

CURRENT CHALLENGES IN THE EUROPEAN CONSTRUCTION SECTOR: A THEORETICAL APPROACH

<https://doi.org/10.47743/jopafl-2022-26-16>

Vlad LEONTIE

Doctoral School of Economics and Business Administration of the “Alexandru Ioan Cuza” University
Iasi, Romania
vlad.leontie@student.uaic.ro

Abstract: *Increasing project complexity, low technological progress, extensive regulations, and market fragmentation result in low returns on capital employed in the European construction industry. Using a theoretical approach in shape of literature review and document analysis, the main challenges, which are faced by the European construction sector, have been identified and analysed. Through the main findings, the low digitalization level, the transition phase, the lack of human resources or the skills mismatch can be accounted as actual challenges, which this industry has to face. The current work could act as a starting point for the competent institutions and state organizations of the building industry in adopting the necessary measures to boost this sector's performance.*

Keywords: *European Construction Sector, Productivity, Digitalization, Innovation, Technologies*

Introduction

While in the last decade, many industries have gone through fundamental changes, reorganized and adopted technological changes that improve the entire production cycle, (such as the automotive industry (GTI, 2021), which has long adopted the process of automation and reoriented towards a powerful paradigm shift: electric cars), the construction sector has avoided or failed to embrace digital innovation. In fact, if one looks at the investments made in information technology spending, a maximum of only 1% can be observed, with only agriculture and hunting recording lower percentages. The results, expressed in terms of productivity, show only insignificant increases or stagnation (ECSO, 2019).

The construction process itself is very complex and merges several dimensions: 3D, time, costs, sustainability, building usage and operation. Organization and coordination are two basic pillars, the actual process being cumbersome, lacking in transparency and with a low level of information exchange.

The logistics process for the supply of materials and resources is conceived independently and there is no direct link with the plans or building documents. Currently, information is not collected in a centralised manner, which could allow a greater flow of information. Understanding by third parties is very difficult and in the case of complex projects, the presence of the people who established the logistics concept being imperative.

The parties involved in the construction process are multiple: architect, civil engineer, builders, beneficiaries and the list goes on. In the building course, construction documents and drawings are transmitted from one party to the other directly in a one-to-one relationship. By many building projects, the information is not centralized in a model

or database, which could allow the simultaneous access, by all parties (Kjartansdóttir *et al.*, 2017).

The building process is not transparent, requiring very effective communication for the smooth development of the construction. In the construction phase, problems are often encountered due to the lack of information received from the design parties. Speed and very good coordination is needed, especially in the advanced stages of the project (construction is started), so that the builder receives the information on time and executes according to the plan.

Compared to other industries, the construction sector is characterized by a rather pronounced fragmentation generated by the presence of many small companies, which leads to a high degree of difficulty in terms of testing new technologies and implementing new information techniques.

The existing human capital in the sector is strongly influenced by the sector's migration towards new trends: digitization and green construction, so that a series of problems deriving from the adaptation to the new directions appear the lack of skills in the sector or their inconsistency (European Commission, 2020). Construction work has a negative reputation for being hard, dirty, weather-dependent and high-risk, so attracting young talent becomes a difficult endeavour.

A primary objective of the current work is to identify the current challenges faced by the European construction industry in a complex environment governed by digital transformations and policy changes that aim to improve sustainability, energy efficiency, and resource efficiency (European Commission, 2021).

Methods

Using literature review approach and document analysis, the main challenges of the European construction sector, which exist have been identified and characterized. The literature review is a type of analysis who investigates official documents and publications, which is often used in social sciences (Sekaran and Bougie, 2016). Being a type of secondary research (the data are not collected from people or companies directly), the data which is required to be analysed consists of unstructured texts and information. For performing a quality analysis, the selection of the data had undergone a filter selection of several criteria as Scott's studies advice (Scott, 2006):

1. Authenticity of the documents: the document origin was proofed whether is reliable and genuine.
2. The credibility of the source: the information should be trustworthy.
3. Representativeness of the documents: to which extent the publication or the document is representative for the research topic.
4. Meaning and consistency: the information should be understandable and consistent.

The first step of the process implied the identification of the various publications and gaining the access to the information. At this point, journal articles, conference proceedings, official publications of the European Union or state of the art papers of the European entities such as European Construction Sector Observatory or the European Construction Industry Federation have been consulted. The second step included a title glance, followed up by an abstract or table of contents review. When the publication passed these search criteria, the full text review was performed.

Challenges of the European construction sector

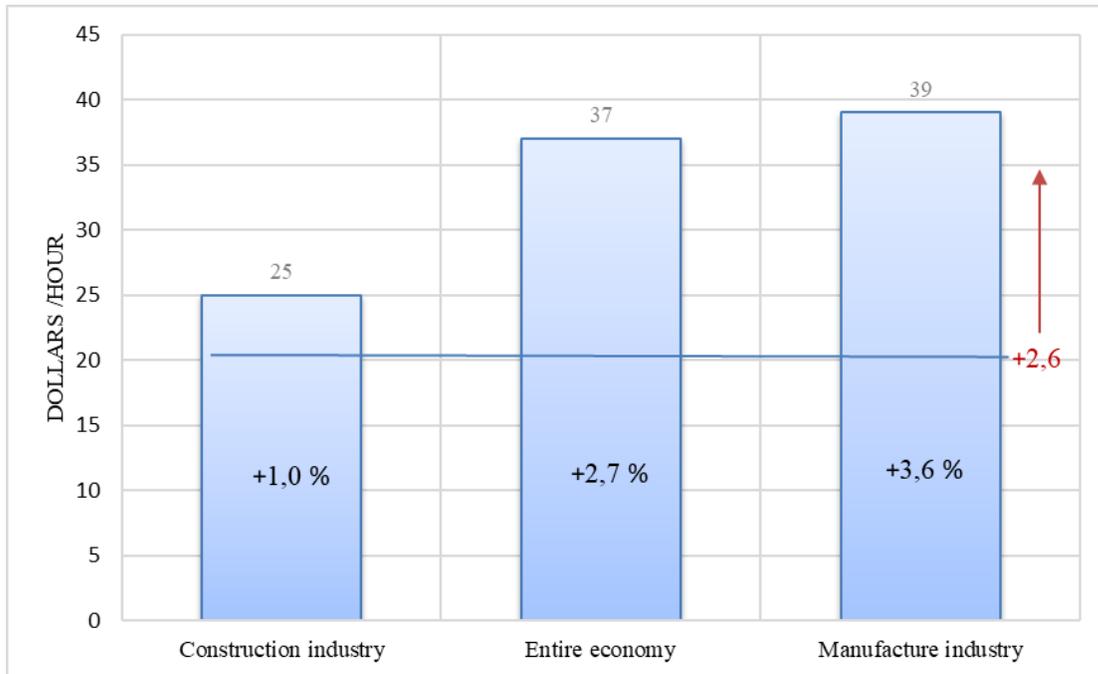
Productivity

The European construction sector is characterized by the presence of many small firms (FIEC, 2022) with limited technological improvements and a high level of labour intensity compared to other fields. All this leads to a low structural stability of the sector, which, reflected in terms of general productivity, is far below European averages (Bellochi and Travaglini, 2021). Low labour productivity is a problem worth mentioning in the construction market. The construction industry has been suffering from remarkably low productivity compared to other sectors for decades. Other industries have transformed and taken steps to boost productivity. In traditional commerce, large-scale chain stores, such as Aldi and Walmart, with global supply chains and distribution systems that are increasingly digitized and technological, have replaced retail stores. In the manufacturing process, Lean principles and aggressive automation have been embraced globally. By comparison, much of the construction industry has evolved at a slower pace. According to the experts from the McKinsey Global Institute (figure 1), on a sample of 20 countries and 30 industries analysed between 1995–2014 the entire construction sector productivity increased with only 1% in this time interval (MGI, 2016). In the global economy overall, productivity growth was 2.7%, while manufacturing (automotive, electrical and electronics, hardware) experienced 3.6% increase.

In general terms, within the EU, the average productivity per worked hour in the construction sector stands at around 21.76 euros/hour, while the European industry average is around 38.46 euros per hour. Although positive values are recorded in certain countries and the construction sector seems to be gaining ground (like in Belgium or Bulgaria), the picture of productivity in the construction sector is one that leaves a lot room for improvement (Bellochi and Travaglini, 2021). If the construction sector were to grow in terms of productivity in the world economy, it is estimated that an increase of about 1,600,000 million dollars per year could be registered, an amount equivalent to the GDP of Canada [40] (Barbarosa *et al.* 2017). Increased projects complexity, low technological progress, extensive regulations, relatively opaque and fragmented construction market, inadequate design and investment processes, poor project management and insufficient qualified staff/Insufficient investment in digitization and innovation represent the causes of low productivity.

The dynamics of labour productivity is directly related to the nature of the sector itself and the historical perspective of these branches of industries. This industry has always been characterized by limited research and technology efforts. When compared to other industries such as automobiles, pharmaceuticals or electronics, it is easy to see that there are a number of major gaps in the construction sector. In most fields, investment in research and development has found an imperative scent and combined with very rapid technological advancements, lead to increased competitiveness within industries. This differs in the construction industry, as they are not perceived as a growth driver of technologies, and the final product is not directly influenced by them.

Figure 1. Average annual productivity growth rate (per worked hour) in the 1995-2014 interval



Source: MGI, 2016

Moreover, the implementation of some technologies takes much longer than in other industries, because the production cycle itself is longer, and an investment in technology needs a longer period of time and a larger capital block. (Bellochi and Travaglini, 2021).

Digitization, Digitalization and Digital transformation

Construction unfortunately remains one of the current industry sectors characterized by manual processes and traditional methods. By their nature, physical presence is needed to technologically fulfil certain processes, and certain properties that apply for example to classic branches such as commerce, cannot be applied to the present industry (Leontie et al., 2022). However, some subsectors of the construction have improved over time. One of the most eloquent examples is that of the design and planning phase, which about 20 years ago began to reorient its methods, changing the "tool" from hand drawings to computer-aided design (Computer Aided Design, CAD). The last decade is characterized by the transition from CAD (mentioned above) to BIM (Building Information Modelling) (Skyles, 2018). By using BIM, constructions, residential and non-residential, have become huge databases through the adoption of new technologies. With a high volume of data, these databases can be analysed more effectively and used with different tools, such as Artificial Intelligence (Skyles, 2018).

Now, communication and collaboration between members of the construction industry are major concerns. The McKinsey Global Institute observed that the digitization index in this sector is at a very low level, ranking last among European countries (MGI, 2016). Digital spending, digital capital deepening or digital interactions are some segments that suffer severely from a very low level of implementation.

Among the most common problems, which act as a strong barrier against process conversion, the employees working in different isolated places without internet connectivity and the permanent movement of the workers for the development of technological processes can be counted (Vrijhoef, 2011).

Digitization and digitalization growth potential, but there are many challenges looking for a solution. The relationship between digitization and digitalization, respectively digital transformation, deserves special attention, their gearing leads to the entire digital transformation that is desired in the construction industry. If digitization refers to information and the form in which it is stored, digitalization considers the processes that are used and the entire digital framework in which they take place. It is about using digital technologies to change a business model. The last step in the industrial revolution is digital transformation. It is defining a digital approach not just for information and tasks, but for the entire business or industry (Sategna *et al.*, 2019).

The digitalization degree of the construction industry and the adoption of the different digital technologies varies across the different EU countries. The member states national policies and strategies lack homogeneity concerning each other and several inconveniences and difficulties appear in the companies who perform international activities (Leontie and Maha, 2022). Between the main barriers against digitalization, the low decision making speed within the large companies, the implementation and training costs in medium and small enterprises (Bilal *et al.*, 2016), fear of implementation in small companies, different implementation stages existing through the industry, security issues (Lee, 2017) and the lack of qualified personnel can be counted (European Commission, 2019).

Human resources, skills and competences

Among the most common challenges facing the labour market within the construction industry, with a strong impact, the following can be listed (European Commission, 2020):

- a) The decrease in the number of young people with appropriate qualifications. This problem is one of the most common, affecting the development and growth of the value of this sector. Economic growth and digital solutions lead to an increase in productivity and an expansion of the sector, but at the same time, they are directly dependent on a skilled workforce with complex skills. The decline of young professionals in this branch is directly linked to the image of the sector, imbued with many risks and unattractive working conditions.
- b) The aging of the labour force is a topic that concerns the labour sector for a long time. The average age of the active population in the construction sector is increasing (in Germany, the active population is between 35 and 50). This can generate an additional barrier to the integration of new skills in this industry (Bundesinstitut für Bau-, Stadt- und Raumforschung, 2021);
- c) The high mobility and ease of working within the EU leads to the situation where some member states, Romania as well as Estonia, face major problems in retaining highly qualified labour force, young people migrate to better paying jobs in other states. At the other pole are countries such as Sweden, which registers a very large influx of foreign workers (European Commission, 2020);

- d) The lack of alignment to a common framework in the case of youth training (vocational education), together with the high demand within the labour market of the construction industry, slows down the speed of development of this branch. About 35% of all construction workers have experienced technological changes in the last 5 years (European Center for the Development of Vocational Training, 2015).

The lack of employees trained and adapted to new market requirements is a direct problem related to the level of research degree existing in the sector. A possible cause of the mentioned can undoubtedly be the fragmented structure of these industries, its nature and the various branches into which is divided. The predominance of small and medium-sized companies within the European construction sector, with an average of approximately 4 workers per company, its multitude and diversity lead to reduced possibilities for testing projects in research and development (FIEC-European Construction Industry Federation, 2020). As jobs go digital, the level and nature of requirements will change, leading to new job profiles and qualifications. The present fact is a known one, the only unknown being the speed with which all this happens (Sategna *et al.*, 2019).

With digital transformation comes a huge volume of data that must be centralized and analysed, and awareness of their impact is necessary for the industry to create value and efficiency. It is expected that the number of site manager jobs will increase, new jobs will emerge, some will change to meet new requirements, and some will disappear altogether. Prominent examples of this would be the use of drones to check material stocks on large construction sites (only one drone operator will be needed, not entire teams to draw up material inventories), sensors connected to the mobile phone network for to indicate different parameters (either meteorological or technical), and the list could go on. The gap between high-skilled and very low-skilled jobs will widen, while the demand for unskilled jobs will decrease.

Considering the fact that the construction field is suffering from continuous aging and a decrease in qualified young people, as mentioned above, human capital becomes a major concern. Rather than changing the value system, digitization could make the field more attractive to young people and women, who are a minority in this industry (Sategna *et al.*, 2019).

There are currently many vacancies (unfilled) on the European construction market, which may have complex causes, but suggest a serious gap between demand and supply of skills and competences. In vocational schools, the number of students enrolled in the training programs is insufficient now; furthermore, the number of graduates is not enough to meet demand (European Commission, 2020).

Discussion

The European construction sector represents a key industry who faces currently multiple challenges, in a complex environment. Undergoing a full paradigm shift towards CO2 reduction (European Commission, 2011), energy efficiency, sustainable and green buildings (European Parliament, 2010), this sector experiences at the same time several digital transformations which try to modernise the way the whole building cycle is conceived. Items related to the productivity, which is obtained in the sector, represent the

first identified challenge. This market suffers since decades of a low productivity, situating itself under the European averages of the other industries (MGI, 2016). The nature of this sector has definitely a role to play and the hard jobs which need here to be done require physical presence and remote works. The main causes of a reduced productivity are represented by increased project complexity, low technical progress, extensive regulations, poor management project or reduced investments in terms of innovations.

A fragmented construction market, with the majority of the companies (over 95%) having fewer than 20 employees (FIEC, 2022) represents an existing problem. Because the construction process is very long, testing new technologies and innovations is particularly difficult (Bellochi and Travaglini, 2021). Digitization and digitalization along with the latest technologies from the field have a huge improvement potential (Foracel *et al.*, 2020). Unfortunately, one should consider the industry as a whole and these innovative means are not perceived at all times as being positive, but rather a sceptical approach exists in the sector (Bock, 2015). There are several barriers which stand against digitalization, and firstly the costs which are necessary for a company to become digital may be mentioned (Bilal *et al.*, 2016). Afterwards, the fear of the small companies to implement digital means along with the different stages of the digitalization and of technology implementation, present in the industry play also an essential role. The small and medium companies lack finance, while the big companies with many employees suffer of low speed in terms of decision-making: long decision chain along with complicated company structures.

The human resources in this sector represent one of the most valuable resources that exist. In terms of labour market, this sector is dependent of experts in the field, which require time to be formed. In the current paradigm shift in the direction of digitalization, and technology use, the sector still requires time to create its experts. In addition, jobs with new profiles appear (as drone operator or BIM manager), and several other disappear. The decrease in the number of young people with proper qualifications along with the aging in this sector are problems, which need to be mentioned (Bundesinstitut für Bau-, Stadt- und Raumforschung, 2021). In addition, the high mobility of the workers, along with the ease of working in other EU states, causes several problems in less developed states. The lack of alignment to a common framework in terms of youth vocational training triggers problems.

Conclusions

Using a literature review approach and a document analysis, the main challenges, which the European construction sector has to face, have been identified and categorized. A total number of three categories has been observed: productivity, items related to digital transformation and human resources. A percentage not exceeding 1% of the sector's volume was spent on IT activities and technological solutions. It is an extremely low percentage, which has caused productivity to remain so low in the last two decades.

Also, the absence of an overall vision and a sustainable long-term technological goal lead to a low efficiency of the degree of research and innovation. The lack of a broad view is felt, which could make all these existing technologies in the industry more efficient.

With digitization and the move towards green, energy-efficient buildings, the new construction worker will need to be digitally perceptive, capable of using tablets and other "Smart" devices. Having a broad spectrum of positive effects, digitalization, digitization

and digital transformation still have to overcome several obstacles in terms of mentality, high costs for training and IT infrastructure and interoperability. The nature of the construction sector itself plays an important part and due to the complicated and long construction process, innovations and new technologies are particularly hard to be tested.

The existing human capital in the sector is strongly influenced by the sector's migration towards new trends: digitalization and green construction, so that a series of problems deriving from the adaptation to the new directions appear: the lack of skills in the sector or their inconsistency. Construction work has a negative reputation as being hard, dirty, weather-dependent and high-risk, so it becomes a difficult ordeal for young professionals. Currently, there is a large number of vacancies (unfilled) within the European construction market, which may have complex causes, but suggests a rather severe discrepancy between demand and supply of skills and competences.

Digital transformation comes with a series of answers to a multitude of requirements that the construction sector manifests, but at the same time, the transition to new horizons is not an easy one. The paradigm shift in an aging and underperforming sector generates many challenges that the industry today must face. Combined with a very high fragmentation and an extensive division of the field, digitalization seems to be the optimal solution for adapting the construction market to modern needs.

References

1. Barbarosa, F., Woetzel, J., Mischke, J., Riberininho, MJ. and Parsons M., (2017). *Reinventing Construction: a route to higher productivity*, McKinsey Global Institute. Retrieved from: <https://pzipb.com.pl/wp-content/uploads/2017/04/MGI-Reinventing-Construction-Full-report.pdf>, Accessed on 12/12/2022.
2. Bellochi, A. and Travaglini, G. (2021). *A quantitative analysis of the European Construction sector: Productivity, Investment and competitiveness, working paper*. Foundation Giuseppe Di Vittorio, Urbino Carlo Bo. University, pp. 4-7, ISSN 2724-1882.
3. Bilal, M.; Oyedele, L.O., Qadir, J., Munir, K., Ajayi, S.O., Akinade, O.O., Owolabi, H.A., Alaka, H.A. and Pasha, M. (2016) .Big Data in the construction industry: A review of present status, opportunities, and future trends. *Adv. Eng. Inform.* 30, 500–521. <https://doi.org/10.1016/j.aei.2016.07.001>
4. Bock, T. (2015) The future of construction automation: Technological disruption and the upcoming ubiquity of robotics. *Autom. Constr.*, 59, 113–121. <https://doi.org/10.1016/j.autcon.2015.07.022>
5. Bundesinstitut für Bau-, Stadt- und Raumforschung, (2021), *Bericht zur Lage und Perspektive der Bauwirtschaft 2021*, Publisher: Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) im Bundesamt für Bauwesen und Raumordnung (BBR), Bonn, Germany, January 2021, Retrieved from: https://www.bbsr.bund.de/BBSR/DE/veroeffentlichungen/analysen-kompakt/2021/ak-01-2021-dl.pdf;jsessionid=52B7F5D980ADC0BEF9C853D836382FD3.live21324?__blob=publicationFile&v=2, Accessed on: 26.10.2022.
6. ECSO, European Commission, (2019). *Integrating digital innovations in the construction sector: The case of 3 D Printing and Drones in construction*. Trend paper series from March 2021, Retrieved from: https://www.google.de/url?sa=i&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=0CAMQw7AJahcKEwjottS7zPT7AhUAAAAAHQAAAAAQAw&url=https%3A%2F%2Fec.europa.eu%2Fdocsroom%2Fdocuments%2F34517%2Fattachments%2F1%2Ftranslations%2Fen%2Frenditions%2Fnative&psig=A_OvVaw22TZbRBX8saw4RjK0evsgt&ust=1670952281995855, Accessed on 2/12/2022.
7. European Center for the Development of Vocational Training., (2015). Skills, qualifications and jobs in the EU: the making of a perfect match?, *Cedefop Reference series*, Publications Office of the European Union(Luxembourg).

8. European Commission, (2021). Energy performance of buildings directive. Part of the Green Deal Retrieved from: https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en, Accessed on 3/11/2022
9. European Commission, (2020). *Improving the Human Capital Basis-Analytical Report*, Brussels.
10. European Commission, (2010). *Internal Market, Industry, Entrepreneurship and SMEs - Service directive*. Retrieved from: <https://ec.europa.eu/growth/single-market/services/services-directive-en> Accessed on 1/12/2022
11. European Commission, (2011). *Roadmap for the transition to a competitive low carbon economy*, Bruxelles
12. European Commission, (2019). *Supporting digitalisation of the construction sector and SMEs-Including Building Information Modelling*, Report from European Commission.
13. FIEC- European Construction Industry Federation (2022). *Construction activity in Europe, edition 2022, Key figures*, Retrieved from: <https://fiec-statistical-report.eu/>, Accessed on 17.10.2022.
14. FIEC - European Construction Industry Federation, (2020). *Construction Activity in Europe - edition 2020*, Published by FIEC.
15. FIEC- European Construction Industry Federation (2022) *The Annual report for construction activity in Europe, edition 2022*, Retrieved from: <http://www.fiec.eu/en/library-619/annual-report-english.aspx>, Accessed at 26.10.2022.
16. Foracel, E., Ferrari, E., Opazo-Vega, A. and Puildo-Arcas, J., (2020). Construction 4.0: A Literature Review. *Sustainability*, 23 11, Issue 12(22). <https://doi.org/10.3390/su12229755>
17. GTI, (2021). Germany Trade and invest, *Automotive industry, Germany-The World's Automotive Hub of Innovation*. Retrieved from: <https://www.gtai.de/gtai-en/invest/industries/mobility/automotive#533362> Accessed on 3/12/2022.
18. Kjartansdóttir, I.B., Mordue, S., Nowak, P., Philp, D. and Snæbjörnsson, T.J., (2017). *Building Information Modelling BIM*, Iceland and Great Britain. Warsaw, Civil Engineering Faculty of Warsaw University of Technology.
19. Lee, I. (2017). Big data: Dimensions, evolution, impacts, and challenges. *Bus. Horiz.* 60, 293–303. <https://doi.org/10.1016/j.bushor.2017.01.004>
20. Leontie, V., Maha, L.-G. and Stoian, I.C. (2022) COVID-19 Pandemic and Its Effects on the Usage of Information Technologies in the Construction Industry: The Case of Romania. *Buildings*, 12, 166. <https://doi.org/10.3390/buildings12020166>
21. Leontie, V. and Maha, L.-G. (2022) Digitalization in the construction sector. Main strategies and policies in the European Union. *Proceedings of the International Conference EU-PAIR 2022*, Jean Monnet Chair.
22. McKinsey Global Institute (MGI), (2016). *The Drum- Further digitization in Europe could lift GDP by 2.5 trillion Euro*. Retrieved from: <https://www.thedrum.com/news/2016/06/30/further-digitisation-europe-could-lift-gdp-25-trillion>, Accessed on: 4/12/2022.
23. Sategna, L.G., Meinero, D. and Volonta, M., (2019). *Digitalising the construction sector, unlocking the potential of data with a value chain approach*. Report from Comitee for European Construction Equipment.
24. Scott, J. P. (Ed.). (2006). *Documentary research*. Thousand Oaks, CA: Sage Publications.
25. Sekaran, U. and Bougie, R., (2016). *Research Methods for Business, A Skill-Building Approach*, John Wiley&Sons Ltd., West Sussex, United Kingdom.
26. Skyes, C., (2018). Smarter Construction, Stronger Economy, Inclusive Society, *European Construction Industry Manifesto for digitalization*.
27. Vrijhoef, R. (2011) *Supply chain integration in the building industry: The emergence of integrated and repetitive strategies in a fragmented and project-driven industry*, IOS Press, Amsterdam, Holland, 1-5, ISBN 978-1-60750-932-2.



This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution - Non Commercial - No Derivatives 4.0 International License.