Sustainable and innovative project management strategies in the engineering management industry: case study of Drees & Sommer

Yufan Wang*

International Education School, Suzhou University of Science and Technology, Suzhou, China, 215009

Abstract. Against the backdrop of globalization and rapid technological development, the engineering management industry faces many challenges and opportunities. Traditional engineering management models are difficult to adapt to the development needs of the new era. This study proposes strategies such as digitalization, economic sustainability, innovation development, and green building by analyzing the project management practices of Drees & Sommer (D&S) in Germany. These strategies aim to improve the efficiency and quality of project management and promote sustainable development. The study points out that the limitations of traditional management models urgently need to be innovated through intelligent technology, lean management, and digital tools such as BIM technology to optimize resource utilization and reduce environmental impact. D&S has achieved innovation and sustainability goals in project management through the "Blue Road" strategy, which organically combines economy, ecology, and functionality throughout the entire life cycle. This study also highlights the key role of zero-carbon emissions and the circular economy in future engineering management, providing strong support for the long-term development of the industry.

1 Introduction

Under the background of globalization and rapid technological innovation, the engineering management industry is facing unprecedented challenges and opportunities. With the continuous acceleration of China's industrialization process and urbanization construction, traditional engineering management models have gradually exposed various shortcomings that are unable to adapt to the development of the new era [1]. The most widely used traditional management mode shows low professional quality, backward technical level, low engineering quality, and too many construction crews. These factors greatly increase the difficulty of project management and cannot meet the needs of rapid development in the new era. According to a large number of studies, Project management and sustainability are two distinct areas of research.

* Corresponding author: 21200412107@post.usts.edu.cn

Previous empirical research on the effectiveness of construction project implementation needed sustainability success components [2]. This study aims to show that sustainability success is an important factor in measuring the optimization of project management models. D&S, a German engineering management consulting firm, has accumulated rich experience in project management mode. Sustainable, digital, innovative, and economic aspects are combined with every project in D&S to promote their successful development. This study will also combine these four aspects to analyze D & S project management strategies.

2 Literature review

Relevant scholars have doubts about the current situation of the engineering management industry. In the information age of the 21st century, traditional management models have not yet effectively enhanced the efficiency of civil engineering management. To achieve this goal, it is essential to fully leverage information technology to foster a seamless integration of information systems and civil engineering management. This approach will enable the comprehensive realization of civil engineering construction design objectives. By harnessing the power of advanced information technologies, we can enhance the synergy between digital infrastructure and traditional civil engineering practices, ultimately optimizing the entire construction design process[3]. It can be seen that the application of digital technology in engineering project management is very important. Building Information Modeling (BIM) represents a transformative approach to construction management, significantly enhancing project efficiency, stakeholder collaboration, and economic performance.

Furthermore, a scholar discusses BIMs pivotal role in improving stakeholder communication, coordinating workflows, and enhancing decision-making processes. The findings suggest that BIM not only streamlines project management but also significantly boost profitability and efficiency [4]. Scholars are studying the implementation process of lean. Some have analyzed the literature on lean management and lean Six Sigma (LM/LSS) in local government organizations (LGOs) and found that this research area has recently received an increase in attention within these types of organizations. Although this research area attracts new scholars every year, there remains insufficient collaboration across different research groups. Research methods, outcomes, and future research areas were also investigated to comprehensively evaluate the literature and specify new research opportunities [5].

Study results show that improving enterprise innovation level has a positive promotion effect on the commonwealth [6]. Therefore, predicting and judging the industry trend is of great significance to relevant companies. Studies have shown that in today's society, the construction sector significantly influences all three aspects of sustainability: economic, environmental, and social. Industry and academia have recognized sustainability in construction projects as a key concern [2]. Sustainability development becomes the ultimate goal of the engineering management industry, so relevant sustainability strategies are very necessary for enterprises. In the context of the big data era, a range of new technologies have been widely applied, bringing new opportunities and challenges to business development. In order to develop steadily in the fierce competition, the engineering management industry must innovate the traditional management mode. Management model innovation is the core of enterprise management in the new era, and the application of big data is the core approach of enterprise management model innovation [7].

3 Case background

D&S is an international consulting and construction management company based in Germany. It was founded in 1970 and has about 850 employees worldwide. D & S provides planning and construction project contractors for large businesses as well as private and public sector investors. Real estate and building construction services cover a full range of management and consulting on the construction of new buildings and the modernization of various types of old buildings. The company's services cover the entire life cycle from initial project planning to implementation and operation, and it has rich experience in various fields, including commercial buildings, residential real estate, industrial facilities, and infrastructure projects. D&S is very focused on sustainability and environmentally friendly buildings, and they are involved in many green building projects and work to drive the sustainability of the industry. The management model and sustainable development strategies of D&S are at the forefront of the engineering management industry. It believes that the three factors of economy, ecology, and function are inseparable, and it names this basic principle “blue road” as a whole idea that runs through the inside and outside of the company. “Blue” is the combination of rationality and sensibility. Rationality means that enterprise management follows certain goals and certain industry rules; sensibility means encouraging innovation and expecting more new ideas to inject new vitality into the enterprise.

4 D&S project management strategies

4.1 Digital strategy

Many engineering management industries need help with technology shortages and backward technology levels, which greatly hinder enterprises' innovative development and rapid transformation. At present, intelligent construction has become the focus of the industry. The characteristic of intelligent building is not only the number of Internet of Things technologies and sensors installed but also, most importantly, the added value it provides for users.

D&S does not see digital technology as a goal but as a means to improve processes, enhance user experience, ensure sustainable real estate operations, and achieve a new business model, focusing on four aspects of digital operations. “Custom smart buildings”, which is set to meet customer needs, has a central brain, so it can learn from users and adapt to their personalized needs. The so-called “brain” intelligently connects all the technology systems, sensors, planning, operation, and user data under the highest IT security standards to best control the processes in the building. For example, the system detects unused areas that do not require heating or cooling and closes the system in those areas accordingly. BIM is a digital tool that creates a three-dimensional project model. It not only supports the work in the design stage but also provides detailed information during the construction process, helps to solve potential problems, optimizes the use of resources, and improves the efficiency of collaboration. Building information modeling, as an innovative digital infrastructure model (BIM), has great potential to promote building innovation (CI). Building an information model is not another form of CAD. D & S considers BIM as the methodology where geometric and alphanumeric information is recorded, coordinated, and recorded in various stages and transactions. The BIM 1 level has been shown to bring significant added value to the project. In addition to routine BIM operations, D & S's step forward to go digital to save construction site time and cost is the use of 3D scanners.

With the help of 3D scanning technology, the current situation of the shell structure is digitally recorded and compared with the target status specified by digital planning. Therefore, the deviation between planning and reality can be detected and corrected at an early stage. This not only saves time and money but also helps to reduce the waste of

resources and thus obtain more building sustainability. To compare the scanned data with the digital plan, D&S used the Imerso software. With Imerso, the scan is immediately updated in the digital model and automatically for target and actual comparisons. In addition, D & S is working with various suppliers, such as Faro Technologies, to further develop these technologies, with the goal of using 3D scans in future construction projects and achieving maximum added value in the digitization process. Digital Ready Check is also a strategy for D & S digitization strategies, and building data in digital readiness checks is recorded digitally by applications provided by D&S. This saves time, efficiently collects building data, especially when viewing a real estate portfolio, and minimizes property managers.
Covivio high-rise Alexanderplatz is a good example. D&S primarily contributes technical and economic expertise to Covivio - among other things, as a client representative for technical building services (TGA). The goal of the project team is to provide holistic advice and thus create the best conditions for the safe course of the project right from the start. A particular challenge is the inner-city location, which per se increases the construction logistical effort. In addition, the base building around the Park-Inn Hotel had to be partially demolished to clear the construction site. D&S also contributed to the success of this task with personnel and know-how - so that construction work could start as planned in May 2021. In addition, the experts covered many other topics. For example, they carried out a Digital Ready Check and advised Covivio on the indoor climate concept for offices and façades, BIM management, and façade planning. Even during the planning phase, the accompanying technical and economic controlling proved to be an added value for customers and planners - and thus for the entire project. When Covivio was looking for a contractor for the energy topics, D&S supported the project developer in supervising the competition. The aim was to lead the bidders to innovative and economical energy concepts. The participants achieved this with flying colors: The bottom line is that Covivio benefits from around 8.5 million euros in saved investment costs.

4.2 The strategy of economic sustainability

Many different project participants in the industry are currently simply working together in a decentralized way, with time and cost pressures increasing and the requirements for safety, sustainability, and smart technologies increasing. D&S presents an alternative solution, Lean Solutions, focusing on expanding the perspective and shifting from a pure resource perspective to a “process-oriented” perspective. Lean Solutions are suitable for every industry, every project scale, and every service stage of the project life cycle; they provide appropriate lean solutions for the project to maximize the added value through the purpose of visual control. In order to increase adherence to deadlines, they implement a process system that leads to basic stability and consolidation of processes through visual control, process focus, daily measurability, and the appropriate process organization. Since 2006, D&S has started a series of pilot work, and by 2015, the lean approach of target value design and agile design management has been transferred to planning and defined as LDM. Effective project management through lean management leads to production principles: flow production, pulling principle, leveling and cycle time planning, and zero defect principle. They can be adjusted so that construction projects can also benefit from lean concepts. Germany's Havelufer-Quartier project is a successful example of this scheme. The lean solutions proposed by D&S will certainly have an unexpected impact and inspiration on the development of the industry, so I will highlight the analysis of this excellent solution in the economic strategies.

As a “temporary construction department”, D&S stands by the client's side for the duration of a project and takes on tasks that can be delegated. With the help of their competence and experience, they protect customers from unpleasant surprises. As project

managers, they provide the customer with professional support in the central topics of deadlines, costs, and quality, as well as in organizational tasks. At the same time, the customer's representatives remain in the management function. They also take over the management function from the client towards the project participants. As a rule, the client transfers the so-called “delegable client functions” to them.

In most cases, this variant involves more complex projects or builders who need their management know-how or sufficient capacities. In the Project Management Office (PMO), they work with the customer in integrated teams to take over the overarching management and reporting for the overall project execution. D&S control the planning via so-called agile planning processes, whereby they constantly keep an eye on profitability and look for the best solutions with value engineering. D&S keeps an eye on costs and deadlines through stringent controlling and always pays attention to compliance with the qualities. D & S records any defects that arise in the execution with special software and ensures that the construction management and executing companies put them in order in a timely manner. For customers, the company takes over a large part of their client tasks so that they can take care of their core business. D&S acts in an integrated, holistic, and solution-oriented manner. By doing this, they guarantee cost-effectiveness, binding overall costs, and adherence to reasonable timelines for the predetermined quality.

Moreover, the practical management experience of D&S makes it possible to handle large-scale projects on time and in a quality manner. Numerous examples, including Potsdamer Platz in Berlin, the new trade fair in Stuttgart, and the complex inventory optimization of Deutsche Bank's headquarters in Frankfurt am Main, prove this. However, there can only be an optimal process if the client is prepared to create the following conditions: The client must define his goals precisely, stick to them, organize himself professionally, and make quick and clear decisions with appropriate preparation. With the General Construction Management (GCM), customers receive security from a single source. The company takes over the complete handling of a construction project and combines project management, planning services, and Construction Management, including construction management, to form a complete package - without interfaces. With Lean Construction Management, they ensure smooth planning and execution processes. In combination with BIM management, GCM can implement very economical planning and execution processes in a short time. They plan to put together the planning team at an early stage, whereby the architect can also be integrated into the GCM team as a partner. This means that our customers have only one person responsible for contacting them for the entire project.

Thanks to D&S’s extensive experience, they can demonstrate broad know-how across cost groups in our classic core competence, the service phases (LP) 6-9 of the Fee Schedule for Architects and Engineers (HOAI). This ranges from new construction to modernization, from residential construction to administrative and retail properties, buildings from the life science sector and clinics to complex special buildings of various sizes. They represent the client before, during, and after construction and, through the use of integrated construction management and lean methodology, bundle all construction management services of the cost groups 200 (demolition and preparation), 300 (building and construction), Civil engineering), 400 (TGA) and 500 (outdoor facilities) over the entire construction phase from the tender to the operation of the building.

4.3 Innovative development strategy

In the past literature, there are few studies on the innovative development strategy of the engineering management industry, and there are no good reference cases. However, this study finds that D&S’s innovative development strategies have made a series of achievements. According to the relevant materials, innovations are part of D&S’s DNA. The

Innovation Center has set itself the task of driving the digital transformation of the real estate industry. Due to the digital transformation in the market, the interests and needs of customers are shifting faster than ever. Following on from this, the goal is to increase the speed of innovation at D&S. Existing business areas are being digitized, and new business models are being developed and brought to market in an efficient and targeted manner. As mentioned in the "Blue Road" in the introduction, the company focuses on encouraging innovation. D&S has set up a series of innovation centers to help better implement innovation solutions. Among them, D&S has set up a series of innovative formats, and customers can realize their innovative ideas through hackathons, ideations, or design sprints. The company created Creators, the innovation ecosystem for the construction and real estate industry. It enables cross-industry exchange between startups, large corporations, SMEs, VCs, and other financiers, universities, and universities of applied sciences, as well as institutions and knowledge carriers. Whether hackathon, ideation, incubator, or accelerator - with the various creator programs, D&S brings the various players together, helps them network with suitable partners - and thus creates added value from which both sides benefit.

Over the weekend of September 20-22, 2019, start-ups and students developed creative solutions for the real estate industry. The D&S Innovation Center in Stuttgart is the hackathon think tank where participants can choose between three tasks: Phoenix Contact, Ed. Zublin AG and D&S, this scheme was successfully implemented. In addition, the company will regularly summarize reports, analyze important technology trends in the industry, and analyze innovative solutions and future development directions and trends. At this stage, it is urgent to analyze future trends and intervene in a timely manner. Many small and medium-sized enterprises do not have innovation departments, and D&S provide a good example. The company has set up specific future paper seminars to analyze current and future trends, not only for its own company but also for its customers. This series of innovative establishments also leads the engineering management industry to set up its innovative department, which can timely judge the future development trend of the company. With the help of D&S, it will save a lot of additional costs for the enterprise.

The company has launched "Match" to initiate exchanges in the construction and real estate industry. With the help of the platform, startups can network playfully with the latest technological solutions and corporates with many years of experience and industry access. The first step for successful cooperation is to be aware of what you are looking for and what you offer and to find suitable partners for innovations.

4.4 Sustainable Development Strategy

Designing environmentally compatible buildings with acceptable performance in terms of cost, materials, and energy efficiency is considered crucial for developing sustainable cities [8]. The engineering management industry urgently needs to accelerate the deployment of zero-carbon building technologies and practices to drive the goal of net zero. D&S proposed the "Zero Carbon" plan to support organizations, companies, municipalities and cities to zero carbon, and companies help develop an overall CO2 strategy, working on the principles of "measurement, reduction, offset". First, the current situation is analyzed, and the CO2 emissions are balanced. According to the "Greenhouse Gas Protocol", the focus is on direct emissions from combustion processes, indirect emissions from energy supplies, and all other indirect emissions from business activities. Then, examine and define the CO2 conservation potential and demonstrate economically feasible measures to reduce CO2, which simultaneously support enterprise implementation and monitoring and reporting of these measures. As part of its sustainability strategies, D&S balances carbon dioxide emissions from plant energy supplies with operating traffic. Each employee emits about 2.29 tons of carbon dioxide per year. Business travel and car fleets accounted for the largest share, with

more than 80%. The rest of the emissions are attributed to the energy operation of the office building, which implements the "zero carbon" principle well.

Beyond that, D&S noted that the circular economy provides an opportunity to reduce dependence on imports of important raw materials by recycling more materials. Advocate the systematic circular economy based on the principle of "cradle to cradle". This means that all materials and structures should be designed to make them completely biodegradable, or they can be reused with the same quality during technical recycling, with the same quality that is more common in the construction world. The circular economy aims to decouple the growth of the economy from the consumption of finite resources through strategies such as eliminating waste, circulating materials in use, and regenerating natural systems [9]. To achieve this goal, these components must be pollutant-free and capable of being separated into uniform material types. The design of the building should also facilitate this. The use of clean energy sources such as green hydrogen is advocated in communities or buildings. In addition to the electricity generated, the waste heat generated by the whole process can also be used for heating. This also means that the engineering management industry should advocate the use of biodegradable building materials, the use of green energy, and reduce energy consumption. Green buildings focus on environmental impacts by reducing energy use and water use and minimizing environmental interference from the building site.

D&S enterprises advocate the establishment of blue buildings and green buildings through innovation to achieve high returns, innovative processes, and methods, namely BIM technology and lean construction management, can be used in new buildings and existing buildings, such buildings are blue buildings, maintain innovation, efficiency, and cost-effective. Green building is one of the measures put forward to mitigate the significant impacts of the building stock on the environment, society, and economy. However, there is a lack of a systematic review of this large number of studies, which is critical for future endeavors [10]. D&S advocate green buildings focus on minimizing impacts on the environment through reductions in energy and water usage and minimizing environmental disturbances from the building site [11]. Reasonable use of natural and climate-friendly energy technology and economic use of resources are the standards of "future building", especially in terms of profitability balance and value development, which shows the importance of green building at present, and related enterprises will develop actively and healthily in the direction of green building.

ESG regulations also guide D&S and support clients in introducing and complying with them. The three letters ESG stand for environmental, social, governance. They refer to an economy that, in addition to economic success, strives for improvements in the areas of environmental, social, and governance. If ESG principles are observed, industrial and financial products geared toward sustainability are created on the market. The ESG model, with the combination of three factors, ESG, emerges as a typical ecosystem with the goal of business sustainable development. ESG is considered the basis for establishing national and global sustainable development goals [12].

5 Conclusion

This study mainly discusses the four key strategies proposed by The German engineering management consulting company D&S for project management, which guides the development direction of today's engineering management industry and helps the industry to transform itself, seize opportunities, and meet challenges quickly. The four strategies of digital, economical, sustainable, innovative, and sustainable development are interrelated, and the ultimate direction is to achieve sustainable success for the development of the engineering management industry. To sum up, all the strategies proposed by D&S also reflect the characteristics of diversification, which inspires engineering management companies to

consider problems comprehensively when carrying out project management. Social, economic, cultural, innovation, profit, and other factors should be included in the scope of the strategy. Project management with a larger goal and a more long-term vision to fully achieve sustainable, digital, innovative, and stable economic development.

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