

Psychological and educational aspects of students' adaptation in the context of digitalization

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Abstract. This article aims to identify the factors that influence the academic performance of undergraduate students, focusing on digital literacy, digital knowledge and skills, as well as personal characteristics in the digital economy. To identify these relationships, surveys were conducted among students using appropriate online questionnaires, and the Big Five Personality Traits (BFPT) testing methodology was chosen to assess the personal qualities of undergraduate students. The findings of the study are consistent with the research in the field indicating a correlation between digital skills and student academic success and simultaneously the inverse impact of social media on academic performance. In addition, the study showed that there is also a positive relationship between some personal traits as conscientiousness, agreeableness and academic performance outcomes. Research illustrates the significant role of gender in academic achievement, explaining how differences in male and female personality traits can influence academic performance and adaptability. The results confirm that academic success and, thus, the ability to adapt to the changing conditions can be explained by personal traits and digital technologies used while the other possible factors can include gender, professional and cultural background.

Keywords: Academic Performance, Digital Technologies, Digital Economy, Personal traits, Education.

Introduction

In modern world digitisation has become one of the most important factors of human life, penetrating all spheres of activity, including the sphere of education. Digital technologies have also become the integral part of learning and teaching. One of the most important directions of the digital transformation of higher education is the transition from traditional educational models to virtual models and the acquisition of the appropriate software (Monisha, M., Valanteena, D. 2022).

Development of digital technologies promotes growth of economies and production cost reduction. However, new technologies including robotics, artificial intelligence and 3D-printing can reduce jobs and remove low-qualified workforce. As a result of employment structure changing the highly educated specialists can effectively adapt to changing labour market while the others can join the unemployed.

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Digital technologies and particularly platform-based jobs create new opportunities for young people, disabled persons and other discouraged and inactive persons. At the same time, access to digital technologies requires appropriate education and professional skills (Global Employment Trends for Youth, 2022).

Simultaneously, the use of digital and information technologies in the field of education leads not only to positive results, but also to some risks that have not yet been fully explored. Increasing access to personal information may contain some risks if the process is not regulated, and if students do not possess enough knowledge in digital literacy. Competent use of personal information and a balanced approach is quite an important issue in this context (Kumi-Yebaoh, A., Kim, Y., Yankson, B., et al., 2023).

No doubt, the use of digital technologies during the organisation of educational processes increased dramatically under the conditions of Covid 19. The pandemic forced the higher educational systems of developing countries to adapt to new realities in a very short period of time, which leads to both positive and negative consequences. Some researches prove that the students' self-control, sense of responsibility, and self-learning skills have gained particular importance in online learning conditions. They also consider that the use of digital technologies in the learning process leads to the formation of a new pedagogic culture (Rezer, T., 2021).

The issue of identifying the influence of different factors including information technologies, personal traits, gender and other factors on the achievements and academic performance of a person using digital technologies is a subject of interest to researchers in the field of education, management, and psychology.

The assessment of students' progress is usually determined by a set of factors, among which one can note, for example, individual differences or teaching methodologies. The question of whether the relationship between individual's personal attributes and their achievements was initially a topic for philosophical contemplation, however, since the end of the 20th century and the beginning of the 21st century has garnered the attention of researchers and professionals in the field of economics, business, sociology, and psychology. Robert McCrae and Paul Costa developed the Five-Factor Model (Costa P., McCrae R.R., 1999), which describes personality in terms of five broad factors.

It is noteworthy that different studies in this area have yielded different results. However, in general, most of the studies highlighted three core personal traits, which are conscientiousness, agreeableness, and openness. However, as different studies show personality traits can explain the differences in academic performance by only 30-35%, which means that the other factors affecting the academic performance should be considered (Nguyen Ngoc Diep, Dinh Thi Ngoan, 2021).

The main objective of this research pertains to identifying potential avenues for predicting students' academic performance through the analysis of the factors affecting the performance in particular use of digital technologies.

Literature review

The digitisation of the economy is transforming the essence of work and labor relations. As a result of the development of digital technologies, workers are forced to improve their skills and knowledge constantly and to adapt to rapidly developing technologies; thus some jobs are becoming less demanded and some are replaced by new ones (Tomashevski, K., 2020).

An analysis of a number of articles and studies has shown that there is a positive relationship between the skills in ICT technologies, virtual reality and various mobile applications and the academic performance of students (Gordillo-Tenorio, W., Meléndez-Flores, C., Sierra-Liñan, F. et al., 2023).

Most of the researchers who are interested in the field of digitalization and its different impacts study its influence on people, workforce behaviour, workplace relationships, and changes in their lifestyles. However, it is also necessary to consider that all innovations and

technological tools are perceived in different ways due to the peculiarities of human character and personal traits.

The positive impact of digitalization both on the implementation of work activities and on the facilitation of the education process is indisputable, but many negative consequences appear as a result of their influence. Thus, digital technologies lead to the spread of the mediated tools' use for the provision of educational services, which limit human contact and contribute to the psychological transformation of a person. At the same time, in the conditions of digital technologies, the possibility of easily obtaining a large volume of information greatly contributes to the increase of work efficiency, but it also causes stress and depression. In these conditions, of course, the development of stress management skills and stress tolerance is important (Burkaltseva, D., Timoshenko, O. Et al. 2020).

Recently, researches related to the impact of technology development and artificial intelligence on labour market and further opportunities for its transformation has become very common. In the process of studying this issue, it should be considered that the impact of science and technology on the labour market in developed and developing countries differs accordingly. While the labour markets and workforce of developed countries can benefit from technological development, the risks and negative consequences for developing countries are greater (Carbonero, F., Davies, J., Ernst, E., et al., 2023).

Although many employers have a stereotype that high academic performance at university can be a guarantee of effective work, research does not prove this position, however, it can be argued that effectiveness in the workplace largely depends on personal qualities and skills (Sulphey, M.M., 2012). In general, among the main factors affecting the academic performance of students the following can be mentioned:

- Digital skills and students' attitudes towards information technology and artificial intelligence as a tool and as a competitor in the labour market;
- Personal traits and qualities;
- Students' motivation and perception of their abilities;
- Gender, age, educational level.

Students in fact are motivated by employment because computer skills can be supportive in job placement (Serge, et al, 2018). Simultaneously, in the literature there is no consensus around the use of technologies in education. Particularly, there are concerns related to the negative effects of technologies and social media use on academic performance of students (Tang, S., Patrick, M., 2018). For instance, studies have shown that increased use of information and communication technologies in learning can lead to technostress. The university students in Sweden experience technostress despite even the fact that during several decades' information and communication technologies are used at all the educational levels (Fitzgerald, N., 2021).

In general, most of the studies related to the impact of personal qualities on the academic performance highlighted three core personal traits, which are conscientiousness, agreeableness, and openness. However, the effect of personal traits on academic performance is mediated by self-efficacy which is positively related to the performance (Simoes S., Oliveira T., Nunes C., 2022). The self-efficacy or the individual's belief in the abilities can be one of the best predictors of the academic success (Stajkovic A. Bandura A., et al, 2018). Such strong personal traits as self-discipline, striving for achievement and a sense of competence can contribute to this estimation.

The motivation to engage in learning is positively correlated with an individual's personal development.

The above-mentioned studies also list some research limitations, including relying on self-reported GPA, restrictions of sample survey within a single educational establishment, and challenges associated with predicting human behavior.

From this point of view, it is important to identify the role of digital technologies in the results of academic performance. Different researchers mention that the empirical research examining the impact of digital technologies on the results of academic performance of students is insufficient. As some of the authors argue the development of digital technologies during the latest 30 years showed its positive and negative consequences (Henderson M, Selwyn N., Aston R., 2015).

A study conducted among university students in India revealed that although students are well aware of the importance and role of digital technologies, they use only very limited tools, particularly, this refers to presentation preparing tools mainly (Monisha, M., Valanteena, D. 2022).

Gandhi, V. Prashant, Ch., Vishal, M. (2018) found that openness, conscientiousness, and neuroticism have a significant impact on the academic achievement of students, while extraversion and agreeableness exert no noticeable influence on student learning outcomes.

John, Romel, John, Rehana, Rao, Zia-ur-Rehman (2020) produced results indicating that openness has the strongest positive effect on academic performance, closely followed by agreeableness. Conversely, neuroticism, and extraversion do not wield a significant impact on student performance.

Hart, J. W. et al. (2007), Major, D.A., Turner, J. E., et al. (2006) determine that openness, extraversion, and conscientiousness are pivot motivation to learn. Moreover, it is noteworthy that the motivation to engage in learning is positively correlated with an individual's personal development.

In this context, agreeableness, conscientiousness, and openness have a positive correlation with the cumulative grade point average, while extraversion and neuroticism have a negative correlation with the cumulative grade point average (Seman, Kamilah & Ismail, Zurina, 2019). This study differs from other similar studies in that the authors found that extraversion is an unfavourable trait for academic performance, while other researchers argue that extraversion has a positive effect on intrinsic and extrinsic motivation, which can lead to higher academic performance.

Recent studies show that despite the importance of digital technologies, particularly use of virtual learning environment and social media negatively impacted the students' skills development. Especially, refers social media use which cannot promote attainment of learning objectives, however, it is used primarily by students (Lacka E., Wong T.C., 2021).

Under the conditions of modern technological development and the changes of social economic relationships within the economy, the possibilities of using artificial intelligence, as well as the skills and competences of exploitation of AI tools are of particular importance.

Research methodology

This research mainly focuses on digital technologies, personal traits and academic performance correlation identification. Diverse research findings imply that an individual's personality and IT can affect their motivation, success, stress, etc. (George Jacob, Febin & George, Elvin & V Jacob, Daniel & Jacob, Tilu & Rajan, Anisha, 2022).

The impact of personal traits was analysed using Likert scale. Particularly, The Big Five personality traits (BFPT) test was used based on 50 items questionnaire. The students answered questionnaire on the scale of 1-5: 1-disagree, 2-slightly disagree, 3-neutral, 4-slightly agree and 5-agree. The personal traits were synthesised into the framework known as Big five personality traits, which can be explained as follows (Radisavljevic, Dusan & Rzepka, Rafal & Araki, Kenji, 2023):

- Openness – Openness to new ideas, to changes;
- Conscientiousness - measure of efficiency;
- Extraversion - measure of energy;
- Agreeableness - measure of how a person gets along with others;

- Neuroticism - measure of sensitivity.

The impact of digital technologies on academic performance was analysed using a sample online survey which comprised 118 undergraduate students from the departments of management, finance and accounting at Armenian State Economic University (ASUE) in Yerevan. The aim of this survey was to reveal the ability of undergraduate students to use digital technologies during their study, research and learning and to evaluate the impact of these technologies on their academic performance. At the same time, the survey was directed towards explaining the students' understanding of contemporary information technologies potential and the usage of artificial intelligence tools during the study and learning.

It is worth noting that 78% of students who completed the survey were females and 22% - males. Interestingly, a range of similarities can be identified among the results of the studies, but some of them also differ depending on the education level of the students, their country and other characteristics.

The items of the survey questionnaire were rated on non-Likert scale of (0,1,2) which is evaluated as the most effective scale type for the analysis (Lonangraph, P.I., Sutanapong, Ch, 2018).

Within the survey, self-reported CGPA was employed as the metric for assessing the students' academic performance. The SPSS software was applied to analyze the results of the sample survey.

Data were diagnosed for multi-collinearity, and as a result, Variance Inflation Factor (VIF) data were lower than the cut-off value of 5. Besides, correlations which were considerably lower than 0.8 proved that multi-collinearity was not diagnosed.

Results and discussion

Research conducted has revealed that 96.6 percent of undergraduate students use information technology in one way or another during the process of learning. Moreover, a vast majority of students use Internet search engines, office programs, social networks and various online groups and chats. The results of the study are presented in Figure 1.

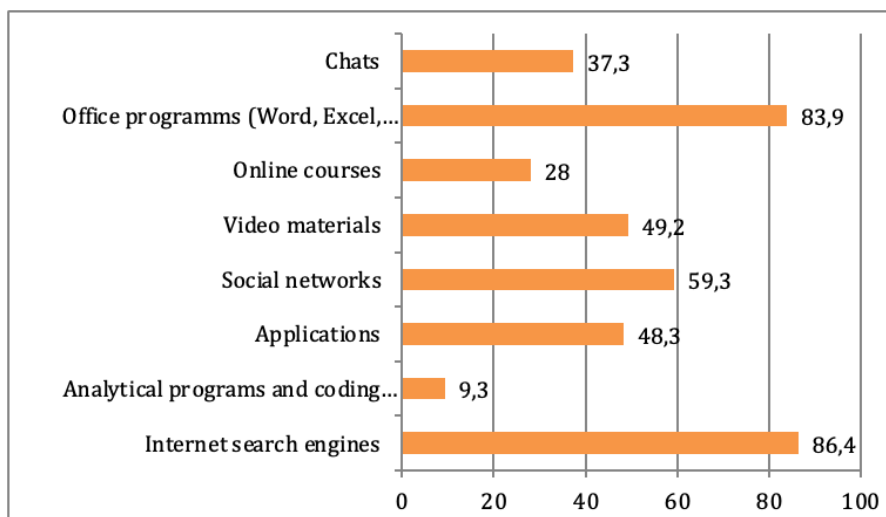


FIGURE 1. Technologies mainly used by undergraduate students during their study.

Half of the students surveyed claim that they are able to use the capabilities of artificial intelligence (AI) in the process of learning, and approximately 40% of them use these

capabilities partially. It should also be mentioned that almost 10% of the students surveyed do not use AI in their studies at all.

As a result of the analysis of survey data, it was revealed that 71.2% of students use the capabilities of artificial intelligence to collect data, 56.8% to study, 57.6% to facilitate operations, and 23.7% to automate some processes.

Besides, 39% of the students surveyed do not see any risks for employment as a result of the development of AI technologies, 35.6% of respondents found it difficult to answer, and 25.4% believe that the development of artificial intelligence will lead to mass unemployment. The survey results showed that despite the rapid dissemination of information technologies, even young people still see risks in the development of technology, as they believe that this will lead to a significant increase in unemployment.

It is interesting to note that the correlation analysis revealed significant correlation between the indicator of academic performance of students (CGPA) and use of Internet search engines.

The correlation results reflecting the impact of information technologies on academic performance are represented in the Table 1.

TABLE 1. Correlation coefficients of academic performance and use of information technologies

	Correlation coefficients
Internet search engines	.271**
Applications	.062
Social networks	-.033
Video technologies	-.119
Office programs	.235*
Artificial Intelligence	.138

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

As the analysis showed there is a significant correlation between the use of internet search engines, office programs (including Word, Excel and others) and academic performance of students reflected in CGPA (Pearson coefficients correspondingly - 0,271 and 0.235). Simultaneously there was no registered significant correlation between the above-mentioned types of technologies as applications, social networks, video technologies, artificial intelligence and indicators of academic performance. However different studies reflected a positive influence of technologies on students' academic performance based on their easy interaction also during the period of COVID-19 pandemic (Gordillo-Tenorio W., Melendez-Flores C., 2023).

This research confirms results of some previous studies regarding the role of social media as a communication tool but not a learning opportunity. For instance, the inverse relationship was revealed between the CGPA and social media, as well as video technologies use, thus, this finding shows that mentioned technologies cannot promote the attainment of learning objectives.

Simultaneously, according to the conducted research and the results supported by other studies (Simoes, S., Oliveira, T., Nunes, C., 2022), only part of the academic performance of students can be explained by the impact of digital technologies.

At the same time, the influence of students' personality traits on academic performance was analysed. The correlation analysis revealed relationship between the academic performance of students and the big five personality traits used in the model. The dimensions of such

personality traits as Conscientiousness and Agreeableness showed the high level on students ranging from 28.85 to 29.92.. The average CGPA was 3.11 (Table 2).

TABLE 2. Academic performance and the level of personality traits

Variables	Mean	SD	N
CGPA	3.11	.64	118
O	27.92	.43	118
C	29.92	5.21	118
E	24.19	6.25	118
A	28.85	7.36	118
N	17.22	6.30	118

Source: Survey analysis data

The correlation analysis revealed a significant inverse relationship between the gender and academic performance, with females scoring higher than males (Table 3). The results of different studies show that female students outperform their male counterparts contributing to the gender gap in educational attainment (Tsaousis I., Alghamdi M.H, 2022). The studies by Hausmann and Spinath (Hausmann R., 2009; Spinath B., 2010) supported the idea on females achieving higher scores in language tests and overall performance. (Marcenaro-Gutierrez O., 2017).

TABLE 3. Correlation coefficients of academic performance and personal traits

	Correlation coefficients
Gender	-.517**
O (Opennes)	.111
C (Conscientiousness)	.228*
E (Extraversion)	.072
A (Agreeableness)	.255**
N (Neuroticism)	.042

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).
 Gender parameters: female- 0, male-1.

At the same time, according to the correlation analysis results (Table 3) two personal traits including the conscientiousness (0.228) and agreeableness (0.255) affect the academic performance significantly. Conscientiousness emerges in many studies as being strongly and positively associated with academic performance, standing out as the most influential predictor of academic performance (Nofle E.E., Robins R.W. 2007; Jensen M., 2015). Such strong personal traits as self-discipline, striving for achievement and a sense of competence can contribute to this estimation.

Agreeableness determines the individual’s ability to be cooperative, compassionate, and trustworthy.

Recent studies show conscientiousness and agreeableness to be the best predictors of job performance (Delima V.J., 2019).

The other two personal traits as extraversion (0.072) and neuroticism (0.042) have no significant correlation with academic performance, which is also confirmed by other studies (John Ro., John Re., Rao Z., 2020; Diep N., Ngoan D., 2021). These lower results observed in relation to extraversion and neuroticism can be attributed to the characteristics associated with neuroticism, such as impulsiveness, depression, and anxiety.

Simultaneously, the results of this research confirm that in the conditions of digital labour market soft skills development such as communicativeness, conflict resolution, decision making and other skills become more important and have impact not only on academic performance but also on job performance.

Conclusions

In the context of technological discoveries and revolutions, the sphere of higher education receives special attention. The issue of student motivation, identifying certain qualities crucial to achieving success and enhancing performance indicators assumes paramount significance. Besides, due to the swift and ongoing changes in the environment flexibility and ability to adapt to the new realities is crucial for success either on the workplace, or elsewhere.

Through comparative studies conducted in different countries, as along with the analysis of the findings of present study, it becomes evident that there is a correlation between the use of digital technologies, personal traits and both academic and job performance.

The main objective of this study was achieved, as technologies, IT literacy and the key personal traits affecting academic performance were identified, and their potential for predicting academic performance was recognized.

However, results of our study and some other studies show that personal traits and digital technologies can explain only part of the academic performance of students while the other part of the performance still cannot be explained.

Concurrently, we conclude that predicting human behavior can be a challenge. The findings of the study are shaped not only by the access and use of digital technologies, but also by personal qualities of the individuals, their age, gender, level of education, professional orientation, socio-economic conditions and cultural traits. The study results align with prior research, demonstrating that conscientiousness and agreeableness are significantly correlated with academic performance results (Hafiz S., 2016, Choudhury and Amin, 2006). Furthermore, the study results underscore the noteworthy influence of gender on academic performance, a trend that has also been substantiated by various other studies.

Related to the digital technologies, the implementation of trainings would be useful for the wider use of technological tools for students and professional staff of educational institutions.

Besides, social media as a digital tool for the educational purposes can be used with limitations mainly for communication and networking opportunities and also taking into account that further expansion of social media use can lead to psychological problems and stress deepening.

Results of study may offer valuable insights for further improvement of educational processes and programs considering the preferences of undergraduate students. Enhancing academic performance indicators can be achieved by improving core personal traits, such as conscientiousness, agreeableness, and openness, widening use of different technologies. However, new digital technologies should be balanced by non-digital structures of high education as syllabi development, promotion of talented students and others. At the same time, it should be mentioned that further research is required to discover the correlation between the IT literacy, academic performance and ability to adapt to the digital economy and implementation of artificial intelligence potential in different fields.

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