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DISCUS PROJECT

Digital Transformation in the Construction Sector:
challenges and opportunities

Country Case Studies

Report – Bulgaria

WETCO

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Main characteristics of the case study (companies, actors)

The 3 case studies used data and information from interviews implemented in two companies: for Case A and C we interviewed employees from 2 companies: Strabag EAD and Sika Bulgaria. For Case B we used data from interviews in Strabag EAD (Sole owner Stock Company).

1. STRABAG is an European-based technology group for construction services, a leader in innovation and financial strength. Their services span all areas of the construction industry and cover the entire construction value chain. STRABAG has been active in the Bulgarian market since 2002 and since 2008 has appeared under the brand name STRABAG EAD. Nowadays the group has subsidiaries in all regions of Bulgaria relevant to the market. The company operates in all construction sectors, particularly in Transportation Infrastructures and Building Construction & Civil Engineering as well as on environmental construction projects.

In Transportation Infrastructures particular emphasis is placed upon the rehabilitation of national, regional and municipal roads. STRABAG's experience allows the provision of motorways, expressways and the modernization, expansion and new construction of railways and rail facilities. Furthermore, STRABAG operates successfully in the areas of hydraulic engineering and canal construction as well as the redevelopment of supply lines.

The construction of outdoor facilities, parking spaces, pavements and sports grounds are also part of STRABAG's field of activity.

The main projects in Building Construction are the building of the Sofia Airport and the construction of various business centers, for example Sofia's Megapark. In general, building construction comprises the construction of office, residential and shopping facilities.

In addition to the STRABAG EAD (Transportation Infrastructures, Building Construction & Civil Engineering, environmental technology, fresh concrete), the group is represented in Bulgaria with the Mineral 2000 EOOD corporations, Z-Design EOOD and TPA.

Details

Output volume 2018: € 42 million

Employees: 366

The STRABAG Group generated € 41.86 million on the Bulgarian market in 2019.

The interviewed actors: 1 HR, 1 TU leader.

2. Sika Bulgaria EOOD – established in 2002 as the 86th subsidiary of Sika AG, Switzerland.

The company employs over 30 highly qualified specialists, ready to advise you on commercial and technical issues related to the products offered for construction, automotive, shipbuilding, etc.

What is important for Sika Bulgaria, according the person interviewed, is **to be even more competitive**, offering innovative products and systems, full technical service and support to our partners and customers with a focus on infrastructure projects, hydro technical facilities, energy sites, as well as construction of logistics centres and production facilities.

The company has its QS and Certificates ISO 9001/14001.

The interviewed actors: 1 HR, 1 R&D manager, 1 employee.

DIGITALIZATION AND INNOVATIONS

Case study A: Building Information Modeling (BIM)

1. Sika

The BIM corporately developed projects are provided to clients and designers. In addition, a 3D model of waterproofing systems for roofs and a model of industrial flooring is used.

In this developing technology Sika has a unique position because it is the only company supplying all of the required building blocks for cementitious printing.

BIM (Building Information Modeling) has existed for several years, but is not yet widely accepted in the sector. BIM allows seeing the projects digitally without even putting a brick on the site. BIM helps to eliminate errors in the project, for faster implementation of calculations and quantitative accounts and shows applicable options for the work execution.

BIM provides several dimensions for project information – 3D to assess the construction of the building before the project begins; 4D shows a visualization of the building model by simulating the construction process; 5D helps with budget accounts with great detail and accuracy.

Sika built a dedicated **3-D center** for automated building construction. The ongoing activities are focused on the first industrial implementations of 3-D, as well as creating an unrivalled freedom of design in collaboration with architects.

This includes:

- Robotics from Sika's Automotive Engineering Center
- Automation with Sika's Pulsment process control
- Extrusion performed by the Sika MiniShot system
- Sika 3-D mortars
- Setting on demand with Sika accelerator
- Sika fiber technology for stability and fire resistance
- Concrete technology and mix design with Sika® ViscoCrete®
- Formulation expertise from Sika's concrete admixture specialist team

This level of progress is quickly turning industrial 3-D printing into a billion dollar industry. Sika solutions for concrete 3-D are helping to increase productivity in construction.

Below – screenshots of company BIM model

SHARE

What is a BIM object?

Before looking at Sika BIM objects, first you should understand what BIM objects are.

BIM objects use digital possibilities to put properties behind the technical drawings.

To simplify the explanation, it could be described as a combination of a **3D drawing** and the related **Product Data Sheet**.

BIM object = 3D drawing of a system/ product + **dynamic, adaptable geometry** that represents the system's physical characteristics + **detailed information** that defines the system/ product (from Product Data Sheets)

An example for Sika:

Sarnafil Roofing System xyz:

- 3D drawing of the roofing system
- Type of waterproofing membrane including all properties (USPs)
- Type of insulation including properties
- Type of vapor barrier including properties

(only relevant data from the PDS would be included in the BIM objects)

The goal of a Sika BIM object is as digital products to provide components with useful information most helpful for the customer, architect or engineer, including **3 key points:**

- Why BIM is important to Sika
- Benefits of BIM
- Corporate Status and Strategy
- Sika BIM Objects
- BIM Dictionary
- Global BIM Policies
- How To Start BIM Locally
- Marketing Your BIM Content, Comm...

Deleted files

BIM AND SIKA'S ADDED VALUE

For the growing importance of BIM in the planning, design and completion of construction projects, Sika provides BIM components for flooring, roofing and waterproofing. These objects can be integrated into the Building Information Model to help streamline the workflow by providing:

- Accelerated planning process
- Improved data quality and coordination
- Eases complex project management
- Architect can adapt changes quickly and create more accurate drawings
- Contractor can facilitate material takeoff with more accurate quantity counts and integral data
- Owner can have a complete, integrated data model to ease future building maintenance

DOWNLOAD SIKA BIM OBJECTS

Please visit the links below to access the BIM Object portal or your local Sika website where BIM objects are available. Contact your local Sika expert for more information or in case an object is missing.

GO TO BIMOBJECT.COM PORTAL 	GO TO BIM PORTAL FOR US 	GO TO BIM PORTAL FOR UK 	GO TO BIM PORTAL FOR FRANCE
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DOWNLOAD BIM OBJECT-RELATED PRODUCT DATA SHEETS (PDS)

Product data sheets for products available on bimobject.com are able to be downloaded from the following:

FLOORING PDS 	ROOFING PDS 	WATERPROOFING PDS
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2. Shtrabag

In 2018, STRABAG established the business unit **3D Mapping Services** as the organisation for a new business field. The entity offers services with **innovative measuring systems** for object surveying, such as drones and mobile laser scanning, internally and on the external market. The entire value chain – from data capture to 3D data analysis – is to be done digitally. To support the research and development activities, the company established a **professional in-house funding management** in early 2019 with the goal of subsidising the necessary development tasks through the public sector as much as possible. The services offered jointly by the service entities TPA and Zentrale Technik include the systematic identification of funding possibilities for development projects as well as applicant support at all stages, from request submission to project execution. In 2019, a total of 17 projects were carried out with public funding in the group, with the support of this new entity.

In building construction and civil engineering, all major structural shell projects are already being developed on the basis of BIM 5D[®], with the volumes determined directly from the model and made available during construction. The trend towards integrated end-to-end solutions is increasingly taking hold in the construction sector as well. Clients want benefit, rather than things and individual functions. This results in complex changes.

3. Impacts on work organization

Strabag: The digital transformation of the production process is a strategic focus of the company, recorded as a field of action in the strategic programme FASTER TOGETHER 2022. With its software and hardware products, new ways of working, new fields of action and applications, digitalisation offers rapidly growing and constantly changing framework conditions on the market. The company continued to drive the development of BIM 5D[®] during the 2019 year. On the one hand, the gaining experience when applying the know-how of digital building in specific projects. On the other hand, the company was engaged in research projects to help it apply BIM.5D[®] in all relevant construction phases if possible.

The “eEmbedded” project, for example, aims at using BIM methods already **during the design phase**. The focus here is on energy considerations and the integration of the planned building into the surroundings. The training offer in this regard was also further expanded in 2019. In addition to the estab-

lished **BIM 5D® training** at company locations, the BIM management training was successfully completed by the first participants in autumn of 2019. The internal programme is going to be further expanded and continually developed in 2020 in order to prepare future **STRABAG BIM managers** even better for their role. In 2020, the programme is offered in English for the first time. The interviewed HR mentioned, that the training is designed **only** for managers.

The group project BIM 2020 Roadmap in Transportation Infrastructures, which is structurally based on the 2020 Roadmap by the German Ministry of Transport and Digital Infrastructure, is now in its second project year. Due to good progress in terms of content and increased demand from within the group, the project was expanded at the beginning of 2019 to include four countries in Central and Eastern Europe more. The integration of Bulgaria, Poland, Hungary, the Czech Republic and Slovakia into the project activities means that, in addition to Austria and Germany, other STRABAG markets are now centrally represented in the overall project.

4. Impacts on employment

Digital workplace: STRABAG is investing in the **digital workplace** and is driving ahead the digital transformation with cloud applications. The complete penetration of an organisation with state-of-the-art working tools is a fundamental requirement for flexible and efficient collaboration. A first step is the STRABAG wide **introduction of Office 365**. The conversion to Office 365 reached 99 % at the end of 2019 (2018: 68 %).

5. Impacts on working conditions

Strabag: Ensuring the health and safety of the employees is a fundamental priority. The global initiative “1>2>3 Choose Safety” that was launched in 2019 is a way to sustainably anchor the clear commitment to occupational safety and health in the group.

According to the interviewed person, the new tools being used in BIM 5D® processes facilitate, among other things, regular consistency reviews of the construction designs, a model-based quantity, cost and performance assessment, and schedule planning, and, on this basis, an end-to-end rendering of the construction sequence with digitally linked processes and consistent data across the entire life cycle of a

building. This can help uncover and correct errors at an early stage, thus **minimising the risks** in a construction project, the roots of which are often found in the design phase. The digitally retrievable data can then be used for different analyses (including building analyses and simulations, sustainability studies or building certification). The digital tools also promote an efficient and transparent working relationship with clients, designers and partner companies.

6. Drivers and barriers of digitalization

Strabag is actively driving forward the digital transformation of construction site processes and is also working on the resulting new (digital) business models. The company is convinced that the focus here must be on the expectations of the customers and the more efficient design of existing processes. A focus of this process optimisation is on a higher penetration of digital methods such as BIM 5D[®], another is on the development of more efficient and more collaborative digitally supported ways of working with customers and partner companies. To this end, the company **invests in the continuous qualification of the employees and strengthen the teams with the right specialists**. The indicators refer to the digital penetration on the construction site and at the workplace – because the digital transformation influences not only the object of construction and the people involved, it also changes the processes within the **group organisation**:

- Collection and analysis of machine data starting with 2019: Increasingly higher expectations are being placed on **quality and performance documentation** and on a more sustainable use of environmental resources. For this reason, the company increased use of telematics systems with key equipment in 2019 to record and analyse their movement and operation. At the end of 2018, around 26 % of the key equipment was outfitted with telematics systems. In 2019, we already achieved a rate of 34 %.
- In 2019, the company outfitted the key equipment with machine control systems for power control and recording for the first time. At the end of 2019 was achieved a high starting value with a rate of 12 % of the operating equipment.
- **BIM 5D[®] workstations**: STRABAG is gradually upgrading its **CAD workstations** for use with BIM 5D[®] technology in building construction and civil engineering, transportation and infrastructure projects. The number of **BIM-capable workstations** has been growing continually and in 2019 reached **1,560 across the entire group**. That corresponds to a year-on-year increase of 15 %.

The following further indicators help STRABAG to measure its innovation activities:

- Provision of **research and development funding** by the company: € ~17 million (2018: € ~14 million)
- Number of subdivisions with at least one **person responsible for innovation**: 23 out of 119 subdivisions (2018: 23 out of 118 subdivisions)
- Reports on relevant development projects to strengthen the group's innovation activities via the new STRABAG innovation magazine "ForeSite" and the website **innovation.strabag.com**.

Industrial relations and social dialogue: trends, critical points and opportunities

In the two studied companies there is a difference – in one of them – Strabag, there is a Trade Union organisation since the beginning of the company entering in Bulgaria.

In the second company – **Sika** – there are no TU organisations or Workers reps.

The trends and challenges of the social dialogue due to digitalisation processes are analysed in Case Study B and C.

7. COVID-19 impact: the role of digitalization

In July, a month in which some of the restrictive measures due to COVID-19 were relaxed in many EU member states, construction output in the euro area rose by 0.2%, but for the EU as a whole construction fell by 0.1%. % compared to the previous month of June, according to Eurostat data.

In June, construction grew more confidently – by 5.1% in the Euro area and by 3.8% in the EU.

On an annual basis, construction output in July shrank by 3.8% in the euro area and by 3.9% in the EU. Building construction shrank by 4.3% in the euro area and 4.2% in the EU. At the same time, civilian employment increased by 0.4% in the euro area, but decreased by 0.4% in the EU.

The strongest declines on an annual basis were registered in Hungary (-21%), Slovakia (-15.4%) and Poland (-11%). There is an increase in Romania (+ 12.2%) and Finland (+ 2.5%).

On a monthly basis, infrastructure construction increased by 1.1% in the Euro area and by 1.2% in the EU in July, while building construction remained unchanged in the euro area and decreased by 0.3% in the EU as a whole.

The strongest monthly increases are reported in Slovenia (+ 12.2%), France (+ 5%) and Romania (+ 4.3%), and the most significant decreases – in Germany (-4.3%), Poland (-3.5%) and Sweden (-1.7%).

For Bulgaria, Eurostat reports a monthly decline in total construction of 0.3% and a decrease of 3.9% on an annual basis.

Case study B: Smart devices for Building Site

COMPANY: STRABAG BULGARIA

1. Digitalization and innovations

For STRABAG, the trend towards digitalisation means that all material business processes – design, construction, production, operation and administration – must be gradually adapted to this new way of processing information. The company introduces digitalisation in the **design-and build process** and uses the “**digital twins**” in all phases of construction in order to remain competitive as an attractive employer and construction partner. The company expects that the interaction between all project participants will lead to increased quality and efficiency as well as better time and cost planning. This means that the staff look at the processes of the suppliers and examine possible intersections. In keeping with corporate value of partnership, the company have therefore begun to offer BIM 5D® training (Building Information Modelling) to its external partner companies so that they can develop the standards of the future together. The company also provide their partner companies with **group tools for use**, for example to **digitally manage logistics chains across several value creation stages**. A first example is model-based calculations in transportation infrastructures, carried out as part of pilot projects, which showed significant efficiency gains in the calculation process. This enables process to derive volumes directly from the models, to link the models with the estimation and scheduling in an integrated manner, and so react very quickly to changes in the real construction site situation.

2. Impacts on work organization

Digitalisation is currently one of the most important issues within the context of innovation at STRABAG. The digitalisation of flows of information changes traditional construction processes because it connects people, machines and things (Internet of Things). Components that gather and send data can be built into nearly everything, even into construction materials, construction machinery and construction parts, to provide information during the construction of buildings or to send status updates during their operation. This makes it possible to make processes transparent and to optimise them from almost anywhere

– whether from the office or the construction site. Using model-based renderings that present the information in an extremely compact and easily understandable form, people are able to work together in real time from different locations no matter where they are. Self-learning algorithms support the decision-making in ever more complex processes – decisions made not only by management but also by robots.

Robots can already lay bricks, perform freeform welding operations and “print” structures, structural elements and construction parts using cementitious pastes. Still, **robots won’t be replacing human workers any time soon**; even in the future, people will continue to put their skills to good use and will have to operate the machines on our construction sites. At the same time, the opportunity that digitalisation gives let machines perform routine or dangerous tasks so that people can spend more time looking for creative solutions.

As a technology group for construction services, the company have to develop innovative solutions in order to remain competitive in the long term. As a driver of accelerated change, **digitalisation** must be applied wherever it creates added value for repetitive processes on the construction site or to implement complex construction projects of the highest quality. The first step is to recognise the scope and, ideally, the implications of the changes.

3. Impacts on employment

Strabag: Mobile end devices for a more flexible work design: Digitalisation is changing the work routine – for example, with a shift towards mobile working. Provided with end devices such as tablets, employees can benefit from the more flexible work design that digitalisation makes possible. The percentage of employees using tablets for work purposes in 2019 stood at 18 % (2018: 11 %).

- **The smartphone app** for site inspections, which was rolled out in the German-speaking countries starting in 2018, was used more than 13,500 times by employees in leadership positions at more than 3,000 construction and job sites. Additional smartphone apps for construction site teams and the HSE specialists were completed in all local languages and will be available from 2020.

4. Impacts on working conditions

Increasing efficiency requires the digitalisation of the construction sites. The construction sites of tomorrow will be connected and automated. Drones are already common on job sites, and the connectivity of intelligent construction machines has already been fundamentally implemented. The Connected Construction Site group project is an important STRABAG lighthouse project in the digitalisation of construction sites in transportation infrastructures. The focus is on concrete, application-based solutions to efficiently support the digital and seamless interaction of all project participants. In order to continue to achieve these goals in the future, the Connected Construction Site project programme, which ended at the end of 2018, was continued in 2019 under the title Connected Construction Site 2.0 with an agile project approach.

5. Industrial relations and social dialogue: trends, critical points and opportunities

In the company there is Trade Union organisation of KNSB, representing workers and employees. The organisation has long-term cooperation with the company management in terms of:

- Collective bargaining and negotiating Collective Agreement for company employees;
- Information and consultation with the employer regarding work organisation, Health and safety issues, workers' rights, conflict management and protection;
- Active participation in informing the TU members for all innovations, new technologies and machinery entering the company;
- Organising and support the employees' qualification and training about new digital tools and processes in the company.

6. Covid impact: the role of digitalization

During the pandemic situation, the interviewed people from the company point the following issues:

- As a big Multinational company, Strabag has the power, resources and know-how to perform its activities including at the construction site; using tablets, mobile apps and other smart devices reduce the direct contacts between employees and provide permanent exchange of information

and guidance; in the same time low qualified or/and older workers have difficulties to use these tools and this create inequalities and risks for health and safety;

- The qualification and training regarding new technologies are provided mainly for managerial staff, and very rear for workers at the building site – thus there is a lack of new skills needed for new work organisation;
- Digitalisation of the company work processes and labor organisation is very important for the development of the company and the sector as a whole, but it needs more time and efforts of all players- management, HRs, Trade Unions, research institutes, clients, suppliers and workers.

Case C: Smart-factory off site building

COMPANY: SIKA BULGARIA

Interviewees, positions and roles – 1 R&D Manager, 1HR manager, 1 employee

Company description:

- Sika Bulgaria Ltd. is a subsidiary of the Swiss company for construction materials – Sika
- Main activities – sale of products for construction and production of concrete admixtures
- Number of employees – 29
- Trends in turnover last year – growth
- Main production units – production of concrete admixtures
- Ownership structure – International company
- Position in the value chain – importer and producer
- Main production and other productions (with a focus on patents and certificates) – production of construction materials

1. Digitalization and innovations

The company uses new ways of communication that help management and employees succeed in the global marketplace and support Sika's growth. The company uses social media and shared digital workspaces like its own social intranet – SikaWorld. At Sika, digital media contribute to the creation and dissemination of real knowledge and are used throughout the recruitment process, staff training and day-to-day communication.

There are number of youTube videos that illustrate innovations in their production.

<https://www.youtube.com/watch?v=5H5IUb23tv0>

The company has long-term cooperation with universities (UACG) and their labs. All new products are tested and proved in the university labs in cooperation with academic researchers. The company invests in Research and development projects that support digitalisation of the design and production.

Sika adheres to the ten principles of the UN Global Compact and uses the GRI Standards. To integrate the views and interests of all stakeholders and to reinforce commitment, Sika has signed the UN Global Compact, and holds a World Business Council for Sustainable Development (WBCSD) membership.

2. Impacts on work organization

The company uses digital programs and tools (like SAP) that allows the optimization of the work processes, procedures and phases. This time saving tools make visible the whole implemented project, or the main details that has to be accomplished by the employees. The digitalised work area has positive Impact on the dimension of flexibility of the working process, on the standardization of the working process and enables coordination between team members. Very important issue is that the digitalised process of the product elaboration is accessible also for the other actors of the value chain- i.e. the client, the trading consultant etc.

The company has elaborated a mobile app – “24 Alert”, so that every employee has the app on his/her smartphone and all the problems and risks at the workplace are directed to the relevant manager for efficient solution.

3. Impacts on employment

The respondents from the company have noticed that the technological tools and innovations are the key to the company success. At the same time, the digitalization of the work processes results in multitasking of the employees for short time and more or less stressful and intensive work. In some cases several people from the company teams and units has to organize, monitoring and report different stream lines that in the “old time” production were entitled to enlarged personnel. In other case, some of the employees, especially older or low qualified, have difficulties to accept new things, although the company regularly trains the staff. Another point regarding the quality of work and payment is observed by the respondents: the big difference between salaries in the Bulgarian company branch and other branches (in Switzerland) for the same work in the same network. The trend of the company management is to hire less employees, and to use the instruments of digitalization for remote control and work organization.

4. Industrial relations and social dialogue: trends, critical points and opportunities

There is no Trade Union organizations or Workers representation body in the company. In the company policy it is stated that: Sika strictly follows the 10 UN Global Compact Principles and acknowledges the

freedom of association and the effective recognition of the right to collective bargaining (see Global Compact Principle Three: “Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining”). Nevertheless, Sika Bulgaria has no TU organisation or Work council.

Central Point of Contact (Help Desk):

If Sika employees throughout the world are in doubt or have questions regarding any issues related to the content of the Sika Code of Conduct, they are asked to contact their superiors or a colleague from Corporate Legal or Corporate HR.

Internal Audits:

Sika standards in the domain of human rights are documented in the Sika Code of Conduct and in the Policies and Principles of the company. The General Managers are obligated to a zero tolerance and to strictly adhere to legal practices and to supervise the subsidiary accordingly. Also, they are responsible for taking preventative action. Human rights reviews are included in the internal audit program and the legal audits which are performed regularly in subsidiaries. Around 20 internal audits and 10 legal audits are performed annually, corresponding to around 20% of Sika’s subsidiaries each year.

Stakeholder Dialogue:

The theme of stakeholder engagement runs across the UN Guiding Principles on Business and Human Rights. Via materiality assessments and a sustainability advisory board the company makes sure that it understands and responds to the interests and concerns of all stakeholders.

The statement only:

- Preserve the confidentiality of the trade unions and leaders in countries where the government does not permit respect for human rights (including rights at work) or does not provide a proper legal and institutional framework for industrial relations and collective bargaining.
- Support the establishment and functioning of local/national employers' organizations, and trade unions.
- Inform the local community, media and public authorities of your company's endorsement of the UN Global Compact and its intention to respect its provisions, including those on fundamental workers' rights.

The company established **Sika's Worldwide Webinar Resource Center**, available in different languages,

and all employees are regularly trained on innovations, H& S issues, new products and processes in the company. Of course, the interviewed employees mentioned that elderly workers have some difficulties to accept and implement rapidly changing digital tools, the younger are more flexible to innovations and in using digital tools at work.