

Development of digital competences of business students through e-business learning based on CMS WordPress

Kinga Anna Krupcala

Bydgoszcz University of Science and Technology

Bydgoszcz, Poland

kinga.krupcala@pbs.edu.pl

Abstract

Digital competences play an important role in the information society. According to a study conducted at the Bydgoszcz University of Science and Technology, however, many students are unable to use many online applications and their abilities are largely limited to social media. In an attempt to broaden the digital competences of economics students, an innovative curriculum has been developed to teach them how to build websites on the WordPress CMS along with an e-shop. This article presents the results of research conducted at 2 Polish universities – the public Bydgoszcz University of Science and Technology and the private WSB University in Warsaw – over the last 4 years. The results of the study indicate that such new skills will allow students to enter the job market (work in CMS-based website administration jobs) or start their own business faster and better (by, for example, reducing the initial cost of setting up a website) and should be further developed. The graduates, who were also included in the additional survey, in several cases confirm that they are able to use their newly acquired competences, which have helped them in their professional and private lives.

Keywords: CMS, WordPress, business students, digital competences, Content Management System

1. Introduction

Nowadays, the development of enterprises in the world is determined by their computerisation, automation and robotization. “Managers and decision makers need to transform their organizational routines and structures to meet the challenges of the digital age” [1]. Fourth industrial revolution involves cyber physical production systems (CPPS), industrial internet of things, cloud computing, big data, machine learning, integration of industrial information sources and service-orientated architecture (SOA) [2]. The digitalisation of the state's economy affects the type of competences desired on the labour market, referred to as digital competences. They are also essential for functioning in the information society itself. According to [3] „Digital competences, (...) are today one of the key competences of the twenty-first century. In the face of the ongoing digital revolution, their importance in various fields of education is growing as well”. One of the five pillars of digital competence development, alongside information processing, communication, security and problem solving, is the area of content creation, i.e. the development and integration of digital content, as well as the creation of copyright, licensing and software content [4]. One form that education in this area can take is the creation of websites, together with an e-commerce site, using tools such as the Content Management System. CMS WordPress is currently the most popular software for building websites and applications around the world. The literature also points to the use of CMS in production engineering - e.g. the implementation of an Open Source CMS system in the product maintenance and service applications, to manage information and knowledge during the process of operations [5]. However, there are gaps in the development of digital competences, both among students and teachers. Many universities have not fully embraced these competences as a core skill, which includes mastery of technology. It can also be seen that new models for the introduction of digital competences are developing very quickly, and thus the digital divide that already exists is also widening.

The aim of this article is to present the results of a survey carried out among

economics students and graduates on the practical learning of e-business and the development of digital competences in this area, through the design of a website together with an e-shop based on CMS WordPress. This paper aims at answering two research questions: (1) Does practical e-business learning based on working with established companies and building websites and an e-store for them by economics students improve their digital competences?; and (2) To what extent can learning e-business based on building, managing, creating website and e-store content in CMS WordPress contribute to a job in the e-commerce industry?. The research hypothesis is: An innovative teaching method for economics students, based on CMS WordPress, contributes to the expansion of digital competencies and increases opportunities for development and new professions in today's labor market to a significant extent.

In the next section, the general conclusions of the literature review made in terms of previous experiences of digital competence, the teaching of e-business and CMS, and students' approaches to teaching this subject are presented. The following sections present the aims, method and results of the two empirical studies. At the end of the paper, some general conclusions of the studies are provided.

2. Literature review

The author used, courtesy of the library of the Bydgoszcz University of Technology, a multi-search engine searching various bibliographic databases (including: Academic Search Ultimate, Business Source Ultimate, Springer Nature Journals, IEEE Xplore Digital Library, Social Sciences Citation Index, Scopus, Directory of Open Access Journals). To find articles addressing the topic under study, the search phrases, 'digital competences' (or 'digital skills') and 'students' (or 'university'); and 'cms' (or 'content management system' or 'WordPress') and “e-business course” were filtered. The search was limited to peer-reviewed scientific articles available in full version in the following academic fields: Economics, Business and Management, Information and Technology, Social Sciences and Humanities. The most important search results (and those most relevant to the title of the article) are presented below.

2.1. Digital competences and their development in the context of student education

Digital competences are a recent topic and their role has also been recognised in higher education, especially at a time when the COVID-19 pandemic has forced teachers and students to use ICTs in the teaching and learning process [6]. There are many definitions of this concept. It has been included in the recommendations on key competences for lifelong learning proposed by the European Commission as one of the eight key life skills, and it is defined as “the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society” [7].

According to a survey among Spanish university students [8] “the majority of the students perceive themselves with a medium to a high level of digital competence, highlighting the multimedia and communicative dimensions, as opposed to the more technological aspects”. The same is emphasised by the cyclical research on the problem of digital competence conducted by [9]. The researchers say that “the institutions of higher education are encouraged to focus on the development students and teachers’ digital competence, create relevant learning strategies and use appropriate tools to improve the quality of education.” Conclusions from their different research [10] indicate that “the development of key competency areas for digital competence, such as the creation of digital content, should be promoted, along with helping students to gain knowledge when dealing with everyday technological issues. The need for training related to the use of ICT and digital competencies was also highlighted”.

Numerous studies from the last few years, e.g. [11, 12, 13] point to gaps in the development of students' and teachers' digital competences. It is argued that higher education has not fully embraced digital competence as a core skill, which includes mastering technology. New models for the introduction of digital competences are developing so rapidly that the existing digital divide may widen further. In order to prevent this, new methods and models need to be incorporated into curricula that develop digital competences in their individual components, e.g. the technical aspect. The

literature also advises that educational systems for the teaching of digital competences, which are treated extremely divergently by the literature, should be standardized [14]. This article therefore focuses on technical competence - a specific system – Content Management System, the learning, ability to use, implement and operate of which is included in digital competence.

2.2. Teaching e-business and CMS as development of digital competences in the light of the literature

Tools such as CMS have been the subject of research for several years now. Content Management System with strong ability, flexibility and extendibility are being taken as one of the most important Information and Communication Technologies (ICTs) in managing organization information and knowledge [15]. CMS, especially Open Source CMS (like WordPress) attracts many researchers to explore its ability to manage knowledge and processes, especially unstructured information and knowledge [15,16]. Universities and colleges are increasingly choosing to implement innovative curricula or courses consisting of practical e-business learning through the use of IT tools and, above all, CMS. Mainly a particular type of CMS is used, which is WCM - Web Content Management [17]. Such studies have been conducted in Croatia (Electronic business course at Zagreb School of Economics and Managements - higher education economy faculty- in 2012-2015 for 20-25 students each year) [18] and in Poland (Bydgoszcz University of Science and Technology – formerly UTP – in 2019-2023) [19].

On the one hand, the literature does not pay much attention to the study of the attitudes of economics students towards the teaching of subjects such as e-business and the applications used during these classes [20]. On the other hand, however, it is a frequently encountered topic in the literature [18], albeit indirectly focused on the analysis of students' experiences to CMS learning. General attitude of students towards learning e-business are presented, inter alia, by [21], who state: "Students' negative attitude to e-Business application fails to promote the increase in the level of students' knowledge and skills in e-Business application, and competence, in general. In contrast, students' positive attitude to e-Business application contributes to the enrichment of the level of students' knowledge and skills in e-Business application and competence, in general". Interesting findings from the study were also presented by [22], stating that „students are required to create new electronic businesses and to build prototypes of their electronic Web fronts”. The authors further notices that „more than half of the students were enthusiastic about the new approach: they felt satisfied and even proud of their projects”. This research is in line with research by [23], which has repeatedly shown positive student attitudes towards building websites with the CMS WordPress, as well as their impact on improving digital competences and opening up new job opportunities in professions they have not yet considered - but which are in demand on the labour market (like digital manager or marketing and website management specialist).

3. Research Methodology

The topic of developing students' digital competences at universities through practical learning to build websites and e-commerce based on CMS WordPress has been the subject of the author's research for several years [24, 19, 23]. The main objective of the empirical study was to investigate the development of digital competences (in technological terms) of university students of economics through the construction of a comprehensive website for an actual company on the market and an e-shop, as well as the possibility of getting a job thanks to the new competences. The achievement of the main objective was to ensure the following specific objectives:

- 1) To learn about the rationale for developing digital competences in economics majors from a technological aspect that could contribute to their enhancement;
- 2) To find out students' opinions about the possibility of using the experience gained during their studies in their future work.

This study applies a quantitative survey approach to gain evidence for the research area at hand, and it was conducted both digitally and in an analogous way. Among others, the context of the research refers to previous knowledge on the use of ICT tools in higher education [25]. An interesting study was presented by [26], where an intermediate level

of digital competence was identified and discrepancies were discovered between the declared good level of digital competence of university and high school students and the survey results. They pointed to the need to improve the educational process in order to provide university and high school students with a higher level of digital competence. Programming is the most lagging in all groups observed. Based on the literature review and practical experiences gained during the first year of the project, the survey questionnaire was developed. It contained 12 subject matter-related questions on the subject matter, the skills gained, the innovation of the programme and future opportunities to use the knowledge gained, as well as to take up jobs that are in demand on the labor market [27]. Due to the subject matter of this article - 4 questions were selected that indicate the sense of conducting such classes at economic universities. The survey was conducted among students of management and management and production engineering at the Faculty of Management at the Bydgoszcz University of Science and Technology (Poland), starting in the 2019/2020 academic year, and students of economics at the WSB University (Poland), in the 2020/2021 academic year. A total of 491 students were surveyed – February 2020 – 94 students, June 2020 – 39 students, February 2021 – 203 students, February 2022 – 70 students, February 2023 – 85 students. There are no other digitization-related classes at these universities and their economics majors. The second survey included a dozen graduates (43 students) of the subject from the last two years and looked at the actual use of the digital competences acquired including the ability to use and operate the CMS.

4. Research Results

An earlier study [23] showed that the Bydgoszcz University of Science and Technology is the only public university in Poland to develop specific technical aspects of digital competences by learning how to build a website with an e-shop on CMS WordPress. The concept for the course was developed by the author in 2019 and stems from her experience in the job market and research in this area covering current e-business teaching programmes at economic universities in Poland. The job market is actively looking for people who can not only build a web application or website, but also operate it - adding updates, website entries, new products or modifications (frontend web developer, web designer). This task, due to the existence of the CMS, does not require complex programming skills (or IT skills in general) which provides ample opportunities also for students of other majors - such as management. The business knowledge, that students acquire during their studies, is already in itself a good "starting point" for knowing how to present content and products so that they find their audience. The concept is implemented during the course of the subject labs, throughout the academic semester, and is based on the WordPress CMS due to the fact that "810 million websites use WordPress, which is 43% of all the websites on the Internet. WordPress has a 64.2% share of the CMS market, which is more than 10x greater than its closest competitor. WooCommerce (e-shop, built on WordPress) is the world's most popular ecommerce platform, with over 36% of the market share" [28]. Each student, on his or her own, makes a comprehensive website including an e-shop, at each lab learning a new skill - adding further functionality to the site. At the beginning of the class, the author shows how, for example, to add a blog and subsequent posts to the site, and then the students do the same on their computers and create the content of subsequent blog posts. In the 2019/2020 academic year, students developed websites for hypothetical companies, while from 2020/2021 onwards, students developed websites for actually existing organisations that applied for the "Free website" project of the Bydgoszcz University of Science and Technology. Thus, the class consisted of creating a websites from scratch for a company that volunteered to participate in the project, including building a homepage, a slider, a contact form, a company blog with a few posts, refining widgets, an entire e-store with services or products.

As already mentioned, the entire survey questionnaire included 12 questions, but due to the size of the publication - only the answers to the four questions that best relate to the topic of the article are presented.

First, students were asked whether classes of this type should be held at economic universities at all. The results from each year are presented in Table 1.

Table 1. Opinions on the relevance of e-business classes for economics majors.

Digital CMS classes should take place at economics faculties	February 2020	June 2020	February 2021	February 2022	February 2023
Yes	78.5%	87.2%	77.3%	94.2%	87,1%
No	6.5%	7.7%	9.9%	2.9%	4,7%
I don't know	15%	5.1%	12.8%	2.9%	8,2%

The vast majority of students believe that classes using the CMS system should be held at economic universities (404 in total). The students were also asked about the way in which the classes were delivered, which required them to spend extra time and the students' contact with representatives of the company for which the website was being built. The results in Table 2 indicate that the clear majority of students enjoyed or very much enjoyed the activities. There was not a person who did not like this kind of teaching or the skills they learn from it at all. This is helpful information that makes both the course of study and the learning process itself more attractive. It shows that such competence digitizing and the process of acquiring it does not cause problems for students. As the literature presented above indicated - job satisfaction has an impact on the expansion of digital competences and the desire to develop them.

Table 2. Students' perceptions of the e-business course.

Did you like the class?	February 2020	June 2020	February 2021	February 2022	February 2023
1. I did not like them at all	0%	0%	0%	0%	1,2%
2. I rather did not like them	3.3%	0%	0.5%	0%	0%
3. I liked them a bit	25.5%	2.5%	8.9%	2.9%	23,5%
4. I liked them	38.2%	15.4%	33%	22.8%	29,4%
5. I liked them a lot	33%	82.1%	57.6%	74.3%	45,9%

The next question aimed to find out students' opinions about the usefulness of the skills acquired, in their future work. A large number of students are currently working in various positions, so they may have some reference to the topic. The answers are presented in Table 3.

Table 3. Opinions on the usefulness of the skills acquired in future work.

The acquired skills will be useful in future work	February 2020	June 2020	February 2021	February 2022	February 2023
1. In my profession – I want to deal with it in the future	19.1%	17%	20.2%	7.1%	13%
2. Only if I decide to launch my own business	20.2%	15%	23.6%	37.1%	32,9%
3. Perhaps, I do not know yet	55.3%	67%	53.7%	55.8%	50,6%
4. Not needed for future job	5.3%	1%	2.5%	0%	3,5%

Although students do not always know whether they will have the opportunity to use their new skills in a future job, around 15% of them plan to permanently associate themselves with a profession in which working on a website and e-shop is possible. One of the next questions asked about professions currently in demand on the labor market, such as digital manager or web administrator. The responses in Table 4 indicate that students recognise the needs of the market and appreciate the opportunity to gain the skills needed for CMS professions.

Table 4. Responses to the question of whether the profession of digital manager is in demand in the labor market.

The profession of digital manager is in demand	February 2020	June 2020	February 2021	February 2022	February 2023
1. Yes, very much	53.2%	43.6%	46.3%	57.1%	49,4%
2. Yes, but not very much	31.9%	38.5%	28.6%	31.5%	32,9%
3. No, it is not in demand	3.2%	2.5%	1.5%	0%	1,2%
4. I have no opinion	11.7%	15.4%	23.6%	11.4%	16,5%

The advantage of a CMS is that all such systems are similar to each other and knowing how to use one of them gives you a very good basis for using a CMS other than WordPress, such as Drupal or Joomla! [17]. Students can therefore also use the knowledge of one system in

situations where they need to work with another CMS. Acquired digital competences therefore provide more opportunities to use technical competences.

In order to find out whether the students actually had the opportunity to use the acquired CMS skills - the author conducted an additional survey. The survey questionnaire was completed by 43 graduates of the subject who attended classes in the academic year 2020/2021 (36 people) and 2021/2022 (7 people) and contained 12 questions. Two, the most important from the point of view of this article, are presented below.

Table 5. Responses to the question of whether the skills/knowledge from web building have ever been applied

Successfully applied skills/knowledge from website building	Number of people (in percentage)
1. Yes	14%
2. No	79%
3. I don't know	7%

It can be seen from Table 5 that a few people, in such a short period of time, have managed to use the knowledge gained in the classes. These persons (6 persons) were also asked in which circumstance/situation this took place. The answers are as follows: "Internet sales; Privately, front end course; Helping a colleague, being at another university; While conversing with friends, at university; I created a website for a company where a person close to me works; In a recruitment interview in my current job, I am to run our company's website in the future". It is interesting to note that the classes interested the students so much that some of them decided to take other, paid related courses, such as the front end developer course or will be working with the site pages in their work.

Table 6. Responses to the question of whether the student has already undertaken the construction of a website or dealt with professional website building themselves after completing the course.

After the class was over, I undertook to build the site from scratch.	Number of people (in percentage)
Yes, and I still do it today	0%
Yes, but it is more of an occasional activity	11,6%
Yes, but it came out poorly/not well	7%
No	81,4%
I don't remember	0%

In Table 6 it can be seen that 8 people (11,6%) indicated that they had attempted to build a website, but not in a professional manner, but rather as an occasional activity or an activity with poor (unsatisfactory) end results. Noting the not too distant time since the end of the subject, the above results can be considered optimistic. Approximately 20% of the respondents used their competences that were formed during the e-business classes and working with the CMS.

5. Conclusion

Research conducted over the last four years shows that the development of digital competences, through, among other things, the ability to build websites using a CMS, can successfully support the improvement of students' technical skills, even in faculties that are not strictly related to IT. Economics students believe that the skills gained are very useful and some are even considering their future work in the area of developing e-business solutions. Surveys carried out on graduates of the subject from the last two years also showed that, in such a short time after completing the course, the ability to build and operate a CMS had already come in handy in several life and work situations. It is also to the author's knowledge that shortly after the end of the course - several students were offered website construction (which they took advantage of) - assignments, as well as the opportunity to take up permanent work in this field at several companies in Bydgoszcz. The literature of recent years points out the shortcomings in expanding students' digital competences and recommends more attention to their development. The proposed model of e-business classes and the developed programme have been successfully implemented and verified, which has been confirmed by the very positive evaluation of students at the Bydgoszcz University of Science and Technology. Students have a lot of autonomy, which can lead to high motivation and a flow experience. This is because the course

provides not only a broad knowledge (acquired during lectures on the subject), but also practical skills to effectively, correctly, safely, critically, creatively and ethically perform tasks related to the construction and existence of websites, teaches to solve technical problems and those related to the placement and correct presentation of content on the website and e-store, to communicate and cooperate with the principal (a company actually existing on the market), to manage information placed on the website, to create and share content. In the professional practice for which the student is being prepared, this usually means being able to search for digital information and present/post it on the website, as well as being able to use the CMS system, which is the backbone of many modern e-businesses.

Nowadays, the CMS-based application system is developing rapidly all the time and it seems that it will still be the basis for building websites and other web applications for the next few years. However, rapidly developing artificial intelligence and the tendency to develop technologies towards even greater simplification for the user means that block-based systems such as Figma [29] are starting to appear. Perhaps in a few/some years these will replace the popular current CMS - just as they did when HTML-based websites were replaced by CMS. The author intends to continue research in this area.

References

1. Berghaus, S., Back, A.: Stages in Digital Business Transformation: Results of an Empirical Maturity Study. MCIS, Proceedings. 22, (2016)
2. Kański, Ł., Pizoń, J.: The impact of selected components of industry 4.0 on project management. *Jurnal of Innovation and Knowledge*, Vol. 8. Issue 1, (2023)
3. Gałan, B.: The role of digital competences in the glottodidactic process from the perspective of the representatives of the digital natives community. *E-mentor*, 93/2022, Issue No: 1, pp. 64-76, (2022)
4. Vuorikari, R., Punie, Y., Carretero Gomez, S. and Van den Brande, G.: *DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: The Conceptual Reference Model*, Luxembourg Publication Office of the European Union, Luxembourg, JRC101254, (2016)
5. Wan, S., Li, D. and Gao, J.: Exploring the Advantages of Content Management Systems for Managing Engineering Knowledge in Product-service Systems. *Procedia CIRP*, 56, pp. 446–450, (2016)
6. Gómez-Fernández, N., Mediavilla, M.: Exploring the relationship between Information and Communication Technologies (ICT) and academic performance: A multilevel analysis for Spain. *Socio-Economic Planning Sciences*, Elsevier, vol. 77(C), (2021)
7. European Commission (2019): *Key Competences for Lifelong Learning*. <https://op.europa.eu/en/publication-detail/-/publication/297a33c8-a1f3-11e9-9d01-01aa75ed71a1/language-en/format-PDF/source-231945798/>. Accessed on January 22, 2023.
8. Esteve-Mon, F. M., Llopis, M. A., and Adell-Segura, J.: Digital competence and computational thinking of student teachers. *International Journal of Emerging Technologies in Learning*, 15(2), pp. 29–41, (2020).
9. Zhao, Y., Pinto Llorente, A.M. and Sánchez Gómez, M.C.: Digital competence in higher education research: A systematic literature review. *Computers & Education*, Volume 168, p. 104212, (2021)
10. Zhao, Y., Sánchez Gómez, M. C., Pinto Llorente, A. M. and Zhao, L.: Digital competence in higher education: Students' perception and personal factors. *Sustainability*, Switzerland, 13(21), p. 12184, (2021)
11. Martzoukou, K., Fulton, C., Kostagiolas, P., and Lavranos, C.: A study of higher education students' self-perceived digital competences for learning and everyday life online participation. *Journal of Documentation*, 76 (6), pp. 1413-1458, (2020)
12. Gazca, H. L. A., Parra, S. S. I., Sanchez, H. G. L., Omar, Z. A., and Gaona, G. D. I.: Cross-sectional study of digital competences in the school trajectory higher education students (e-skills). 2019 IEEE International Conference on Engineering Veracruz (ICEV), Engineering Veracruz (ICEV), 2019 IEEE International Conference On, I, pp. 1–6, (2019).

13. Dias-Trindade, S. and Albuquerque, C.: 'University Teachers' Digital Competence: A Case Study from Portugal. *Social Sciences (2076-0760)*, 11(10), p. N.PAG., (2022)
14. Morales, K. F. , Angona, S. R. and López-Ornelas, M.: Technological appropriation, digital skills and digital competences of university students: Systematic mapping of literature. *Revista Conhecimento Online*, 2, pp. 46-72, (2021)
15. Clair K.: Metadata Best Practices in Web Content Management Systems. *Journal of Library Metadata*. 12. pp. 362-371, (2012)
16. Yen, C.C., Yen, C. and Hsu J.: A Web-based CMS/PDM Integration for Product Design and Manufacturing". *E-Business Engineering, IEEE International Conference on*. pp. 549-553, (2008)
17. Barker, D.: *Web content management: Systems, features, and best practices*. O'Reilly Media, Inc., p. 7., (2016)
18. Jerkovic, H., Vranesic, P., Slamić, G.: Implementation and analysis of open source information systems in Electronic business course for economy students. 39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), Opatija, Croatia, pp. 912-917, (2016)
19. Krupcała, K., Januszewski, A.: Website and e-shop Development as an e business Teaching Programme Innovation in Management Education. *Procedia Computer Science*, Volume 176, pp. 2476-2486, (2020)
20. Ahrens, A., Zaščerinska, J.: A comparative study of engineering and business students' attitude to e-Business application. *Proceedings of the 11th International Conference on e-Business - ICE-B, (ICETE 2014)* pp. 31-38, (2014)
21. Ahrens, A., Aust, S. and Zaščerinska, J.: Factors that Influence E-Business Application in Tertiary Education. *Proceedings of the International Conference on Data Communication Networking, e-Business and Optical Communication Systems - Volume 1: ICE-B, (ICETE 2012)*, Italy, pp. 341-344, (2012)
22. Lichtenstein, Y., Abbott, P., Rechavi, A.: Engaging Students in an MIS Course through the Creation of E-Business: A Self-Determination Theory Analysis. *Communications of the Association for Information Systems*. Vol. 36, Article 10, pp. 157-177, (2015)
23. Krupcała, K.: Developing e-business competencies among business students – research and opportunities. *Procedia Computer Science*, Volume 192, pp. 4711-4720, (2021)
24. Krupcała, K., Kurek D.: Developing e-business Competences a challenge for Economic Universities in Poland. 35th IBIMA Conference. Conference proceedings, published in the USA, pp. 11370-1137, Madrid, Spain (2020)
25. Gueldenzoph, L.E.: E-Commerce Topics for Business Education: Perceptions of Employers and Educators. *Delta Pi Epsilon Journal*, v48 n1, pp.19-27 (2006)
26. Draganac, D., Jović D., Novak A.: Digital Competencies in Selected European Countries among University and High-School Students: Programming Is Lagging Behind. *Business Systems Research*, vol. 13, no. 2, pp. 135-154 (2022)
27. Top 100 careers (2022) <https://www.careerprofiles.info/top-100-careers.html/>. Accessed October 25, 2022
28. Silkalns, A. (2023) "WordPress Statistics: How Many Websites Use WordPress in 2023?", <https://colorlib.com/wp/wordpress-statistics/>. Accessed April, 20, 2023
29. [Figma.com/](https://www.figma.com/). Accessed April 24, 2023