



GINOP-5.3.5-18-2018-00041

*“Opportunities for Intensive Increase of Construction
Workforce Capacities”*

**Final Research Report
Collection of Policy Recommendations**

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Executive Summary

This document is aimed at summarizing the results of the project identified as GINOP-5.3.5-18-2018-00041 and titled „Opportunities for Intensive Increase of Construction Workforce Capacities”.

It consists of two main parts:

- A) **Final Research Report:** it is a brief summary of the objectives and basic pillars of the research. This chapter covers introduction of the combined methodology based on primary and secondary research and gives a brief summary of the major problems explored we intend to respond to in the collection of good practices and collection of policy recommendations of the project.

- B) **Collection of Policy Recommendations:** it drafts goals and proposals for the intervention in the construction labour market, for the interventions in the overall education market and for the other fields of intervention affecting sector-related employment, digitalization and resource sharing.

Below is a brief summary of the policy recommendations and related interventions:

- 1. **Supporting construction clusters**
 - a. Government subsidy policy, privileged treatment of cluster membership
 - b. Government support to extension of the authority of organizations in charge of construction clusters
 - c. Support to establishment of top clusters
 - d. Support to sharing economy within clusters
- 2. **Increasing the digitalization level of the construction industry**
 - a. Support to market-based investment projects aimed at promoting digitalization of the construction industry by reducing administrative burdens and by incentives
 - b. Priority government support to digitalization efforts
 - c. Giving preference to companies that use BIM systems and smart contracts, positive discrimination of digitalization efforts
 - d. Introduction of BIM and smart contracts assists efficient and more sustainable work and make companies more attractive and innovative
 - e. Granting investment loans to install the BIM system
 - f. Cooperation agreement on installation and operation of BIM, announcement of BIM training sessions
 - g. Digital turn at all training levels, Digital-based education-development
 - h. Improvement of the trade’s training infrastructure and opportunities
 - i. Support to companies’ further training courses
 - j. Extension of the training locations serving the construction industry
 - k. Announcement of programs intended to improve digital competencies of employees in order to enhance efficiency
 - l. Support to further training and further study opportunities
 - m. Announcement of short-cycle further training and retraining on digital topics

- n. Organization of executive training sessions
 - o. R+D+I projects in the field of Construction 4.0 or BIM
 - p. Extensive information program on digitalization opportunities with the assistance and involvement of specialized associations and industry chambers
 - q. Support to the knowledge transfer of representative organizations and chambers
 - r. Support to the construction professions' campaigns raising popularity; and organization and support to the organization of career choice days and fairs
- 3. Intensive management of labour shortage**
- a. Reducing the regional differences between wages in the construction industry by flexible regulators
 - b. Determining skilled and wages in the construction industry
 - c. Attracting and retaining workforce and its motivating by training and continuing training opportunities
 - d. Business development in information fields and motivating young employees by extensive knowledge base and activity
 - e. Creating an attractive, safe work environment for the workforce
 - f. Providing for good work communities, permanent employment and predictable wages
 - g. Labour shortage becoming acute can be managed by numerous investment opportunities, e.g. in the field of foreign or domestic employee hiring and travelling
- 4. Differentiated support to (micro, small, medium and large) construction enterprises**
- a. Considering the regulations relating to economy development resources concerning micro enterprises and providing targeted support to them
 - b. Construction guarantee system for "startup" companies or those wanting to scale up by providing public funding and curing scarcity of capital by tendering opportunities
 - c. Local, regional or national classification of companies in relation to their operations and establishment of a regionally differentiated support system
 - d. Strengthening large enterprises for export purposes
 - e. Funding technology development and investment projects by non-refundable subsidies
- 5. Support to establishment of B2B / sharing economy systems**
- a. Working out and formulating a system to regulate resource sharing within simple frameworks
 - b. Support to business cluster building based on resource sharing
 - c. Enhancing efficiency by resource sharing
 - d. Investing in establishment of a construction resource sharing company
 - e. Technical development and operation of a resource sharing platform and providing logistic services

6. Mitigation of COVID-19 effects

- a. Job creation and orders for construction companies by implementing public projects also during the epidemic
- b. Providing wage supplement opportunities for the construction industry, financial compensation of coronavirus effects

A) Final Research Report

Purpose of the project and subject of procurement

The purpose of the project identified as GINOP-5.3.5-18-2018-00041 and titled „Opportunities for Intensive Increase of Construction Workforce Capacities” supported by the Ministry of Finance as Managing Authority under its decision adopted on 18 December 2019 within the „Construction” section of national economy is:

- to identify the challenges of the construction industry by intensive increase of construction workforce capacities (i.e. focusing on the more optimum utilization of the existing resources rather than on involving additional resources), to define short-, medium- and long-term solution alternatives
- to review the sector-related peculiarities, characteristics and national and international good practices of B2B community solutions
- to inform the employers involved on specific and potential solutions within a pilot project, who may request legal and expert assistance if they have an intention to clustering, using the guidelines created
- to define packages of proposals for decision-makers based on the targeted and overall review of the intervention areas identified in a preliminary survey.

Implementation of the set objectives was assisted by multi-step primary and secondary surveys carried out by complex methodology and elaboration of the packages of proposals was assisted by a labour market pilot project generating common thinking based on an intensive knowledge transfer.

By implementing the GINOP-5.3.5-18-2018-00107 project, ÉVOSZ (National Federation of Hungarian Contractors) intended to identify additional thematic areas related to the labour market and affecting the construction sector, by addressing of which the labour market problems becoming acute can be solved partly. The primary objective of the project was to involve the demand side of the labour market, i.e. the employers operating in the sector. Within the above project we reviewed the opportunities for intensive solution of labour shortage.

Content pillars of the project

In the first part of the project we laid the foundation of our primary research by an overall overview of technical literature, whereby we dealt with the existing trends in the current construction sector, the transformation of the sector, clustering, networking, willingness to cooperate, major problems and the national and international good practices.

As a whole, the project is set up on several basic pillars. In the initial phase of research, a general overview was prepared mapping the principal labour market problems affecting the construction sector. The situation analysis was started with a theoretical summary addressing the conceptual issues concerning clusters and B2B economy based on sharing.

Such analysis strongly focused on the topic of digitalization. Then, based on the above, we have collected foreign and domestic good practices to solve the problems identified, which have been summarized in a collection of good practices. Good practices were classified by topics. Having worked out the basic situation analysis and having prepared the collection of good practices, a primary research was conducted. The primary research consisted of a questionnaire and a survey by interviews. Thereafter these were analyzed by topics.

Using the results of primary research, a pilot event was organized in the last phase of the project, the methodology of which has become simple due to the change in the legal environment and the travelling-organizational difficulties caused by coronavirus.

An opportunity has presented itself to become acquainted with the solutions and means of labour market interventions explored in the previous sections using a small sample and involving ten employers within the pilot project. The pilot's objective was to provide the employers involved in the pilot project with tangible, adaptable and practice-oriented proposals for solutions that might have an impact even on the short run on a company's ability to attract and retain workforce and on intensive remedy of labour shortage.

Finally, this document, consisting in the Final Research Report and the Collection Of Policy Recommendations, gives a summary of the results of the professional and methodological survey in order to provide a decision-preparation expert material for policy and sectoral decision-makers.

Major pillars of the research in summary

Pillar 1 – Situation exploration: exploration of the basic features of clustering, networking and sharing economy, overview of the labour market situation in the construction industry

- 1.1 Clusters and their significance in the construction industry
- 1.2 Sharing economy
- 1.3 Factors affecting efficiency, Construction 4.0
- 1.4 Performance of the sector in European comparison
- 1.5 Labour market situation from the point of view of employee headcount
- 1.6 Construction clusters
- 1.7 Factors affecting the sector (Covid19, housing subsidies)

Pillar 2 – Clusters, sharing economy and collection of good practices of digitalization

- 2.1 Good practices in clustering
- 2.2 Negative experiences in clustering
- 2.3 Good practices of digitalization and sharing economy, in particular BIM, smart contracts and blockchain technology

Pillar 3 – Primary research

- 3.3 Questionnaire survey for cluster members and non-cluster members
- 3.4 Questionnaire survey on the applicable good practices
- 3.5 Deep interview survey

Pillar 4 – Pilot

- 4.1 Organization of a free workshop and meetup on 29.04.2021 subject to registration with participation of not more than ten employers Common thinking of clusters, sharing economy and BIM
- 4.2 Methodological summary and collection of the results of the pilot project
- 4.3 Dissemination of research results

Brief Summary of the Situation Analysis Results

Construction industry is a driving engine of Hungarian economy, which has a significant role both in employment and value production, however, according to international tendencies, increase of efficiency has lagged behind the desirable extent in the recent decades.

The State has a significant role in efficiency enhancement in the construction industry from many aspects. It is related also to the fact that the sector is explicitly controlled by policy as the orders, funding and the development programs in the background of the projects are strongly correlated with policy. In addition, it is important to emphasize the State's regulating function, by which it may contribute to reinforcing digitalization – for example so that it prescribes the use of Building Information Modelling (BIM) in public procurement procedures.

The situation analysis pointed out that the **processes** reviewed **have numerous actors** and **require the cooperation of several territorial** (international, national, local) **levels**, several sectors (e.g. by involving the related sectors of construction industry), and the public and private sectors (enterprises and the State, educational institutions, research centres).

In the recent decades **several attempts have been made** in Hungary **to promote clustering** but the success of such attempts was rather limited: in many cases the groupings were **set up for a specific tender or project and then ceased to exist or become “in a deep freeze” state after its termination.** Both successful initiatives and those proved to be short-term point out the importance of partnership, community of values and interests, as well as confidence in the field of clustering.

However, in addition, numerous experiences and good practices show that **confidence is a key factor, for example for the purposes of sharing economy**, since the participants share high-value resources with each other or a partnership should be established with their potential competitors in respect of whom they must be certain that their relationship will be based on mutual advantages.

Experiences also point out that up-to-date data are indispensable both at entrepreneurial and decision-making level, increasing so the significance of digitalization. Accordingly, we must not forget about the role of knowledge appearing at several levels and in several forms. For example, in one respect, cooperation with universities and research institutions contributes to dissemination of new knowledge, to its fast appearance in education and to experimental application and fine-tuning of new technologies.

The digitalization processes of recent years, including in particular improvement of and improved access to infocommunication devices, generated countless processes (e.g. improvement of IT and technological background, use of new devices, easier and faster data collection and processing) that assist improvement of efficiency of the construction industry already today and that may be accompanied by even more opportunities in the future.

Sharing of resources and information might be a take-off point for the Hungarian construction industry. It may represent shared resource or workforce management on the one hand and introduction and extensive use of sharing IT platforms (BIM, smart contracts,

blockchain systems) on the other.

However, it should be highlighted in any case that, according to both international and domestic experiences, the lack of funds constitutes one of the most significant obstacles to utilization of the above prominent opportunities. This problem is particularly important in the domestic construction industry consisting of numerous small enterprises. They often lack funds and their economic management is hardly predictable, that is being rendered even worse by the delays in payments and circular debts typical of the sector.

Such difficulties may be aggravated by the COVID-19 epidemic evolved in 2020 spring that affects wider social and economic operators, so the construction industry sensitive to cyclical changes is particularly exposed to its impacts. **As a consequence of the crisis, the prospects of economic operators have worsened as reflected in the economic prosperity indices as well.** On the other hand, the crisis has led to a decrease in resources in the private and municipal sectors alike. Consequently, the construction industry will be exposed to political decisions and subject to public and EU resources even more strongly than before.

Identified processes

Production characteristics, added value

It can be stated of EU, as a general rule, that the added value, profit rate and labour cost of the construction industry are lower than those of the average of the whole economy, but **Hungary exceeds the EU average** in respect of its contribution to the gross value added. **In Hungary the significance of small companies exceeds the EU average** in respect of the gross value added. Between 2010 and 2018 the amount of gross value added of the construction industry **has nearly doubled**, partly owing to Family Housing Allowance (CSOK) and the housing loans offered on favourable terms. Many people have taken advantage of the opportunities provided by CSOK, so **the number of construction and modernization projects has grown by leaps and bounds.**

In the recent years, the construction-installation service export of Hungary showed a decreasing tendency, which is attributable – among others – to the fact that the export relations were not continued with several existing partners. **Germany is the most significant partner of Hungary** (as a general rule, it is also true to the whole export of goods, so Hungary is largely exposed to the changes in the German economy).

Business demography

The dominance of **small and medium enterprises** is characteristic of the whole sector: they have the largest share both in respect of the distribution of enterprises and added value. Small enterprises play the greatest role in employment in Italy, however, **Hungary is also in the forefront in this respect.** **Fragmentation** and lack of confidence stemming from the previous years are **highly typical** of the Hungarian construction industry. Along with scarcity of capital, it leads to enterprises trying to succeed alone, but so they are unable to invest in target machinery, technology and training innovations, their capacity utilization is fluctuating on the long run and several entities in the end of the subcontractors' chain become blocked in development. Use of cooperation platforms is justified – among others – by this fact.

Effects of the coronavirus, 2020 production results

In Q1 of 2020 the coronavirus epidemic **affected the performance of the construction industry to a minor extent only** and the processes measured in March and April have appeared as a tendency as early as in the end of the previous year. The decrease in orders has slackened also due to the cyclicism of investment, since the first half of 2019 was the period of preparation for municipality elections, so **in the second half and last quarter of 2019 a few percent decline could already be observed**. Such decline was strengthened by the seasonality character of construction, representing a minor decline in the winter periods. Furthermore, the decline is attributable also to the fact that 2020 was the **last year of the EU budget cycle**, which is paying until 2022 (n+2 principle), however, orders already “phased out” in that year.

Transformation of customers

The composition of contracting authorities and contracting parties has changed. The Hungarian State is the one that has remained a customer nearly in the same volume as in the previous years and **the volume of contracts concluded with the Hungarian State has not diminished. Works of small value and small scale have disappeared from the construction market**. In addition it can be observed that **public construction procurement has become concentrated** and it is mostly the Hungarian State that acts as a customer. Simultaneously, concentration of **successful contractors** can also be observed. It can be stated of 2020 that in the first two quarters the municipalities as customers have essentially disappeared from the market.

Temporary and permanent labour shortage

Due to the emergency, **foreign workers**, i.e. ca. 15 thousand non-EU citizens **travelled home** and so several works were interrupted, however, such workers were replaced within two weeks. Nevertheless, foreign workers typically returned in the recent months. Basically, **the temporary labour shortage caused by COVID caused local problems** and has a minor impact on the total performance of the construction industry. While it caused some temporary obstruction initially, it can be observed that employees treat the current situation more calmly than in the first cycle. Workers want to work and rather undertake isolation and distance from their family. This situation will not occur in the future in the case of an epidemic of similar scale and spreading with similar dynamics.

The data reflect the **extent of importance of re-starting of the increase of construction industry for the national economy**, which is reflected also in the Government’s intentions, as they strove to take steps to assist enterprises not only in the construction industry but also in connection with other strategic sectors (e.g. support to tourist projects).

The most significant obstacle to post-crisis operation and economic growth is lack of specialists, which is even more significant in Hungary than in other EU-countries. The lack of specialists is attributable to several reasons: employment of workers abroad, their fluctuation and ageing, the amount of labour supply that is insufficient as a result of the deficiencies in the vocational training system.

Cyclicism and overload of the construction industry

Output of the construction industry and the periodical fluctuation of investment projects cause cyclicism. The cyclicism of **construction production follows** the medium- and long-term **EU development periods** providing for the relative continuity of projects in a seven-year term based on the n+2 principle on the one hand and follows also **political cycles** on the other. Owing to the activity of the public and municipal sectors in the year of elections and preceding it, the volume of orders in the construction industry is typically higher, resulting in an average increase of 5 to 10%.

In addition to the lack of specialists, a considerable increase in construction demand can be observed, which further aggravates the existing capacity shortage. Such increase was caused by:

- the growth of GDP since 2013
- the increase in income
- the ingoing EU resources
- the government investment projects (road and railway construction, construction of sport facilities, tourist projects)
- the increase in real estate investments due to the low central bank base interest
- the Government's policy supporting construction and purchase of homes (5% VAT, CSOK, Brownfield City Home Building)

Employment tendencies

The construction industry reached its employment nadir in 2012 and 2013. At that time the number of workers employed in the construction industry was around 244 thousand. After this, the number of employees started to increase owing to industrial and EU investments. It can be stated that **the number of employees in the construction industry increased in each year until Q1 of 2020**. It can be stated in general **that in the first quarter of 2020 there was no drastic redundancy in the construction industry**. Where redundancy occurred nevertheless, employees were taken over by other companies due to the periodical labour shortage. This tendency has no longer been typical since June. Dismissals began in the construction industry as well. In the construction industry the works have to be performed in due course and with the available staff, **atypical and flexible employment is not feasible in this sector** as the works have to be performed by the undertaken deadline **under the given circumstances**.

The business cycles strongly impact the construction industry: when the whole economy upswings, the performance of and the employment in the construction industry will also be likely to improve. The gross average salary of full-time employees in the construction industry is continuously growing in the years under review, although **it lags far behind the average salary in all other sections of the national economy**.

Based on the net employee income, gross employee salary and gross employee income per capita it can be stated that there are several counties that **seem to close up strongly and to have a more and more significant role**. Such counties are – among others – Bács-Kiskun and Pest counties, which are in an advantageous position according to each index. Furthermore, Tolna and Komárom-Esztergom counties also play an increasing role. Outcast is the most

typical of two territories, i.e. the one is Nógrád county and the other one is Budapest. In the case of the latter, although per-capita and net regional employee salaries and their change have been not so dynamic between 2010 and 2017 that could preserve their leading role also on the long run.

It is perceivable on the labour market and is treated as a fact in the profession – and it is in harmony also with ÉVOSZ' observation – that the construction profession has filled vacant and newly created jobs mostly with unskilled workers through subcontractor systems.

Spatial distribution

For the less developed regions, roughly two-third of the TOP100 businesses are concentrated in 18 settlements, and the most TOP5 construction enterprises are located in Győr, Székesfehérvár (6 enterprises each), in Debrecen, Nyíregyháza and Szeged (5 enterprises each). These enterprises employed total 2653 persons in economic section F according to the average statistical headcount. **Extension of the construction industry is shown by the fact that the average statistical headcount has increased by total 21% on the average in the settlements of the less developed regional TOP5 construction centres. The concentration of construction of the less developed regions is shown by the fact that most of the construction-related employers are in the centres of regions and county seats.** The county and regional centres may function actually as construction centres that might facilitate not only more concentrated job creation but also organization of intensive workforce management.

Training and supply

Supply of skilled workforce is solved with more and more difficulties, since according to training data, the interest of students is decreasing in several construction professions, similarly to international experiences. **In most cases, the „remainder principle” applies in training, which not only decreases the quality of the work of workers acting in the profession but also it decreases the prestige of the profession.** In order to stop this harmful process, both national and international practices should be applied, e.g. in the field of dual or OKJ (National Qualification Register) training. **Fluctuation of the headcount** is typical in training of **construction professions** – in particular on secondary level – as a result of the exposure of the sector to national and international economic, political and development processes. Several professions have to face low popularity. **In several cases, the demands generated by companies are short-term demands but they require a quick response that cannot be addressed by the training system.** The clusters based on sharing of workforce may mitigate this problem partly, however, currently no such construction cluster operates that would answer this issue.

Contrary to popular belief, construction industry is a knowledge-intensive sector, so experience-based knowledge and, due to the fast-changing sectoral environment, adaptability, adapting the knowledge acquired to new requirements and quick decision-making ability all play a significant role in enhancing productivity.

Construction clusters in Hungary

Operation, extension and success of domestic construction clusters show a very different view. There are clusters that are expressly active and strove to represent the interest of members and the sector intensively even at the time of the coronavirus crisis (e.g. Construction Technology Cluster) but there are ones the operation of which seems to be suspended or discontinued (according to their website updates, availability or press activity). The fields of activities show a diversified view, although **innovation, common acquisition of funds (activity in tenders), education and common marketing** appear in the majority of cases.

Identified risks

In concern to the future strategies several risks can be mentioned, of which the **economic crisis caused by the coronavirus epidemic** – as a result of which governmental, municipal and market operators all had to reconsider their investment plans due to decreasing orders and revenues – should be highlighted. As for municipalities, they suffered a considerable decrease in tax revenues, aggravated often by the measures taken to control epidemic (e.g. cutting of municipal funds), so one of the important customer groups in the construction industry is expected to face permanent narrowing down of its funds.

The issues related to **training and labour supply** represent an additional risk factor, since not only renewal but also the foundations of operation of the sector depend also on how the quality of workforce training will develop. It is important to emphasize that labour shortage appears at all (at both secondary and higher) training levels in the construction industry, however, the current **national training structure is unable to supply the demands in a spatially balanced way**. Location of the training sites is given a prominent role since the primary supply of local labour markets is provided by the nearby educational institutions. The supply of skilled workforce can also be emphasized, since according to training data, the interest of students is decreasing in several construction professions, similarly to international experiences. In order to stop this harmful process, both national and international practices should be applied, e.g. in the field of dual or OKJ (National Qualification Register) training.

The **eventual negative experiences** and the resultant lack of confidence represent also risk factors, for example in connection with the operation and effectiveness of previous clusters or the activity and reliability of the individual cluster members. The crisis caused by coronavirus manifests itself also in financial difficulties that might lead to chain debts highly degrading the foundations of confidence.

Lack of knowledge and information, as well as hitch in knowledge transfer, in particular the lack of professional knowledge, non-knowledge of new technologies and the lack of cooperation-related knowledge, should also be mentioned among risk factors. Due to the aforesaid, it is important to provide and maintain efficient and rapid information flow in the future. The platforms presented above and enabling establishment of a decentralized system of relations and flow of information might contribute to promotion of information flow. However, it applies not only to inter-company but also intra-company efficient communication and knowledge transfer.

Identified proposals for solutions

We are presenting three solution focuses as forms of manifestation of the intensive increase of workforce capacities and production efficiency:

1. Community economy or sharing economy operated using ICT tools aimed at sharing and rational use of properties and expertise.
2. Clustering: cooperation operating in a more formal way within organizational frameworks.
3. Digitalization and smart construction industry.

There are several well-known domestic and foreign good practices of the above two tools of economic development and there is no sharp border line between these two approaches: a cluster may be generated also from sharing economy and the objective of clustering may also be sharing economy and rationalization through investment and development projects. The sharing-based solutions might be tools for renewal of clusters in the construction industry.

However, all these problems can be overcome by cooperation and sharing of their administrative, technological and construction workforce capacities: fluctuating demands can be equilibrated and market presence as a cluster member can be increased to a one of regional or district level. Notwithstanding that clusters have been operating in Hungary for a long time, only 1 accredited organization is active within our borders.

Clustering might be stimulated also by subsidy policy, for example by granting bonus scores for cluster membership and subjecting awarding of the subsidy to participation. Clustering might be promoted also by large market operators who play typically a prominent role in such organizations and, by means of sharing, survival and strengthening of the subcontractors of such operators might also be achieved.

In view of the aforesaid, ÉVOSZ is capable to become a catalyst of changes building on its wide system of relations and trust capital. By domestication of sharing economy and establishment of the opportunities for access-based economy, ÉVOSZ might have a pilot role in construction industry by operating the new platforms.

The Hungarian construction industry has a great potential in digitalization and automation, i.e. its productivity could be considerably increased by technological improvements. However, numerous enterprises are not in possession of the resources required therefor and the related expenses represent a low level compared to sales revenues. In addition, no decrease can be expected in labour costs on the long run since the wage level in the construction industry lags behind the national average and the labour-pull impact of Western-European markets is significant. Besides it could be eliminated first of all by wage increase, in particular in respect of highly qualified workforce. Therefore, the main indicator of enhancing productivity might be increase of the per-capita added value through digitalization and other innovations. To this end, it is worth cooperating with the Regional Innovation Platforms (RIPs) initiated by the National Research, Development and Innovation Office. Such platforms intend to enhance technological and knowledge transfer and stimulate cooperation building on the knowledge base of higher education institutions, so

they are suitable for working out and adapting innovations and promoting coordination between the operators.

The cross-border initiatives available as a result of Hungary's membership in the European Union give an excellent opportunity for networking and clustering. Such are used and implemented, for the moment, to a slight extent and, as a rule, only in individual cases. However, our country's economic strategies, such as treatment of the Carpathian Basin as a single economic area, in which cooperation with the enterprises established outside Hungary and inhabited by Hungarian people is highly facilitated by digitalization, are also worth considering. Clustering might assist in being successful on foreign markets in which the success opportunities and significance of small enterprises are lower than in Hungary.

Summary of the Results of Good Practices

Numerous conclusions can be drawn from the good practices of networking, clustering and digitalization that strengthen each other and point in the same direction. According to experiences, the **regulation environment** has an expressly important role in enhancing efficiency and adapting good practices. However, it would be too simple to state that if we want to emphasize only the significance of the public level as presented below – the cooperation between the various partners is also indispensable.

Besides there are **several key operators to be determined** who largely influence the innovation processes. Involvement of such operators and establishment and maintenance of an appropriate relationship between them are required in any way. According to the experiences, the role of the following operators involved should be emphasized:

- the European Union;
- the State;
- the municipalities;
- the various representative bodies, chambers;
- universities, research institutions;
- large companies;
- small and medium enterprises;
- workers' organizations.

The significance of the **European Union** arises first of all from the fact that, while recognizing the situation and trends of the construction industry and the opportunities inherent in digitalization, it supports the sector by more and more initiatives. These create an opportunity for obtaining tender resources and make accessible several good practices and pilot programs, which contribute to creation of the necessary knowledge bases during local, regional or national decision-making. Besides, we must not forget that a substantial part of the construction orders are financed from EU funds.

The **State** is an important operator in the innovation processes partly because of its supporting role and partly due to regulations. On the one hand, in line with EU development priorities, the State is to set the national lines of development and to allocate subsidy

resources to them. On the other hand, the State is to enact acts, decrees and regulations that determine the operation and development orientation of the individual sectors. As we could see for example in the case of top clusters, the State can encourage the merger and cooperation of clusters and so it contributes to strengthening of their competitiveness and export capacities. Simultaneously, the State is an important customer and, accordingly, it is the manager and financier of large infrastructure investment and public institution projects. Finally, we have to highlight the State's role in training, which is important in connection with establishing the skills required for innovations.

The **municipalities** play a role in the local coordination of improvements in relation to the principle of subsidiarity. Municipalities are in a strategic position and they are often the initiators of coordination and intermediation between the various network operators. Local and regional (or in Hungary county) municipalities are often customers who play a role jointly with the State in establishing and extending the cooperation between clusters and cluster members.

Representative organizations and chambers collect and represent the interests of enterprises, so their coordinating role is indispensable and they may have a great importance also in connection with innovations. Namely, if the members of an organization trust in representation of their interests, they can be induced to cooperation more easily. The membership in an organization can be understood also as a characteristic feature indicating some kind of a quality and reliability – which are indispensable both in clustering and sharing of resources. Their information role is also prominent since they are often in possession of the most up-to-date and most complete figures of the position of the sector and the characteristics of enterprises.

The importance of **universities and research institutions** is related to innovations. As it is shown by several domestic and international examples, the technical, management, financial, geological or social knowledge concentrated in universities have a cross-fertilization effect on the enterprises and the society of the neighbouring regions. Therefore, providing for knowledge transfer is indispensable between the university-research and market sectors. It is not unusual that this can guarantee the fastest possible utilization of innovation. The representatives of the academic sphere should be involved also in the monitoring and evaluation of improvements. At the same time universities play a role also in labour supply, in which appearance of dual training and spread of more practice-oriented forms of training have brought considerable changes.

The guiding role of **large companies** often stimulates also the other operators of the sector for innovation or cooperation. Such enterprises cannot be omitted from new initiatives all the more because of their weight, since without them application of the principle of economies of scale could be much more difficult or even it cannot be applied at all. As a rule, they are in possession of more resources and so they are more likely to have an opportunity for introduction of innovative solutions. However, the feeling of small enterprises that they are pushed into the background and „suppressed” by large ones might be a real threat. It may be eliminated by an appropriate management organization and information flow. Large companies have also external relations in addition to their local embeddedness, so they may assist in gaining markets.

In all countries of the European Union **micro, small and medium enterprises** represent the overwhelming majority of construction companies and this is typical also for Hungary. Their

significance is given – among others – by their role in employment and their flexibility, as well as the fact that they can be efficiently specialized in certain parts of the market. Through their flexibility, they can adapt themselves to new circumstances often more easily, so they are suitable for introduction and testing innovations. However, they face often lack of funds and so need support. Sharing of resources might be suitable means for the replacement thereof. Use of sharing economy might render such enterprises more competitive without raising a substantial financing need either from own funds or from the tendering system. Networking will reduce their exposure to crises and their sensitivity. They may be assisted therein also by large companies, strengthening so survival and stable operation of their own subcontractors.

The role of **workers' organizations** appears in motivation for obtaining and using new skills and in efficient representation of the workers' interests. Workers often face delays in payments and joint action may be a solution therefor. Furthermore, it is worth emphasizing that as sharing of resources often means at the same time sharing of workers, strong guarantees are needed for avoiding infringement of workers' rights and safety at the workplace.

The role of **as wide and up-to-date databases as possible** must not be forgotten either – as experiences in the Netherlands show in the field of clustering. These assist decision-making and response to new challenges. No responsible decisions can be made without use of the latest possible data – as it is proven also by the current crisis caused by COVID-19. Therefore, not only creation of databases but also their regular update and maintenance are important. Furthermore, the significance of collection of empirical data among the sector's operators must not be forgotten either.

As we could see, nowadays there are quite a number of **software** available that is capable to transform the operation of the construction industry to a huge extent. Of course, these software need investment and appropriate knowledge, which is not available in several places – so the role of networking, cluster development and sharing of resources might be important also in this relation. In addition, international experiences show that companies are still reluctant in separating resources for digitalization even if they could otherwise afford it. To this end it is required to shape attitude and strengthen information transfer.

Cluster organizations established for a specific tender or project are worth mentioning among the mistakes to be avoided. In these organizations it is often experienced that their cooperation does not prove to be long-lasting and possibly the very first unsuccessful tender puts the organization, which is actually not yet established, to an end. Consequently, a community of interests and values needs to be established going beyond a specific tender for example in the case of newly established clusters. It requires well-defined objectives and members capable and willing to cooperate.

Accordingly, we are presenting the following proposals:

- **Partnership** between various operators should be assisted and strengthened.
- Preference should be given first of all to **existing, successful cooperation** instead of establishing new clusters.
- Based on the evaluation of sectoral needs and peculiarities, it should be reviewed **whether top clusters can be established in the Hungarian construction industry**. If so, which companies and existing clusters might be the central operators thereof?

However, if the level of confidence or willingness to cooperate is inappropriate, merger of clusters must not be foisted on market operators from above.

- **Value production chains should be interpreted broadly** and so they have to include also the related activities. Too narrow-tailored interventions bring only temporal and partial results.
- **Strong involvement of universities** in networking and digitalization. Establishment of BIM labors for training and attitude shaping of future employees.
- Due to cost constraint, **giving preference to open source software** if it is possible.
- **Assisting enterprises in internationalization** through EU programs (e.g. Erasmus+).
- **Not only companies but also government organs have to become internationalized**, for example in order that they could influence the international (e.g. EU) regulations and standards to render them as favourable for domestic construction industry as possible.
- **The knowledge broker role of the State and municipalities should be strengthened.** It needs appropriate infrastructure and system of institutions, as well as the reinforcement and extension of relations as mentioned above.
- **Enterprises should be motivated to implement digitalization** by construction regulations but it must not result in falling of small and medium enterprises into the background to a too great extent. Namely, the balance between bringing of innovative enterprises to an even better position and the support to companies with scarcity of resources should be created.
- Lack of information represents one of the largest obstacles also in the field of digitalization and clustering, so the **appropriate information flow should be ensured in as wide range as possible.**
- **Training programs should be launched** for improving missing skills. These may focus on the workers on the labour market, and on future generations, for example by introduction of new courses.
- **A fast and flexible regulation background is needed** that can respond to appearance of new operators.
- The State should be a **“demanding customer”** and should endeavour to require the use of innovative solutions.

Based on the experiences of national and international good practices, regulation and improvement activities presented in the analysis, **the proposals presented create an opportunity for improving the competitiveness, efficiency and export potential of the Hungarian construction industry.**

Summary of Empirical Results

The construction industry faces similar problems all over the world: the efficiency below the average, difficulties in workforce management (e.g. fluctuation, ageing, and labour supply in an inappropriate headcount and level). In Hungary these processes were even more aggravated by the crisis related to COVID-19 evolving in 2020 spring. The decline

manifested itself in the decrease in the number of orders and this gave rise to a further increase in the relative significance of public and EU funds. **Enhancing productivity is indispensable in any case** in the future through innovative solutions by which capacity constraints could be overcome. As a rule, construction industry is a knowledge-intensive sector in which experience-based knowledge and skills play a great role. In addition, the sector is characterized by fast-changing environment (e.g. economic environment, regulations, market expectations, etc.) as a result of which adaptability is very important – i.e. the knowledge acquired previously should be adapted to new circumstances. The purpose of this study is to review **how the enterprises assess the situation and the processes of the Hungarian construction industry and what they think about construction clusters, the opportunities of the sector’s digitalization facilities, and introduction of the elements of sharing economy**. Contrary to the decline occurred, **every crisis provides an opportunity** also for renewal, i.e. COVID-19 might contribute to faster adaptation of innovative solutions – so exploration of the possible paths of renewal and establishment of appropriate strategies are necessary despite a possible short- or medium-term decline in demand.

This study is built on the situation analysis performed previously, as well as on exploration of domestic and foreign practices – these are presented in chapter „Starting points of research”. It appears from statistical data that **construction industry is a driving engine in the Hungarian economy**. Besides, **the State has a significant role in enhancing the efficiency of the construction industry** – it is correlated with the policy-controlled nature of the sector and the importance of regulations and development programs. It also appeared from the situation analysis and exploration of good practices that the **processes under review involve multiple partners** and take place at several regional (international, national, local) levels and in several sectors (e.g. by involving the related sectors of construction industry). Therefore, **partnership, community of values and interests and confidence** are particularly important in the field of clustering (and in general as to operation of the sector and enhancement of its efficiency). The analyses pointed also to the essential significance of **up-to-date data** and information both at business and decision-making level. In concern to the flow and sharing of information it was conceived that **sharing of resources and information might be a take-off point** also for the Hungarian construction industry. As regards the financial background we have to emphasize that the **lack of funds** constitutes one of the most significant obstacles to utilization of opportunities, aggravated further by **delays in payments and circular debts** characteristic of the sector. Such challenges may be reinforced by the **COVID-19 epidemic** evolved in 2020 spring that exercise an influence on wider social and economic circles, so the construction industry sensitive to cyclical changes is particularly exposed to such influences. The foreign innovation practices revealed several opportunities in the field of **BIM, 3D printing and other digitalization efforts**. In addition, according to experiences **the „turn of sharing” of the whole economy has not left the construction industry unaffected either**: there have appeared practices which were aimed at sharing and reciprocal use of workforce or equipment. For the moment, such initiatives are not known in Hungary, so it was important to explore how the representatives of Hungarian enterprises accept these opportunities.

The chapter „Results” presents first the general opinions on the situation of the construction industry. Based on the surveys the statement that **the sector highly depends on the general boom and bust periods** renders the situation of enterprises much more difficult has been confirmed. For the purposes of workforce management and investment planning, **predictable development would be better** than hecticness. Those interviewed emphasized that the **construction industry is strongly hierarchical and specialized** – and it has an impact on its opportunities for cooperation.

Those interviewed reported that they see the **sector’s employment or revenue tendencies in a positive light** – even if such upturn did not affect all of them to the same extent. In the opinion of most of them, **first of all large companies are the winners of the increase in the construction industry**. Our surveys show that such increase has also drawbacks because **the demands have exceeded capacities and a considerable price increase has occurred**.

The policy-controlled nature of the sector is demonstrated by the fact that the **Government and the State play a dominant role in the increase**. The role of the State might be prominent also from other aspects: according to a considerable part of answerers, **the State has to assist expansion of the Hungarian construction enterprises in the Carpathian Basin**. However, several people pointed out that **public action might bear also risks**: for example, when the effect of the State becomes smaller in the construction industry, foreign enterprises might take over the place of domestic ones.

Those who we asked **would not support such governmental measures that would support large companies to the detriment of small enterprises**. Those who answered our questions think that **small and medium enterprises should be supported**.

Several proposals have arisen in connection with the State’s regulating role during the interviews and questionnaires: **for example, simplification of administration might contribute to diminishing the burdens on enterprises and so to the increase of productivity**. In addition, it would be worth regulating **too long supplier chains**. Several people mentioned that **the domestic company structure is rather fragmented** – as was revealed previously also by the situation analysis based on the statistical data relevant to the construction industry. In this relation, especially micro enterprises may find that fund raising is almost impossible for them.

Those asked **link innovation first of all to large companies** – mostly to international companies. Several people emphasized the significance of the large company segment due to the system of relations and capital intensity of the relevant companies. Partly for this reason and partly due to the nature, organization and quality of the works performed, **several answerers mentioned large companies as models**.

The export performance of the domestic construction industry is not satisfactory. In this relation no notable international activities were reported by the cluster members either, i.e. **networking and cooperation have not assisted their entry of the international market**. The majority of the enterprises asked is **strongly specialized**, focuses mostly on one activity and act in extensive geographical areas within the country.

The research dealt also with the impacts of the COVID-19 epidemic. It appears from the

answers that despite the fact that for example the economic prosperity indices showed an unfavourable view of the sector's near future, **the view formed by the sectoral operators is rather diversified. The development of the headcount of employees does not show an unfavourable view either**, the number of employees has remained unchanged or increased slightly in the majority of companies. Several people emphasized that the **crisis caused by COVID-19 differs from the decline in 2008-09 that affected the real estate market and construction industry explicitly adversely** – so they do not expect a decline experienced previously. It is justified also by the fact that – in the opinion of several people – **the adaptability of enterprises has become enhanced**, moreover, due to their specific position, small enterprises can address the emerging situation more flexibly than the larger ones. However, it is question **to what extent the crisis caused by coronavirus will increase the proportion of delays in payments** that was a considerable problem also previously.

As regards the effects of the coronavirus epidemic on the longer run, **the expectations of those asked are rather diversified**. Although most of them were of the opinion that COVID will affect employment in the construction industry, they do not expect a material improvement in the field of recruitment, moreover, they expect strengthening of the competition for skilled workers. It is worth considering that the **COVID-19 crisis coincides with the end of the 7-year EU funding cycle** resulting in a potential decline in grants and in the number of tenders invited.

Several companies **reported on problems in the recruitment and retaining of skilled workforce**, but the situation is not much more advantageous in concern to the unskilled workforce either. **The employers are dissatisfied with the motivation and preparedness of career-starters**. We have reviewed what factors those asked consider important for the purposes of attracting and retaining workforce. **Good work community, permanent employment and predictable wages are among the most important aspects**. Although the system and standard of training sessions were criticized several times, **the enterprises are afraid of sending their employees for further training** as they are afraid they cannot retain them thereafter.

The next chapter of the analysis addresses networking, clustering and other forms of cooperation. It appears from the results that the **answerers regularly undertake works as subcontractors** but their experiences are not always positive. For example they can relatively often find that their work is not paid for – i.e. the obstacle to their cooperation is the lack of payment discipline. It appeared also in concern to this issue that **too long supplier chains raise problems**. As a consequence of such problems it often occurs that the enterprises prefer performing their work by themselves to engaging subcontractors, but **it requires many-sided workforce**. Despite this, **the significance of subsidized further training and flexible work** as attracting factors **is expressly low**.

According to our survey, clusters could be useful tools for obtaining and disseminating knowledge, since several interview subjects pointed out that **such groupings may assist their members by common training sessions**. In the companies of those participating in the surveys **the proportion of those with specialized qualification showed a rather diversified view**: this value is expressly low for several enterprises.

It was conceived in the interviews that, as a general rule, notwithstanding that clusters are useful groupings, **it is not sure that they are capable to operate in the domestic construction industry**. In this relation the interview subjects shared several **dilemmas** relating to organization, **the relations and the balance of power between the members**. Therefore, it appears from the interviews that clustering **does not seem to be a really popular solution** but it also appeared that other groupings cannot be easily organized either: one of the interview subjects reported that **they hit difficulties also if they try to find members in their professional association**.

The general situation analysis brought to the surface the importance of persons and the **role of company managers** arises also in connection with clusters. Personal relationships, personal ambitions and experiences might be important in the decisions made on clusters and cooperation.

Those whose company has never been a cluster member explained this fact mostly by the fact that **membership would not have been an advantage to them**. Most people emphasized also that **they are not aware of** any cluster in the neighbourhood. Similarly as during exploration of previous experiences, it was also mentioned in the interviews that **the activity of clusters is related often to a specific tender or project and, accordingly, to acquisition of funds**. Consequently, **no such community of values and interests comes to existence** that may be the foundation of long-term relationships. Moreover, the **issue of conflict of interests** has emerged several times as enterprises would have to put aside their self-interest for the purposes of development on the longer run. It can also be stated that in several cases not only good examples but also good experiences are missing in relation to clusters but often quite the opposite is typical and the **negative experiences and wrong news associated with previous groupings** keep enterprises away.

Several mentions of the **lack a cluster traditions** in the interviews can be explained by the fact that in our country such initiatives has a much shorter history than in Western Europe where such organizations were established and survived as a result of organic development for several decades. In the opinions of those interviewed, the **tendering system fails to reward and stimulate** cluster membership sufficiently.

In summary of the positions related to clustering it can be stated that the **attitude of market operators is contradictory to some extent**. As a general rule, they are aware of the related advantages but in the situations when decisions should be made on specific clustering such advantages are less evident.

The following part of the analysis dealt with digitalization, in a more general sense of the word, modernization and the role of knowledge. The research revealed that **the labour shortage mentioned by those interviewed several times is partly a problem and partly a motivation to modernization**. Nevertheless, due to the **scarcity of capital**, several enterprises – in particular smaller companies and private enterprises – cannot implement the necessary investments. The problem concerned is that the individual EU programs target prominently small and medium enterprises, i.e. according to the interviews, **these do not and did not succeed in meeting the expectations for the moment**.

Just as in the previous part of the analysis, those asked missed the **appropriate regulation**

background also in relation to digitalization as the lack thereof enhances unpredictability. The significance of appropriate knowledge is demonstrated by the positions according to which the focus should be put on finding and defining **the appropriate market segments** on the one hand and the advantage arising from **local knowledge and geographical proximity** on the other. Namely, the participants in the survey were also in agreement that the **export performance of the Hungarian construction industry can and should be improved**.

In concern to the constraints of modernization and efficiency enhancement, **several critics were expressed in connection with the training conditions**, emphasizing that workforce trained under inappropriate infrastructure circumstances cannot be expected to apply the state-of-the-art technologies and to take an active part in modernization, digitalization and efficiency enhancement.

The disadvantage of small companies appears also in the acquisition of such knowledge since in the opinion of those asked, **first of all larger companies have the opportunity to organize in-house further training courses**. So the position that it is **not small and micro enterprises that are the most suitable** for making use of innovation, and it seems that they give up such opportunity (for understandable reasons), seems to be a general position.

Despite the above challenges it can be stated that those interviewed were in agreement that **modernization and transformation cannot be stopped**. Those asked found also the potential positive features thereof, i.e. that digitalization might improve not only efficiency but also **it might make the construction industry more attractive** for young people by rendering assistance in changing the image of the related professions.

The current direct experiences are not yet too extensive as, based on our data, **most of them do not use otherwise automated solutions** in their companies. The initiatives intended to share the tools and workforce might be a solution therefor. In the course of the general review of this issue it has appeared that **those asked were cautious about or rejected hiring of tools and workforce**. Most of them **would be willing to cooperate with their reliable partners** for the purposes to ensure the appropriate human resources and **in the course of sharing machines and equipment**.

Therefore, in summary it can be stated concerning this issue that the **market operators attach importance to digitalization but they see several obstacles in connection with the enhancement thereof**, including, in particular, those related to finances and human resources.

The last part of the analysis reviewed the attitudes related to the good practices explored previously. In concern to national clusters many people highlighted the **different business culture** and the fact that more regional cooperation would be needed rather. Those who are open to establish national clusters **attach prominent importance to the role of the State**. They would expect that such cooperation would enhance reliability.

Based on the international experiences, **broad introduction of BIM is of key importance** in improving the efficiency and transparency of the construction industry – in which the State could play a key role through regulations and subsidies. Most answerers **would consider the State's taking a strong role in dissemination of BIM necessary in Hungary as well**. In line

with the previous statements of our analysis, it was established also in relation to this issue that **knowledge is lacking in this field** and there are few or even no projects in which digitalization could be utilized.

In relation to 3D printing that could render implementation of projects cheaper and faster, a **cautious hope** appears in the opinions – however, several people may find deficiencies both in the market opportunities and the available professional knowledge and technology.

Contrary to the fact that we found during general review of the issue, **most answerers issued a positive statement concerning sharing of tools** in the course of evaluation of good practices, i.e. they would be open to participate in such a process – presumably because of mentioning specific examples demonstrating that such initiatives may work elsewhere.

The **answers concerning the applicability of smart contracts were rather divided**. The problem of lack of knowledge and technology has appeared among the answers. The importance of public action was mentioned also at this point. However, a great emphasis was put also on the fact that **the market operators would in any case circumvent them**, so there is no much sense in introduction and distribution of smart contracts.

Notwithstanding that drones gain more and more ground in the course of preparation and inspection of construction projects, most answerers **do not consider them applicable in their own activity**, however, as a general rule, companies would be open to them but they fail to use them due to financial or regulation reasons.

Several experiences are related to the fact that cooperation and relations with the operators within the sector and those of the related sectors have prominent importance in enhancing competitiveness and efficiency. According to the answers, the **overwhelming majority of enterprises have such cooperation in place**, however, it could be extended. Most of those asked work with other construction enterprises. The relations can largely be extended towards the chamber, development agencies, knowledge centres and public institutions, by which application of the principle of EU partnership could be reinforced.

In concern to evaluation of good practices it appeared that **many answerers are open to innovations** but the difficulties presented in other chapters herein might represent an obstacle thereto.

Based on the review, the main guidelines of future interventions might be the following: **strengthening confidence, establishing a predictable regulation background and predictable market conditions, building and distributing the knowledge required for innovation and efficient operation**. In any case, the Government has to play a key role in such interventions, but first of all it has to act as a mediator and operator providing for the appropriate conditions. Furthermore, the **potential integrator role of large companies**, which present a model for the other operators of the sector being in the vanguard of producing, adapting and disseminating knowledge and which may assist in integration of specialized micro, small and medium enterprises into networks, should also be utilized.

Thematic Overview of the Project Results

Construction industry is one of the driving engines of Hungarian economy, which is, however, strongly affected by the development of the economic, social and political environment related to COVID-19. In order to achieve that the sector could adapt itself to such changes and challenges as successfully as possible, it is required to establish and work out the possible future directions in the most prudent way. To this end, it is indispensable to become aware of and review the adaptability of the previous domestic and foreign initiatives. Of course, acceptance of actions taken somewhere else without critics would be a mistake, since each country has a different economic structure, market and political processes, so the initiatives that proved to be successful elsewhere may only be applied in Hungary when the domestic circumstances are also borne in mind.

Besides, it is also important to emphasize that utilization of innovation experiences is of key importance in the current situation when the decline caused by the epidemic strongly affect construction demand and so the situation of enterprises. However, in our opinion, the crisis represents not only a threat but also it offers opportunities and motivations for changes. Namely, recovery from the COVID-19 crisis represents at the same time an **innovation pressure** on enterprises and other industry operators.

In order that the results of the research could be utilized in the future, below we give a thematic overview of the results of the various research phases. The results are presented, combined with a policy recommendation, focusing on three main target groups, in which the major findings of the research are explained.

- I. Proposals targeting enterprises and employees
- II. Proposals aimed at governmental intervention
- III. Proposals concerning the financial world and investors

B) Policy Recommendation

1. *Support to construction clusters*

The development of construction clusters are based on the existence of the necessary infrastructure. The most important elements are transport (road network, railway, deployment), the appropriate level of (secondary and higher) education, protection of the environment, and innovation infrastructure. There are specific elements that are essential for the operation of certain clusters, such as special university faculties, laboratories equipped with specific instruments, research institutions, etc.

Cooperation is an important characteristic of construction clusters, however, the role of competition is also essential for the purposes of their improvement. Cooperation and innovation are established by individual technological knowledge that is different by clusters and information flow and common IT improvements are indispensable therefor. Sustainability, energy awareness and high value added technologies are prominently important aspects. In the system of clusters such cluster management organizations might be set up by means of newly established relationships the operation of which is correlating to such an extent that they create a common image and common brand. So they may enter into new relations with other regions and clusters.



It is evident that although clusters have been present in the construction industry for a long

time and the number of initiatives has increased in several periods, it is hard to find a really successful cluster in Hungary. As a rule, geographical concentration is typical of the construction clusters in Hungary and they are concentrated mostly in county seats.

In any case, **common goals** are important for successful clusters for which the members should have long-term objectives both on enterprise level and the level of the whole cluster. Network cooperation requires strong and efficient cluster management in which the members have trust. **Strategic thinking** is related thereto, whereby the members make a common decision on the directions of development and the steps to be taken. Survival of a network needs **strong and stable members** who may give an impetus to cooperation and well-balanced power relations. A cluster should consist of members who offer marketable products and do not expect the success of the cluster but they should be competitive already before their entry, on their own. **The role of confidence**, which may be established by the members' previous advantageous experience and system of relations, cannot be neglected either. Credible and reliable cluster management is also associated therewith.

In the future concentration processes might take place among clusters. As a result, such top clusters might be established which are much more complex, e.g. they cover not only a narrow scope of activity but also their activity covers other sectors as well. It would include clusters consisting of at least 100 members with professional management that are capable to provide services of higher standard.

The time for clusters is not over at all, but their establishment should be initiated in a modernized form and the technological changes of recent years and decades should be taken into consideration. Digitalization and the resultant opportunities, e.g. integration into shared economy should also have a key role.

	<ol style="list-style-type: none"> 1. Governmental support policy would give an impetus to mitigation of cluster problems. In tenders bonus points would be granted for cluster membership and the persons would be motivated for joining by emphasizing the relevant privileges. 2. The Government could extend the scope of authority of the organizations dealing with construction clusters, by which the opportunities would be dynamized and the administrative constraints of cluster formation would be mitigated. 3. The Government might assist in formation of top clusters, creating so complexity and a critical mass within the domestic construction clusters and promoting extension of the principles of sharing economy. 4. Clusters need such cluster members who may appear as exemplary and create sufficient confidence. Large and small companies need to be encouraged for organic cooperation. 	<p>Governmental stakeholder</p> 
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2. Increasing the digitalization level of the construction industry


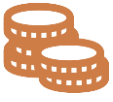
As a result of technological development, digitalization appears in more and more fields, so also in the construction industry, however, its level is rather low and elementary in Hungary. There are areas where some of the opportunities offered by digitalization has been applied successfully and relatively for a long time. As a result of digitalization a large amount of data is generated and accessible, allowing higher specialization, higher quality and better productivity. Digitalization might provide a solution in systems that become more and more complicated and in complex social networks. Exchange of information is much more efficient and simple if digital communication is used. The European Union strongly endeavours to support the spread of these, for example through training or presentation of good practices. However, public action is also important, for example in the field of regulation or education.

Digitalization of processes

Innovation is linked first of all to large companies – mostly to international companies. There are several investment opportunities in the construction industry in the field of ICT that might bring profits also to non-construction companies. Digitalization and enhancement of digital competence might be profitable also for ICT investors.







According to the survey of the European Union, one of the greatest problems of the Hungarian construction industry consists in delays in payments, so it would be explicitly useful to use smart contracts that might assist clarification of the market. 57% of the enterprises analyzed consider desirable to draw up new public regulations for addressing the problem, which percentage is by 12% more than the EU average.

	<ol style="list-style-type: none"> 1. Subsidy to market-based investment projects aimed at promoting digitalization of the construction industry by reducing administrative burdens and by incentives 2. Priority government support to digitalization efforts 3. Giving preference to companies that use BIM systems and smart contracts, positive discrimination of digitalization efforts 	Governmental stakeholder 
	<ol style="list-style-type: none"> 1. Introduction of BIM and smart contracts assists efficient and more sustainable work and make companies more attractive and innovative 	Contractors and employees 

	<ol style="list-style-type: none"> 1. Granting investment loans to establishing the BIM system 2. Cooperation agreement on installation and operation of BIM, announcement of BIM training sessions 	
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Digitalization of education

In Hungary the lack of skills renders digitalization more difficult, which is a general problem in the construction industry. So in particular, development of the digital construction industry and introduction and popularization of new solutions represent a great challenge. In addition, the financial issues are also important: that is why it can be observed that large companies come further in the field of digitalization than small and medium enterprises. The current educational infrastructure is insufficient for transferring and transmitting new digital competences, so this situation needs to be changed.

	<ol style="list-style-type: none"> 1. Digital turn at all training levels, Digital-based education-development 2. Improvement of the trade's training infrastructure and opportunities 3. Support to companies' further training courses 4. Extension of the training locations serving the construction industry 	<p>Governmental stakeholder</p> 
	<ol style="list-style-type: none"> 1. Announcement of programs intended to improve digital competencies of employees in order to enhance efficiency 2. Support to further training and further study opportunities 	<p>Contractors and employees</p> 
	<ol style="list-style-type: none"> 1. Announcement of short-cycle further training and retraining on digital topics 2. Organization of executive training sessions 3. R+D+I projects in the field of Construction 4.0 or BIM 	<p>Investors, financial world</p> 



Overall information

In general, information is missing in connection with digital solutions, appearing partly on the side of customers and partly on the side of construction enterprises. As for customers, as they are not aware of the opportunities provided by digital technologies and platforms, they do not require the contractors to use them. As to enterprises, there are many misbeliefs arising from lack of information that restricts, for example, use of BIM or smart contracts.

	<ol style="list-style-type: none">1. Extensive information program on digitalization opportunities with the assistance and involvement of associations and industry chambers2. Support to the knowledge transfer of representative organizations and chambers	Governmental stakeholder 
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The popularity of construction professions showed a decreasing/stagnating tendency in the recent years, at least based on the number of applicants for training and that of vocational examinations. Fluctuation, and most often, decrease of headcounts are characteristic of higher, but especially of secondary education as well.






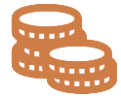
Notwithstanding that, according to the composition of those employed in the construction industry, their majority is given by skilled manual workers, however, the proportion of unskilled workers is also high and, similarly, in addition to graduated non-manual employees, the number of non-graduated employees cannot be neglected either.

	<ol style="list-style-type: none">1. Support to the construction professions' campaigns raising popularity; and organization and support to the organization of career choice days and fairs	Governmental stakeholder 
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3. Intensive management of labour shortage

Despite the continuous increase in construction wages, enormous spatial differences have emerged and become preserved when comparing the individual regions of Hungary, however, the same is true of Hungary's position within the EU as well. East-Hungary, in particular Békés county and Szabolcs-Szatmár-Bereg county, as well as Nógrád county in the northern part of the country belong to the regions characterized by traditionally lower wages but some counties in South-Transdanubia (Baranya, Somogy counties) are in a similar situation. The wage costs of the construction industry are amongst the lowest ones within the EU and we come before only Romania and Bulgaria that causes strong migration from our country. Brain-drain affects not only white-collar employees but also talented specialists.

The average salaries of full-time employees in the construction industry is continuously increasing but it still lags behind the average ones of all other sections of the national economy. It is even more worsened by spatial differences since the difference is even more perceivable in the peripheral regions.

	<ol style="list-style-type: none"> 1. Reduction of the regional differences between wages in the construction industry by flexible regulators 2. Determination of skilled and graduate wages in the construction industry 	<p>Governmental stakeholder</p> 
	<ol style="list-style-type: none"> 1. Attracting and retaining workforce and its motivating by training and continuing training opportunities 2. Business development in information technology fields and motivating young employees by extensive knowledge base and activity 3. Creating an attractive, safe work environment for the workforce 4. Providing for good work communities, permanent employment and predictable wages 	<p>Contractors and employees</p> 
	<ol style="list-style-type: none"> 1. Labour shortage becoming acute can be managed by numerous investment opportunities, e.g. in the field of foreign or domestic employee hiring and travelling 	<p>Investors, financial world</p> 

4. Differentiated support to (micro, small, medium and large) construction enterprises



In Hungary the significance of small companies exceeds the EU average. The dominance of small and medium enterprises is characteristic, they have the largest share in respect of employment, distribution of enterprises and added value alike. Most of the TOP100 construction enterprises are SMEs. Small enterprises have the largest share both in respect of gross value added and construction of buildings. *Multinational companies can be considered key operators in the construction industry. They dominate the Hungarian construction industry. Evidently, influence is exerted by capital. Not only micro enterprises but also medium ones are unable to compete with them. They are backed by such an amount of equity and trust and social capital that cannot be competed with.*

As concerns tenders, small and medium enterprises often face the problem that they have no sufficient capital and are granted no loans either, so they are unable to produce the own funds required for tenders.

In lack of verification of contract conditions and automated payment, SMEs often meet delays in payments arising from underdevelopment of technology. However, use of obsolete







technologies has an expressly adverse effect on productivity and so on profit-making and the opportunity for further development.

Lack of funds is a significant and frequent problem in the domestic construction industry where the number of small enterprises is high and the hardly predictable economic management causes further difficulties rendered even more difficult by the delays in payments and circular debts characteristic of the sector.

	<ol style="list-style-type: none"> 1. Considering the regulations relating to economy development resources concerning micro enterprises and providing targeted support to them 2. Construction guarantee system for “startup” companies or those wanting to scale up by providing public funding and curing scarcity of capital by tendering opportunities 3. Local, regional or national classification of companies in relation to their operations and establishment of a regionally differentiated support system 4. Strengthening large enterprises for export purposes 5. Funding technology development and investment projects by non-refundable subsidies 	<p>Governmental stakeholder</p> 
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5. Support to establishment of B2B / sharing economy systems

Construction industry is a specifically **equipment- and resource-intensive sector**, so companies often hire work equipment. In many cases it needs much money and is a fast process, so recovery is doubtful. Several start-ups have been established for solving this problem by assisting in optimizing the use of equipment through sharing of resources. Airbnb, an online accommodation platform, which has become one of the greatest tourism operators with a market value overtaking the traditional hotel chains, is a model of these companies. On the international markets such **resource optimization companies have appeared**, which might be targeted by considerable risk capital investments, that **have changed how we think about the use and ownership of construction equipment**. The volume of the North-American labour hire market may in itself exceed 50 billion dollars, so the options of growth are remarkable. It is not industry operators but rather external intermediaries who are initiators of innovation in sharing of resources. In this way such activities can be supported **by simplification and flexibility of the regulatory framework**, which will form an attractive environment for the intermediary platforms entering the market.

	<ol style="list-style-type: none"> 1. Working out and formulating a system to regulate resource sharing within simple frameworks 2. Support to business cluster building based on resource sharing 	<p>Governmental stakeholder</p> 
	<ol style="list-style-type: none"> 1. Enhancing efficiency by resource sharing 	<p>Contractors and employees</p> 
	<ol style="list-style-type: none"> 1. Investing in establishment of a construction resource sharing company 2. Technical development and operation of a resource sharing platform and providing logistic services 	<p>Investors, financial world</p> 

6. Mitigation of COVID-19 effects

In concern to the trend of construction production it can be stated that the rate of growth is moderate, i.e. reversion to the 2019 level does not seem to be within a visible distance. It is only partly caused by the coronavirus epidemic, now the sector's halt in the housing market and the growth of EU grants through years do not represent an extra for the sector. The number of orders decrease, there is a delay in the preparation of new projects and less new contracts have been concluded in this period. Due to the epidemic more and more subcontractors suspend their work resulting in redundancies in a worse case and no new workforce is required in the better case. Dismissals took place in large companies, affecting 1 to 5% of the employees, while the headcount of SMEs stagnated or, as the case may be, increased to a smaller extent.

	<ol style="list-style-type: none"> 1. Job creation and orders for construction companies by implementing public projects also during the epidemic 2. Providing wage supplement opportunities for the construction industry, financial compensation of coronavirus effects 	<p>Governmental stakeholder</p> 
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