *Journal of pain research*, 13, 897–908. <https://doi.org/10.2147/JPR.S217022>.
- Huang, R., Tlili, A., Chang, T. W., Zhang, X., Nascimbeni, F., & Burgos, D. (2020). Disrupted classes, uninterrupted learning during COVID-19 outbreak in China: application of open educational practices and resources. *Smart Learning Environments*, 7, 1-15. <https://doi.org/10.1186/s40561-020-00125-8>
- Kelly, A., Johnston, N., & Matthews, S. (2020). Online self-access learning support during the COVID-19 pandemic: An Australian university case study. *Studies in Self-Access Learning Journal*, 11(3), 187–198. <https://doi.org/10.37237/110307>.
- Khalil, A., & Cowie, B. (2020). A research note: Video conferencing interviews. *Waikato Journal of Education*, 25, 101–107. <https://doi.org/10.15663/wje.v25i0.778>.
- Leporini, B., Buzzi, M. & Hersh, M. (2023). Video Conferencing Tools: Comparative Study of the Experiences of Screen Reader Users and the Development of More Inclusive Design Guidelines. *ACM Transactions on Accessible Computing*. <https://doi.org/10.1145/3573012>.
- MacLeod, A., Cameron, P., Kits, O., Power, G., & Tummons, J. (2019). Teaching and Learning with Videoconferencing at Regional Medical Campuses: Lessons from an Ethnographic Study. *Journal of Regional Medical Campuses*, 1(6), <https://doi.org/10.24926/jrmc.v2i1.1559>.
- Mader, C., & Ming, K. (2015). Videoconferencing: A new opportunity to facilitate learning: The clearing house: A Journal of Educational Strategies. *Issues and Ideas*, 88(4), 109–116. <https://doi.org/10.1080/00098655.2015.1043974>.
- Massner, C. (2022). *The Use of Videoconferencing in Higher Education*. IntechOpen. doi: 10.5772/intechopen.99308
- Matsumoto, K., Hamatani, S., & Shimizu, E. (2021). Effectiveness of Videoconference-Delivered Cognitive Behavioral Therapy for Adults With Psychiatric Disorders: Systematic and Meta-Analytic Review. *Journal of medical Internet research*, 23(12), e31293. <https://doi.org/10.2196/31293>
- Mukan, N., & Lavrysh, Y. (2020). Video Conferencing Integration: Challenges and Opportunities at Universities. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(1Sup2), 108-114. <https://doi.org/10.18662/rrem/12.1sup2/253>.
- Nichols S.C., Xia Y.Y., Parco M., Bailey E.G. (2022). Participation and performance by gender in synchronous online lectures: three unique case studies during emergency remote teaching. *J Microbiol Biol Educ*. 23(1) doi: 10.1128/jmbe.00281-21.
- Oducado, R. M. F., Fajardo, M. T. R., Parreño-Lachica, G. M., Maniago, J. D., Villanueva, P. M. B., Dequilla, Ma. A. C. V., Montaña, H. C., & Robite, E. E. (2021). Predictors of Videoconference Fatigue: Results From Undergraduate Nursing Students in the Philippines. *Asian Journal for Public Opinion Research*, 9(4), 310–330. <https://doi.org/10.15206/ajpor.2021.9.4.310>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 372. <https://doi.org/10.1136/bmj.n71>.
- Parasian, N., & Yuliati, R. (2020). Video Conference as a Mode of Communication in the Pandemic Era. *Proceedings of the 6th International Conference on Social and Political Sciences (ICOSAPS 2020)*, 9–17. <https://doi.org/10.2991/assehr.k.201219.002>.
- Pennella, A., & Bignami, G. (2021). I didn't think you were listening. Some Reflections on Online Setting and Patient Proxy in the Remote Clinical Relationship. *Mediterranean Journal of Clinical Psychology*, 9. DOI:10.13129/2282-1619/mjcp-3155.
- Riedl, R. (2022). On the stress potential of videoconferencing: definition and root causes of Zoom fatigue. *Electron Markets* 32, 153–177. <https://doi.org/10.1007/s12525-021->
- Rush, K. L., Howlett, L., Munro, A., & Burton, L. (2018). Videoconference compared to telephone in healthcare delivery: A systematic review. *International journal of medical informatics*, 118, 44–53. <https://doi.org/10.1016/j.ijmedinf.2018.07.007>.
- Salha, S., Saifuddin Khalid, M., Affouneh, S., & Tlili, A. (2022). ON or OFF!? How Arab Students Perceive Using Webcams in Online Learning. In *International Conference on Learning and Teaching in the Digital World* (pp. 161-177). Singapore: Springer Nature Singapore.
- Siddiqui, K. A., & Ahmad, S. (2022). Comparative Study of Alternative Teaching and Learning Tools: Google Meet, Microsoft Teams, and Zoom during COVID-19". In *Teaching in the Pandemic Era in Saudi Arabia*. Leiden. The Netherlands: Brill. https://doi.org/10.1163/9789004521674_008.
- Singh, J., Steele, K., & Singh, L. (2021). Combining the Best of Online and Face-to-Face Learning: Hybrid and Blended Learning Approach for COVID-19, Post Vaccine, & Post-Pandemic World. *Journal of Educational Technology Systems*, 50(2), 140-171. <https://doi.org/10.1177/00472395211047865>.

- Stokes, W., Ruzycski, S., Jainarine, R., Isaac, D., & Cole, J. (2017). The Canada-Guyana medical education partnership: using videoconferencing to supplement post-graduate medical education among internal medicine trainees. *Canadian medical education journal*, 8(2), e18–e24.
- Susila, H. R., Qosim, A., & Sutiono, E. (2023). Training of Operating Video Conference for Online Learning During Covid-19. *Jurnal Pemberdayaan Masyarakat Madani (JPMM)*, 7(1), 102-113. <https://doi.org/10.21009/JPMM.007.1.09>.
- Sutterlin, J. (2018). Learning is Social with Zoom Video Conferencing in your Classroom. *eLearn Magazine*. 8 (12), [http://DOI: 10.1145/3302261.3236697](http://DOI:10.1145/3302261.3236697).
- Tarihoran, D. E. T. A. U., Daryanti Saragih, I., Saragih, I. S., & Tzeng, H. M. (2023). Effects of videoconferencing intervention on stroke survivors: A systematic review and meta-analysis of randomised controlled studies. *Journal of clinical nursing*, 32(17-18), 5938–5947. <https://doi.org/10.1111/jocn.16716>.
- Tlili, A., Nascimbeni, F., Burgos, D., Zhang, X., Huang, R., & Chang, T. W. (2023). The evolution of sustainability models for Open Educational Resources: Insights from the literature and experts. *Interactive Learning Environments*, 31(3), 1421-1436. <https://doi.org/10.1080/10494820.2020.1839507>
- Uerz, D., Monique V., and Marijke K. Teacher Educators' Competences in Fostering Student Teachers' Proficiency in Teaching and Learning with Technology: An Overview of Relevant Research Literature. *Teaching and Teacher Education* 70 (February 1, 2018): 12–23. <https://doi.org/10.1016/j.tate.2017.11.005>.
- Yu L. T. (2022). The Effect of Videoconferencing on Second-Language Learning: A Meta-Analysis. *Behavioral sciences (Basel, Switzerland)*, 12(6), 169. <https://doi.org/10.3390/bs12060169>.
- Zhang, X., Tlili, A., Nascimbeni, F., Burgos, D., Huang, R., Chang, T. W., ... & Khribi, M. K. (2020). Accessibility within open educational resources and practices for disabled learners: A systematic literature review. *Smart Learning Environments*, 7, 1-19. <https://doi.org/10.1186/s40561-019-0113-2>.

Appendix 1. Coding of the 11 studies

Authors & Year	Title	PACT			
		People	Activities	Context	Technologies
Directory of Open Access Journals (DOAJ)					
MacLeod, Cameron, Kits, Power & Tummons (2019).	Teaching and Learning with Videoconferencing at Regional Medical Campuses	Medical education students faculty members, administrators, and audiovisual professionals	Everything we hear, we hear through a network of microphones, cables, and speakers. Everything we see, we see through a system of cameras, cables, and screens. Spontaneous adjustments we would make in in-person	This study used ethnography students often avoided asking questions because they were hesitant to have their images projected on screen. The technologies are designed to optimize seeing and hearing-and they do so very efficiently! eye contact to gage attention	Videoconferenced distributed medical education (VDME)
Nichols, Xia, Parco, and Bailey (2022)	Participation and Performance by Gender in Synchronous Online Lectures: Three Unique Case Studies during Emergency Remote Teaching	Instructors and students	Participation in synchronous online lectures during Emergency Remote Teaching. Observation Recording Students interaction	Classroom Observations Protocol for Undergraduate STEM (COPUS)	ZOOM
Stokes, Ruzycski, Jainarine, Isaac and Cole (2017)	The Canada-Guyana medical education partnership: using videoconferencing to supplement post-graduate medical education among internal medicine trainees	Medical residents	Evidence-based internal medicine residency curriculum Twenty-four videoconference teaching sessions were conducted	Survey Questionnaire Focus group videoconference teaching series is a mutually beneficial partnership for Canadian and Guyanese medical residents and fosters international collaboration in medical education.	The videoconferencing unit (PolycomR HDXR 8000)
Susila, Qosim & Sutiono (2023)	Training of Operating Video Conference for Online Learning During Covid-19	University lectures	Using video conference to facilitate instructional process	A survey for need assessment	Zoom

Education Resources Information Center(ERIC)					
Khalil & Cowie (2020)	A research note: Video conferencing interviews	Doctoral students	Interviews. Building understanding with participants, exchanging nonverbal cues between researcher and participants, considering socio-cultural aspects of the participants	Socio-cultural aspects e.g., cell phone, tablet, computer electricity, computer, internet, camera, microphones)	Zoom
Pennella & Bignami (2021)	I didn't think you were listening. Some Reflections on Online Setting and Patient Proxy in the Remote Clinical Relationship	Italian university students and young adults	Counseling and psychological support service Exploratory interviews	Even when a comparison between offline and online therapy MJCP 9, 3, 2021 Reflections on Remote Clinical Relationship 13 settings is made, the goal cannot be to identify a winner between the two but to favour a thought process upon the features and specificities of these instruments and how they support and guide the clinical practice.	Skype
Hilyard, Kingsley, Sommerfield, Taylor, Bear & Gibson (2020)	Feasibility of a Randomized Controlled Trial of Paediatric Interdisciplinary Pain Management Using Home-Based Telehealth	Adolescents	Interviews qualitative analysis	Deliver health services SCOPIA provided an encrypted video link between the hospital and the participant's home, community or school environment	SCOPIA
Kelly, Johnston, and Matthews, (2020)	Online Self-Access Learning Support During the COVID-19 Pandemic: An Australian University Case Study	Students in Australian universities	Reflections. Self-access resources and videos for preparing to learn online, videoconference appointment options with learning advisers and librarians, and peer-to-peer virtual guides to online learning.	Peer-to-Peer Virtual Guides to Online Learning Online Self-Access Learning Support While the Peer Learning Coordinator observed that more students used the Microsoft Teams chat (62%) than made phone calls, the significant proportion of students calling (38%) indicates the need for multiple modes to support students effectively in a digital environment.	Blackboard, Microsoft Teams and Zoom
Oducado, Fajardo, Parreño-Lachica,	Predictors of Videoconference Fatigue: Results from Undergraduate Nursing	Nursing students	Cross-sectional online survey. The determination the predictors of	Nursing students experienced high levels of videoconference fatigue	Zoom

<p>Maniago, Villanueva, Dequilla, Montaña & Robite (2021)</p>	<p>Students in the Philippines</p>		<p>videoconference</p>	<p>Gender, self-reported academic performance, Internet connection stability, attitude toward videoconferencing, frequency, and duration of videoconferences predicted videoconference fatigue. Zoom fatigue is real in the context of the educational enterprise. And while videoconferencing tools have made schooling possible in the midst of a pandemic, it has come without a challenge that may have undesirable consequences specifically among nursing students</p>	
<p>Blake, Somerset, Mahmood Mahmood Corner, Ball and Denning (2022)</p>	<p>Workforce Experiences of a Rapidly Established SARS-CoV-2 Asymptomatic Testing Service in a Higher Education Setting: A Qualitative Study</p>	<p>University employees and students.</p>	<p>Qualitative semi-structured videoconference interviews Exploring workforce experiences of the rapid implementation of a SARS-CoV-2 asymptomatic testing service (ATS)</p>	<p>Self-confidence and a sense of value and belonging. This has implications for staff wellbeing, work engagement, and the creation of workplaces across the sector that are well-prepared to respond to future pandemics and other disruptive events.</p>	<p>NA-- one-to-one, semi-structured, telephone or videoconferencing interviews</p>
<p>Griffin, Gallagher, Vigano, Mousa, Van Vugt, Lodder, and Byrne (2022)</p>	<p>Best Practices for Sustainable Inter-Institutional Hybrid Learning at CHARM European University</p>	<p>Students and teaching staff</p>	<p>Participatory Action Research Hybrid Classroom Design Informing practice while contributing to scholarly knowledge</p>	<p>Action research</p>	<p>MS teams</p>

Skills of Different IT Departments and Recommendations for Those Who Want to Work in This Field

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Abstract

This study examines the qualifications of different IT departments and provides recommendations for those who aspire to work in this field. With the rapid advancement of technology and the digital transformation of the business world, the importance of IT departments has increased. However, variations in qualifications among different IT departments raise questions for those interested in working in this field. In this context, there is a growing need for a skilled workforce and collaboration between educational institutions and employers is necessary. With the increase in job opportunities in the IT sector, investment in enhancing employees' skills and utilizing new training methods is recommended. The rapid development of the IT sector in Turkey and the increasing demand for qualified workforce should also be taken into consideration. Those who aspire to work in the IT sector should receive proper education to specialize in a specific area and continuously update their qualifications.

Keywords: IT industry, employment, personal development

1. Introduction

With the rapid advancement of technology and the business world keeping up with digital transformation, Information Technology (IT) departments have gained significant importance. Almost all businesses require IT departments to make their operational processes more efficient and effective. However, due to variations in qualifications among different IT departments, individuals interested in working in this field may have questions about which areas to focus on. With the increasing job opportunities in the IT sector in the United States, attention is drawn to the growing need for a skilled workforce, emphasizing the importance of collaboration between educational institutions and employers to meet this demand (Moon, Bartholomew, & Weitlauf, 2017).

The results of another study conducted in Malaysia indicate that employees in the IT sector are insufficient in areas such as software development, network management, and database management (Ünal, İ., 2017). With the increase in job opportunities in the IT sector, there is a growing need for a skilled workforce, emphasizing the importance of employers investing more in talent development. Furthermore, solutions such as collaboration between educational institutions and employers, the use of new and innovative training methods, and the establishment of programs within companies to develop internal talent are recommended (Michael, O. E., 2019). The rapidly developing nature of the IT sector in Turkey and the increasing demand for a qualified workforce are evident in the data from the Turkish Statistical Institute (TÜİK) in 2022. The IT sector has increased its share in the country's economy and the number of people employed in the sector has approached 400,000. Therefore, enhancing the availability of young generations in the IT sector is believed to contribute to the sector's development.. (TÜİK. (2022). Information and Communication Technology Statistics). The Ministry of National Education (MEB) has set goals in its 2018-2023 Strategic Plan to provide technology-focused education to students, update and enrich the curriculum of computer courses to enhance the use of information technology and software development skills. In line with these goals, the content of computer courses in secondary education is being aligned with the needs of the IT sector (Ministry of National Education, 2019, 2018-2023 Strategic Plan). Additionally, the demand for IT workforce in Turkey is supported by data from the Turkish Employment Agency (İŞKUR). According to İŞKUR data, the unemployment rate in the IT sector in Turkey is quite low, and the need for qualified professionals in the IT sector is continuously increasing (İŞKUR, 2021, Labor Market Report 2020). The IT sector is one of the fastest-growing industries today, encompassing various disciplines. However, this rapid growth increases the demand for a skilled workforce. Individuals aspiring to work in the IT sector need to receive proper education and guidance to specialize in a specific area. Research emphasizes the need for continuous updating of competencies for IT professionals. Therefore, regular training and development programs can help IT professionals enhance their qualifications and assist employers in gaining a competitive advantage. IT departments need to be equipped with employees possessing different qualifications to adapt to the digital transformation of businesses. As a result, IT departments can be more efficient by

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employing specialized professionals in different fields (Çavuş, 2004). As advancements in IT and software progress rapidly, students should be provided with up-to-date information about new technologies and trends. Particularly, the introduction and development of computational thinking skills, which emerge as a new concept, should be the first step in the process of equipping teachers with the responsibility of teaching these skills. Moreover, identifying individual shortcomings, deficiencies, and inadequacies through tutorial supervision, observations, and program implementation, and involving relevant teachers in personal professional development programs are believed to have a positive impact. As a result, students will not only understand existing technologies but also quickly adapt to new technologies used in the business world. Additionally, students need to be equipped not only with technical skills but also with skills such as analytical thinking, problem-solving, communication, and collaboration. These skills are crucial for students to succeed in the business world (İliç, Mercimek, 2017). Information technology plays a significant role in business processes in the business world. However, many businesses lack adequate tools to measure the impact of information technology. Therefore, a suitable measurement system should be developed to assess the effects of information technology on business performance. This measurement system will assist businesses in utilizing information technology more efficiently and enhance overall business performance (Dulkadir & Akkoyun, 2013). The use of IT within organizations also increases employee motivation. As businesses rapidly progress towards institutionalization, the need for IT has become even greater. Hence, there is a requirement for employees who are skilled and knowledgeable in the field of IT. By providing support to individuals proficient in this field and offering necessary training to those lacking expertise, businesses positively contribute to employee motivation. When employee motivation is increased, overall business performance improves (Varışlı, 2021). In today's digitalized world with rapid technological advancements, the importance of information technology (IT) departments is emphasized. IT departments manage the digital infrastructure, resolve technological issues, and contribute to the successful implementation of the company's digital strategy. However, there may be variations in competency levels among different IT departments.

This study provides important guidance for individuals interested in working in the IT sector, aiming to help businesses succeed in their digital transformation processes. By examining the competencies of IT departments, the study offers appropriate training and guidance recommendations for those who want to work in this field. The objective of the study is to present strategies that will assist in the effective management of digital infrastructures within businesses. Additionally, it will contribute to enhancing the employability of the younger generation in the IT sector and play a crucial role in meeting the demands of the labor market. This study has an academic nature and aims to be a valuable resource for individuals interested in the IT industry. The minimum competencies required for individuals working in different departments within the IT field are summarized above. The variations in tasks performed by different sub-departments lead to differences in the required competencies. Expressing the necessary competencies and what needs to be done to acquire them by experts working in these areas is considered to be a guiding factor for individuals who aspire to work in the IT sector. Therefore, this study aims to present competencies and recommendations based on the opinions obtained through interviews with professionals specialized in various sub-departments of the IT sector. Within this scope, the research problem is defined as follows: What are the most in-demand competencies among different IT departments today, and what recommendations are there to acquire these competencies? The sub-problems that seek answers related to this problem are as follows:

1. What are the competencies?
2. What should be done to acquire these competencies?

2. Corporate Framework

Software, network systems, cybersecurity, artificial intelligence, data analysis, and help desk departments are vital departments for businesses in today's technology age. These departments perform critical functions such as protecting digital assets, managing network and computer systems, developing software and applications, and resolving user issues. Through a review of the literature in the field, it is evident that IT departments consist of several subunits, but six departments stand out and receive more focus and attention, indicating the presence of distinct activities within them. Therefore, this study specifically identifies these six departments.

2.1 Software Department

The software development department is responsible for the development and maintenance of a company's or organization's software-based products. Those who wish to work in the software development department should first enhance their technical skills, practice and master programming languages and software development tools, and develop skills such as effective communication within a team, problem-solving abilities, teamwork, and project management. Various positions within this department include software engineers, software developers, test engineers, project managers, and product managers. (Bass, McDermott, Lalchandani, 2015). The software department should consist of individuals who closely follow technological advancements, possess analytical

thinking skills, adapt well to teamwork, and have strong communication skills. Additionally, a team that is open to learning and change, has developed problem-solving abilities, pays attention to details, and takes a customer-focused approach will ensure successful completion of software projects. Employees in the software department should continuously improve themselves, be open to learning and implementing new technologies. Furthermore, they should establish strong communication with other teams during the software development process, adapt well to teamwork, and understand customer requirements to provide suitable solutions. Consequently, to enhance the qualifications of the software department and improve the skills of employees, it is necessary to stay up to date with technological innovations, participate in training, and continuously improve in areas such as project management and communication. Furthermore, having knowledge in areas such as user experience, design, and testing is important in understanding customer needs and providing appropriate solutions. (Kaptanoğlu, Gündüzyeli, 2021). Employees in the software department also work on understanding customer needs and requirements, troubleshooting issues during code development, ensuring software testing, measuring performance, and ensuring the sustainability and security of the software. Additionally, documentation of the software and user training are also responsibilities of the department. It is important for employees in the software department to have access to the technological infrastructure required to access tools, hardware, and software used in software development. Finally, effective management of the department and adopting a culture of open communication can increase employee productivity and happiness.

2.2 Cybersecurity Department

The cybersecurity department is a department created to protect and defend an organization's (company, government agency, etc.) digital systems against cyber threats. This department develops cybersecurity policies, identifies security vulnerabilities, and takes measures to prevent them. It also establishes defense and response strategies against cyber attacks and provides cybersecurity training. The cybersecurity department is responsible for the confidentiality, integrity, and accessibility of digital data. It should consist of individuals who closely follow current technological advancements, possess analytical thinking skills, and are capable of working in teams. Additionally, having an experienced team that can produce solutions to protect sensitive information, develop defense strategies against current cybersecurity threats, and handle crisis management plays a vital role in ensuring the organization's cybersecurity. Those considering working in the cybersecurity department should keep up with current technological advancements, gain knowledge about cybersecurity threats, and develop analytical thinking skills. Technical proficiency is highly important while working in the cybersecurity department. Some of the required skills may include:

- Understanding of network security concepts
- Knowledge of firewalls, IDS/IPS, antivirus, and other security devices
- Ability to perform technical security assessments such as penetration testing and vulnerability scanning
- Familiarity with data encryption techniques and protocols

Technical skills in configuration management, system administration, and database management Furthermore, improving crisis management and communication skills, developing defense strategies against current cybersecurity threats, and adopting a customer-focused approach are important for playing an effective role in ensuring the organization's cybersecurity. To enhance the capabilities of the cybersecurity department and improve employees' skills, it is necessary to receive cybersecurity training, enhance crisis management and communication skills, closely follow current technological advancements, and develop defense strategies against current cybersecurity threats. Additionally, the organization should adopt a customer-focused approach and establish effective communication between the cybersecurity department and other teams, which is crucial for maintaining cybersecurity (Hekim, Başbüyük, 2013).

2.3 Network Systems Department

Network Systems departments are responsible for meeting the information processing needs of organizations, managing and maintaining the network infrastructure. They oversee network hardware and software, monitor network performance, establish and enforce network security policies. Additionally, the Network Systems department keeps up with emerging technologies, optimizes the network infrastructure, and implements necessary improvements to enhance its efficiency. The technical knowledge required for individuals aspiring to work in the Network Systems department can be outlined as follows:

- Network hardware and software: Understanding how network management, network hardware, and software work, including the tools used to manage connections and data flow between network devices.
- Network protocols: It is important to have knowledge about network protocols such as TCP/IP, DNS, DHCP, and SNMP. These protocols are essential for ensuring the proper functioning of the network infrastructure.

- **Security:** Professionals in the Network Systems department should have knowledge of network security. They need to be familiar with identifying security vulnerabilities, implementing preventive measures against attacks, and authenticating the identities of users accessing the network.
- **Backup and recovery:** Understanding the backup and recovery of network data is crucial. This ensures the quick reestablishment of the network in cases of data loss or disruptions.
- **Troubleshooting:** The Network Systems department must possess troubleshooting skills to identify and resolve network problems. They should also be able to provide improvement recommendations to enhance network efficiency and address performance issues.

Individuals who wish to work in the Network Systems department should possess not only technical skills but also strong communication and collaboration abilities. The Network Systems department plays a critical role in ensuring smooth information and communication flow among different units within an organization. Therefore, it is important for employees in the Network Systems department to have the skills to effectively communicate and collaborate with other departments. Additionally, individuals working in the Network Systems department should be prepared to continuously learn and stay up-to-date with the latest technological advancements. This may involve participating in certification programs or relevant courses, attending conferences, and utilizing other resources to stay technically current (Kendall, K. E., & Kendall, J. E., 2003).

2.4 Artificial Intelligence Department

The Artificial Intelligence Department is a division within an organization that focuses on artificial intelligence technologies. This department is responsible for the design, development, implementation, and management of artificial intelligence systems. These technologies can be applied in a wide range of applications, such as natural language processing, image processing, robotics, and games.

The technical knowledge required for individuals who want to work in the Artificial Intelligence Department can be listed as follows:

- **Mathematics:** Proficiency in mathematical subjects such as linear algebra, probability theory, differential equations, and statistics is necessary.
- **Programming:** Knowledge of programming languages such as Python, Java, C++, and R is required.
- **Data Science:** Familiarity with data cleaning, data analysis, and data mining is important.
- **Machine Learning:** Understanding machine learning algorithms, linear and nonlinear regression, classification, and clustering techniques is necessary.
- **Natural Language Processing:** Knowledge of natural language processing techniques, language modeling, and word vectors is required.
- **Deep Learning:** Familiarity with deep learning networks, neural networks, CNN, RNN, and LSTM is important.
- **Computer Vision:** Knowledge of image processing techniques, image segmentation, and classification is necessary.

In addition to technical knowledge, individuals working in the artificial intelligence department should possess the following qualities:

- **Innovative Thinking:** Employees in the artificial intelligence department should continuously generate new ideas and provide innovative solutions.
- **Problem Solving:** The artificial intelligence department is designed to tackle challenging problems. Therefore, employees should be skilled in problem identification, analysis, and resolution.
- **Communication Skills:** Employees in the artificial intelligence department should be able to explain technical concepts to both technical and non-technical personnel. Therefore, strong communication skills are crucial.
- **Teamwork:** Employees in the artificial intelligence department work in teams. Thus, the ability to collaborate, interact with others, and work effectively as part of a team is important.
- **Learning Agility:** Artificial intelligence is a rapidly evolving field, with new technologies and methods emerging continuously. Therefore, individuals working in the department should be open to learning and development.

The above-mentioned qualities are essential for individuals working in the artificial intelligence department, beyond their technical knowledge. These qualities can contribute to their success and increase work efficiency. The responsibilities of employees in the artificial intelligence department include developing new artificial intelligence applications, improving existing applications, conducting data analysis, managing artificial intelligence projects, and promoting artificial intelligence technologies both internally and externally within the company.

2.5 Help Desk Department

The Help Desk Department is a unit where a company provides customer support services. This department handles and resolves issues, requests, and complaints related to products or services that customers may have. Help desk departments interact with customers through various communication channels such as telephone, email, live chat, or ticketing systems. The main duty of the help desk department is to promptly and effectively address customer issues in order to enhance customer satisfaction. The department must work efficiently to maintain the highest level of customer satisfaction. Therefore, employees in this department should possess high technical knowledge, strong communication skills, and problem-solving abilities. Additionally, time management and stress management skills are important for providing quick and accurate responses to customer inquiries. Help desk department employees should also undergo regular training based on the business needs, keep up with technological advancements, and continuously update their skills. (Güzel, 2020).

For those considering working in the help desk department in businesses, the technical knowledge they should possess includes the following:

- **Basic knowledge of computer hardware and software:** Help desk department employees should have knowledge of basic computer hardware and software to understand and resolve technical issues faced by customers.
- **Knowledge of network and internet technologies:** Help desk departments also handle customer issues related to network and internet connectivity. Therefore, employees should have knowledge of network and internet technologies.
- **Database management:** Help desk department employees are responsible for managing customer data related to products and services. Therefore, having knowledge of database management is important.
- **Communication technologies:** The help desk department uses various technologies to directly communicate with customers. Therefore, employees should have knowledge of communication technologies.
- **Problem-solving skills:** Help desk department employees should possess problem-solving skills to quickly and effectively resolve customer issues. These skills can enhance customer satisfaction and maintain the company's reputation.

2.6 Data Analysis Department

The Data Analytics Department collects, analyzes, and derives meaningful insights from a company's data to support its strategic decisions. The employees in this department are responsible for tasks such as data collection, analysis, interpretation, and reporting. The technical skills required for individuals interested in working in the Data Analytics Department include:

- **Database Management:** Employees in the data analytics department should have knowledge of database management for data collection, storage, and management purposes.
- **Data Mining:** Employees in the data analytics department should be familiar with data mining techniques to identify patterns and relationships within the data.
- **Programming Languages:** Employees in the data analytics department should be able to use programming languages to analyze and report data. Commonly used languages in this field include Python, R, etc.
- **Statistics:** Employees in the data analytics department should have knowledge of statistics for data interpretation and reporting.
- **Data Visualization:** Employees in the data analytics department should be able to create visualizations such as graphs, tables, and infographics using tools to represent the data.

The personnel skills required for individuals interested in working in the Data analysis department include:

- **Analytical Thinking:** Employees in the data analytics department should have analytical thinking skills to analyze and interpret data.
- **Problem-Solving:** Employees in the data analytics department should have problem-solving skills to identify and solve issues within the data.
- **Communication:** Employees in the data analytics department should be effective communicators when sharing analyzed data with other teams within the company.
- **Teamwork:** Employees in the data analytics department should have teamwork skills as they collaborate with other teams to analyze and interpret data.
- **Openness to Learning:** Employees in the data analytics department should be open to continuous learning as data analytics technologies evolve rapidly.

3. Method

3.1 Research Methodology

This study was conducted in accordance with the Case Study method. Case study is a strategic approach where a single case or event is examined in detail, systematic data collection is conducted, and real-life situations are observed. In this study, focusing on the IT sector employees in a company, the research was carried out in line with the case study methodology.

3.2 Study Group

The participants of the study were selected from experienced professionals working in different IT departments. The selection of participants was based on the characteristics of their respective departments. A interview form was used as the data collection tool for the study. The sample of the research consists of 32 personnel working in various IT departments of Belbim A.Ş, a subsidiary of Istanbul Metropolitan Municipality. To select the participants, departments that are relevant to the purpose of the research were initially identified. Participants were randomly selected from among individuals working in these departments and positions. The interviews were conducted individually. Demographic information, including age, gender, experience, and education status of the participants, was collected. The average age of the participants is 33. Among the participants, 19 are male and 13 are female. The average work experience of the participants is 7.8 years. One participant has an associate degree, 21 participants have a bachelor's degree, and 10 participants have a master's degree.

Table1.Demographic Information

Demographic Information	Value
Average Age	33
Total Number of Participants	32
Number of Males	19
Number of Females	13
Average Work Experience 7.8	7,8 years
Number of Participants with Associate Degree	1
Number of Participants with Bachelor's Degree	21
Number of Participants with Master's Degree	10

3.3 Procedures

The process started with interviews conducted to examine the competencies of different IT departments and gather recommendations for those who want to work in the IT industry. Notable points from the interviews were quickly noted and then analyzed using content analysis methods. These analyses were used to determine the requirements of IT departments and the skills that prospective employees should acquire.

3.4 Data Collection Instruments

A semi-structured interview form was designed to answer the research questions of this study. The prepared form was reviewed by a subject expert, who is a faculty member, and made ready for implementation. The form consists of six open-ended semi-structured questions to gather demographic information such as age, gender, education level, work experience, and department, as well as information regarding recommendations and competencies. The interviews were conducted face-to-face on an individual basis. The interviews encompassed participants' competencies, skills, experiences, and career advice. The form was prepared to collect information about the years of experience, gender, department, and education level of individuals working in the IT sector, and also to learn their professional qualifications and opinions about their careers.

3.5 Data Analysis

The data obtained from the interviews were analyzed using content analysis methods. The findings have provided recommendations for building a successful career in the IT sector.

4. Findings

The data was collected through interviews and analyzed using content analysis method. In this section, the obtained data will be presented in the form of frequency tables.

Table 2. Findings regarding software department competencies

Competencies	Frequency(n=5)	Percentage
Programming languages	1	20%
Database management	1	20%
Project management	1	20%
Software testing	1	20%
Network management	1	20%
Data analysis	1	20%
Software architecture	1	20%
Security	1	20%
Front-end technologies	1	20%
UI/UX design	1	20%
Web applications	1	20%
Machine learning	1	20%

The table presents the competencies possessed by 5 individuals working in the software department and the percentage of individuals having each competency. Each competency is expressed by one person, and the frequency of each competency is 1. The percentage column represents the distribution in percentage for each competency, with each competency having a 20% ratio.

Table 3. Findings Regarding Recommendations for the Software Department

Recommendations	Frequency(n=5)	Percentage
Participating in online training courses	3	60%
Keeping up with current technology and industry trends	3	60%
Sharing knowledge	2	40%
Continuous self-improvement	2	40%
Team work	1	20%
Internal company training programs	1	20%
Certification	1	20%
Networking	1	20%

According to the above table, the recommendations with the highest frequency are "Participating in online training courses" and "Keeping up with current technology and industry trends" (60%). Following that, the recommendations for "Knowledge sharing" and "Continuous self-improvement" have a frequency of 40%. "Teamwork", "Internal company training programs", "Certification", and "Networking" are other recommendations, each with a frequency of 20%.

Table 4. Findings Regarding Cybersecurity Department Competencies

Competencies	Frequency(n=5)	Percentage
Network security	4	80%
Penetration testing	3	60%
DLP management	2	40%
Cyber incident response	2	40%
Ethical hacking	2	40%
Crisis management	2	40%
Firewall management	1	20%
Threat assessment	1	20%
SOC management	1	20%
Threat analysis	1	20%
Security management	1	20%

According to the table, the competency with the highest frequency is "Network security" (80%). The second highest competency is "Penetration testing" with a frequency of (60%). The competencies of "DLP management", "Cyber incident response", "Ethical hacking", and "Crisis management" have a frequency of 40%. The competencies of "Firewall management", "Threat assessment", "SOC management", "Threat analysis", and "Security management" have a frequency of 20%.

Table 5. Findings Regarding Recommendations for the Cybersecurity Department

Recomenmendations	Frequency(n=5)	Percentage
Self-improvement	5	100%
Education and certifation	2	40%
Monitoring security threats	1	20%
Creating a test environment	1	20%

According to the above table, the recommendation with the highest frequency is "Self-improvement", emphasized by all participants (100%). The recommendation for "Education and certifications" is suggested by 40% of the participants. "Monitoring security threats" and "Creating a test environment" are other recommendations, each with a frequency of 20%.

Table 6. Findings Regarding Competencies for the Network Systems Department

Competencies	Frequency(n=5)	Percentage
Switching	5	100%
Routing	4	80%
SDN	4	80%
Cloud technologies	4	80%
Network management	3	60%
Firewall	3	60%
VPN	3	60%
Linux sistem administration	3	60%
SAN	2	40%
Ağ design	1	20%
Load Balancer	1	20%
WAN	1	20%
Active Directory	1	20%
Windows server	1	20%

According to this table, the most common competencies include Switching (100%), Routing (80%), SDN (Software-Defined Networking) (80%), and Cloud technologies (80%). This indicates that the employees in the department generally possess a good competency in these areas. Other competencies have lower frequencies.

Table 7. Findings Regarding Recommendations for the Network Systems Department

Recommendations	Frequency(n=5)	Percentage
Communication skills	2	40%
Technical document comprehension	2	40%
Problem-solving skills	2	40%
Leadership skills	2	40%
Self-improvement	1	20%
Openness to new technologies	1	20%
Teamwork	1	20%

According to the above table, the recommendations with the highest frequency are communication skills, technical document comprehension, problem-solving skills, and leadership skills. Each of them has a frequency of 40%. Self-improvement, openness to new technologies, and teamwork recommendations have a frequency of 20% each. This table demonstrates which skills and attributes are considered important based on the recommendations provided by the employees in the network systems department.

Table 8. Findings related to the competencies of the Artificial Intelligence department.

Competencies	Frequency(n=5)	Percentage
Data mining	5	100%
Machine learning	5	100%
Pythhon, Keras, Tensorflow	5	100%
Natural language processing	4	80%
Deep learning	3	60%
Artificial neural networks	2	40%

According to the table, the competencies of "Data mining," "Machine learning," and "Python, Keras, Tensorflow" rank highest with a percentage of 100%. Following them are the competencies of "Natural language processing" (80%), "Deep learning" (60%), and "Artificial neural networks" (40%).

Table 9. Findings on recommendations for the Artificial Intelligence department.

Recommendation	Frequency(n=5)	Percentage
Self-improvement	5	100%
Domain expertise	1	20%
Project participation	1	20%
Professional training	1	20%
Open-source projects	1	20%
Coding skills	1	20%

According to the above table, the recommendation with the highest frequency is "Self-improvement", which has been given by all participants and has a frequency of 100%. The recommendations for domain expertise, project participation, professional training, open-source projects, and coding skills each have a frequency of 20% and are evenly distributed among the competencies.

Table 10. Findings regarding the competencies of the Help Desk department.

Competencies	Frequency (n=6)	Percentage
Technical skills	2	33.33%
Communication skills	2	33.33%
Project management	1	16.67%
Team coordination	1	16.67%
Teamwork	1	16.67%
Cloud computing expertise	1	16.67%
Professional development	1	16.67%
Goal setting	1	16.67%
Participation in mentorship programs	1	16.67%

According to the table, the competencies of "Technical skills" and "Communication skills" are ranked highest with a percentage of 33.33%. Following them are the competencies of "Project management," "Team coordination," "Teamwork," "Cloud computing expertise," "Professional development," "Goal setting," and "Participation in mentorship programs" with a percentage of 16.67%.

Table 11. Findings regarding recommendations for the Help Desk department

Recommendation	Frequency (n=6)	Percentage
Self-improvement	3	60%
Online courses and certifications	2	40%
Cloud computing	2	40%
Teamwork	1	20%
Presentation skills	1	20%
Professional networking	1	20%

According to the above table, the highest frequency recommendation is "Self-improvement", which was given by 3 participants and has a frequency of 60%. The recommendations for online courses and certifications, as well as cloud computing, were given by 2 participants each and have a frequency of 40%. The recommendations for teamwork, presentation skills, and professional networking have a frequency of 20% each.

Table 12. Findings on skills of Data Analysis department.

Competencies	Frequency (n=6)	Percentage
Data mining	4	66.67%
Data visualization	4	66.67%
Statistics	2	33.33%
Big data management	2	33.33%
Big data analysis	2	33.33%
Programming	1	16.67%

Continued Table 12

Database management	1	16.67%
Machine learning	1	16.67%
Business intelligence	1	16.67%

According to the table, "Data mining" and "Data visualization" skills are ranked highest with a percentage of 66.67. Following them are "Statistics," "Big data management," and "Big data analysis" skills with a percentage of 33.33. "Programming," "Database management," "Machine learning," and "Business intelligence" skills have a lower percentage of 16.67.

Table 13. Findings regarding recommendations for the Data Analysis department.

Recommendation	Frequency (n=6)	Percentage
Continuous self-improvement	2	33.3%
Keeping up with new technologies	2	33.3%
Enhancing data security	2	33.3%
Collaborating to develop strategies	1	16.7%
Developing technical and communication skills	1	16.7%
Effectively presenting findings	1	16.7%
Keeping track of tools used in data analysis	1	16.7%

According to the above table, the recommendations with the highest frequency are "Continuous self-improvement," "Keeping up with new technologies," and "Enhancing data security." Each recommendation was provided by 2 participants and has a frequency of 33.3%. The participants who suggested collaborating to develop strategies, developing technical and communication skills, effectively presenting findings, and keeping track of tools used in data analysis have a frequency of 16.7% each.

Table 14. Findings on common competencies Across departments.

Competencies	Frequency (n=32)	Percentage
Data mining	9	28.12
Machine learning	8	25.00
Network security	7	21.88
Firewall management	4	12.50
Data analysis	3	9.38
Programming	2	6.25
Database management	2	6.25

According to the table, the highest percentage of competency is "Data mining" (28.12%), indicated by 9 individuals. Following that are "Machine learning" (25.00%), "Network security" (21.88%), "Firewall management" (12.50%), "Data analysis" (9.38%), "Programming" (6.25%), and "Database management" (6.25%).

Table 15. Findings on common recommendations Across departments.

Recommendations	Frequency (n=32)	Percentage
Continuous self-improvement	18	33.3
Certification	5	15.62
Communication skills	4	12.50
Teamwork	4	12.50

In the table, the recommendation of "Continuous self-improvement" has the highest frequency, suggested by 56.25% of the participants. This emphasizes the need for employees to continuously renew themselves to advance their careers and enhance their knowledge and skills. The recommendation of "Certification" has a frequency of 15.62%, and 12.50% of the participants have suggested both "Communication skills" and "Teamwork".

5. Results and Discussion

The data obtained in this study, which aims to determine the competencies and recommendations of employees working in different IT departments and provide guidance to those who want to pursue a career in this field, are highly informative and guiding. When examining the information that overlaps with the data from

the Tübider IT Industry Association (2020), individuals who aspire to work in the software department should focus on identifying their desired position and acquiring the relevant competencies for that position. To learn and develop these competencies, it is important to participate in online training programs and stay updated with current technology and industry trends. Those planning a career in the cybersecurity department should acquire skills such as network security, penetration testing, and DLP management, while continuously updating and improving themselves through education and certifications. As for individuals aspiring to work in the network systems department, they should obtain skills in switching, routing, SDN, cloud technologies, network management, and firewall, while also honing their communication skills, problem-solving abilities, and technical documentation comprehension. Those considering a career in the field of Artificial Intelligence, as mentioned by Taştan (2018), should have a command of machine learning, data mining, and programming languages. Additionally, they should continuously develop themselves in response to ever-changing technologies and aim to become experts in a specific area. For those aspiring to work in the help desk department, it is important to acquire technical skills, communication skills, and teamwork abilities, while also continuously updating and improving themselves through online courses and certifications. In the data analysis department, competencies such as data mining, statistics, data visualization, and big data stand out. In recent times, the field of big data has become a highly valuable area in terms of job opportunities. Employees in the data analysis department should also continuously improve themselves, keep track of new technologies, and be inclined towards teamwork. In this study and the conducted literature review, all departments emphasized the importance of focusing on a specific area and becoming an expert in that field. They also highlighted the significance of continuously monitoring and adapting to changing technologies, developing oneself, strengthening technical and communication skills, and considering data mining, network security, and machine learning as the most valuable competencies and recommendations.

References

- Bass, J. M., McDermott, R., & Lalchandani, J. T. (2015). Virtual Teams and Employability in Global Software Engineering Education. *2015 IEEE 10th International Conference on Global Software Engineering (ICGSE)*, 1-10.
- Bozüyük, T., Yağcı, C., Gökçe, İ., & Akar, G. (2005). Yapay Zekâ Teknolojilerinin Endüstrideki Uygulamaları. Çavuş, N. (2004). Bilgi ve iletişim araçları hakkında bilişim programı öğrencilerinin yaklaşımlarının değerlendirilmesi.
- Dulkadir, B., & Akkoyun, B. (2013). Bilişim Teknolojilerinin İşletme Performansı Üzerine Etkileri ve Gaziantep İlinde Tekstil Sektöründe Bir Araştırma. Gümüşhane Üniversitesi *Sosyal Bilimler Elektronik Dergisi*.
- Güzel, G. (2020). Bilgi Teknolojileri Departmanlarının Kurumsal İhtiyaçlara Göre Yapılandırılmasında Bir Yapı Önerisi: Antalya İli Resort Oteller Örneği. Ankara.
- Hekim, H., & Başbüyük, O. (2013). Siber Suçlar ve Türkiye'nin Siber Güvenlik Politikaları. *Uluslararası Güvenlik ve Terörizm Dergisi*, 4(2).
- Hollabaugh, E. J., & Hall, T. E. (2019). 5E Instructional Model for Technology and Engineering Teacher Education. *Technology and Engineering Teacher*, 79(5), 22-28.
- İŞKUR. (2021). İşgücü Piyasası Raporu (2020). Ankara: İŞKUR
- Kaptanoğlu, R. Ö., & Gündüzyeli, B. (2020). Yönetim Bilişim Sistemleri Geliştirme. *Balkan ve Yakın Doğu Sosyal Bilimler Dergisi*, Cilt (06) 29-42.
- Kariyer.net/Veri Analiz Uzmanı Nedir? [Online]: <https://www.kariyer.net/pozisyonlar/veri+analiz+uzmani/nedir>
- Kendall, K. E., & Kendall, J. E. (2003). Sistem Analizi ve Tasarım. *Journal of Information Systems Education*.
- Mercimek, B., & Ünal, İ. (2017). Bilişim Teknolojileri ve Yazılım Dersi Öğretim Programı Güncelleme önerisine yönelik bir değerlendirme. *Academia Eğitim Araştırmaları Dergisi*, 2(1), 1-9.
- Michael, O. E. (2019). The need for talent development in the IT industry: Innovative approaches. *International Journal of Emerging Technologies in Learning*, 9(2), 48-54
- Millî Eğitim Bakanlığı. (2019). 2018-2023 Stratejik Planı. Ankara: Millî Eğitim Bakanlığı
- Moon, C., Bartholomew, S. R., & Weitlauf, J. (2019). Developing and Assessing Engineering Design Thinking in K-12 Makerspaces. *Technology and Engineering Teacher*, 78(6), 8-13
- Taştan, S. B. (2018). Bilişim Teknolojileri Alanında Kariyer Olanakları ve Gelişim Süreçleri. *Sosyal ve Beşeri Bilimler Dergisi*, 13(2), 9-15
- TÜİK. (2022). Bilişim ve İletişim Teknolojileri İstatistikleri. Ankara, Türkiye: Türkiye İstatistik Kurumu.
- Tübider Bilişim Sektörü Derneği. (2020). Bilişim teknolojileri meslek seçimi [Online]: <https://tubider.org.tr/tubider-bilisim-teknolojileri-meslek-secimi-ve-ucretler/>
- Ünal, İ. (2017). Bilişim Teknolojileri ve Yazılım Dersi Öğretim Programı Güncelleme Önerisine Yönelik Bir Değerlendirme. *Procedia Computer Science*, 120, 144-152.

Varışlı, N. (2021). İşletmelerde Bilgi Teknolojileri Kullanımının Çalışanların Motivasyonu Üzerine Etkisi: Kobiler Üzerinde Bir İnceleme. *İşletme Araştırmaları Dergisi Journal of Business Research-Turk*,13(1), 410-429

Appendix

Appendix -1. Demographic Information

Age:

Gender:

Education Level:

Work Experience:

IT Department you work in:

Appendix -2. Interview Questions

- What skills do you believe you possess in your profession, and how did you develop these skills?
- What is the most significant achievement in your career, and what skills did you use to accomplish this achievement?
- What do you see as one of the most important trends in the IT industry, and how do you plan to adapt to this trend?
- Which skills do you consider critical for someone working in an IT department, and how can we develop these skills?
- What advice do you have for young IT professionals regarding building a career, and what recommendations would you give them?
- Which software tools are you currently using actively?