

BIM as a catalyst of product diversification

S. Kalinichuk, A. Tomek

Abstract

One way to increase the effectiveness and economic stability of a construction company is product diversification. Industrial changes are suggested to be conducted concurrently with implementation of BIM technology. In these cases BIM serves as a basis for offering new services and brings a high level of benefit to construction practice. It becomes an actuality especially under conditions of severe competition when the possibility of attaining a work contract is reduced by increased focus.

Introduction

In a general sense diversification in the construction industry is a complex of actions connected to changes in production processes in order to expand a spectrum of offered works, services and goods, connected or otherwise with the primary activity as well.

When a construction company has chosen a specific direction of diversification, markets or market segments, the company has to decide its own positioning within it. There are two possible ways of taking into consideration a competitor's position.

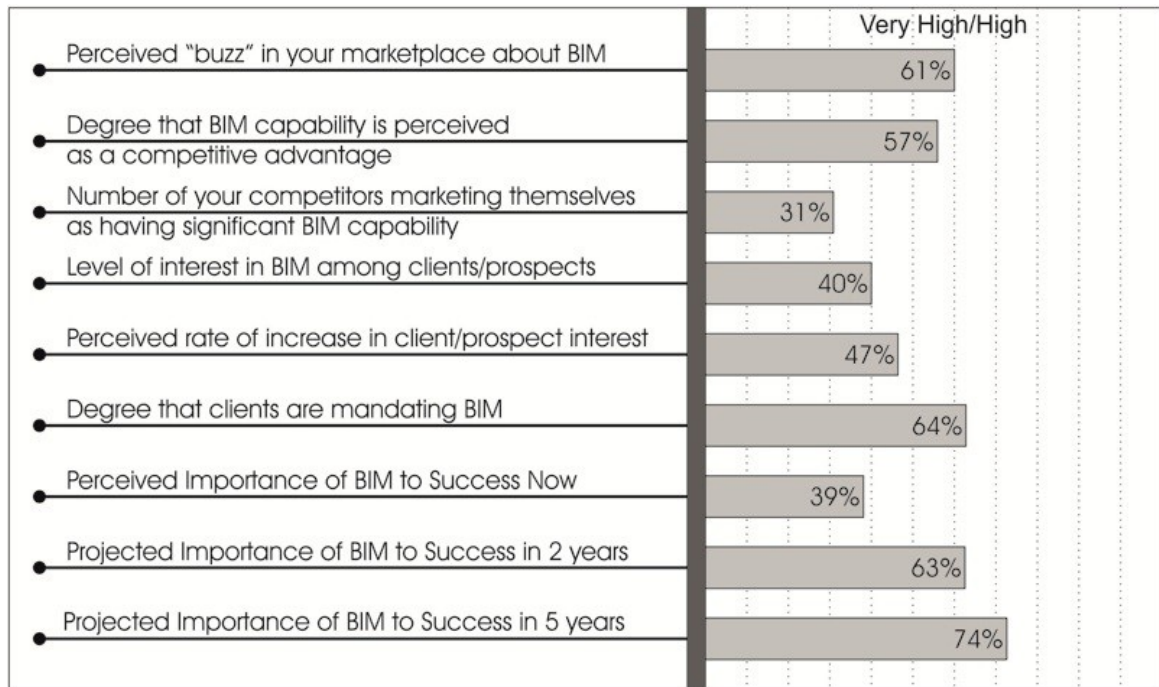
The first way is to take a competitive position among competitors who already operate in the market and to start a struggle for market share.

The second and the more perceptive way is to use such kind of material and/or technology which either does not exist in the market or has been poorly developed. The next step on this path is to offer products and/or services with a special difference made with special materials and/or technology and thereby winning consumers. Building Information Modeling (BIM) implementation operates precisely along this second path. It is valid because of the increasing demand for BIM based products coming from the Owners and for those companies that wish to take a firm competitive position it is necessary to have BIM skills. On the other hand construction companies can offer BIM technology as a marketing feature to a new clients who have yet to demand it.

What is stated above is substantiated in a report issued by McGraw-Hill Construction with the Society for Marketing Professional Services (SMPS) which reported that 98% of European BIM users indicate that BIM capability is having an impact on enabling their companies to win new work [1].

European BIM user viewpoints on the above mentioned subject is presented in Figure 1.

Figure 1: BIM user viewpoints

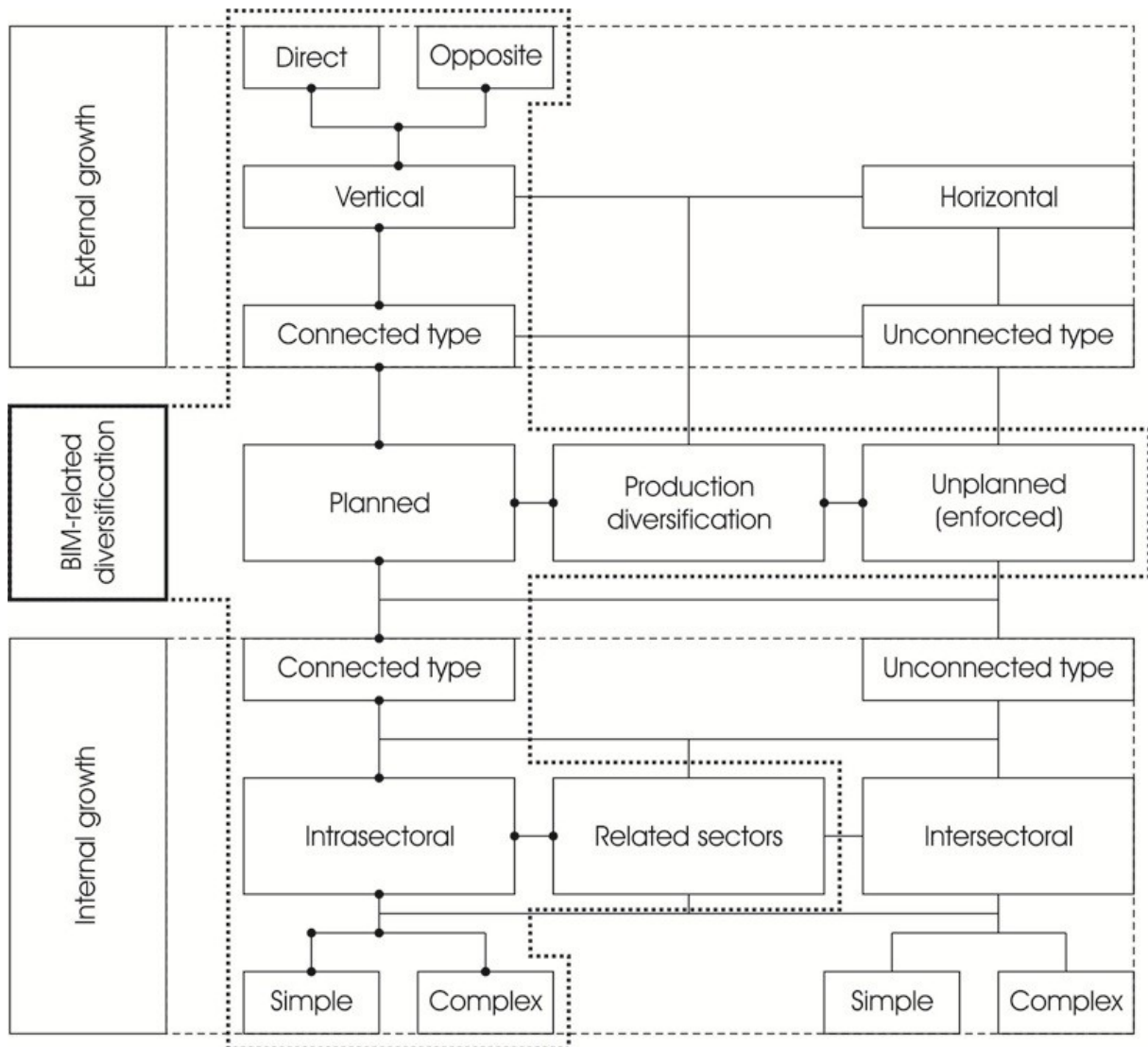


Source: McGraw-Hill Construction, 2009, adapted.

Classification of diversification processes in the construction industry

Intention to diversify products can be initiated for such reasons as necessity of capital injection, reducing of risks and costs of production, desire for optimization of delivery system, increasing economic competitiveness etc. BIM can help to solve assigned tasks by diversification and optimize system operation as a whole. In case of expansion of activity scope directly on the path production the production basis, skills and business connections will find industrial application. A classification of diversification processes in the construction industry is shown in Figure 2.

Figure 2: Classification of diversification processes in the construction industry



Source: I. S. Stepanov, 2007, adapted.

Factors that influence the effectiveness of diversification

The effectiveness of diversification is influenced by some factors and require management decisions seeking adaptation or to eliminate negative influence on them. Classification can significantly simplify detection of these factors. On the effectiveness of diversification there are impacts from three groups of factors: the macroeconomic, the sectoral and the in-house. The interrelationship between the influencing factors and the adoption of drivers for BIM implementation is shown in Table 1.

Table 1: The interrelationship between the influencing factors and the adoption of drivers for BIM implementation

		Factors	BIM adoption drivers
External environment	Macroeconomic	Government investment policy	Government support and/or requirements of BIM projects
		Government tax policy	Rate of tax reduce with project

			ecological compatibility	
		Government monetary policy	Highest return of investments as a result of improved project delivery	
		Inflation rate	Acceleration in the rates of ratio of capital turnover of basic capital as a result of reducing project realization	
	Sectoral	Quantities demanded/Quantities supplied	Growth of demand for BIM projects	
		Competitive rate between construction companies	Relatively low level of competition on BIM projects market	
		Amount of financing of construction works	Rising market of green building	
		Competitive rate between suppliers of products and services	Rising market of BIM building	
		Rate of market loading of products and services	Retention of existing and making new connections with suppliers	
	Internal environment	In-house	Availability of required capital	Reducing of cost of construction works
			Personnel skills level	Personnel skills growth as a result of BIM trainings
Innovation potential			Growth of innovation potential as a result of adoption new technologies	
Available informational technology			Renewal of hardware, software and Communication devices	
Organization structure			Positive effect as a result of reorganization of company structure	
Management methods			Creation of new management roles and project delivery methods	

Source: Own data.

Criteria for consideration of diversification direction

Construction companies conversion from a dedicated activity to diversification activities need to be considered for every separate case. Consideration should be based on a set of criteria which are derived from the nature of diversification goals. Final goals of diversification must be profit maximization, creation of new positions, growth of the capital utilization rate, and the winning of new market segments.

The deliberative process regarding diversification direction can be done as follows. A construction company considers that the best prospect is to produce products and services

based on BIM technology. BIM implementation addresses the purpose and available resources which is the production basis, personnel membership and skills that allows it to provide for production of the new products and services. At the same time there must be available financial resources and economic relationships capable of providing the required resources to organize production distribution.

Economic indicators of an existing construction company can represent a similar case. Data found in an article “The volume of initial investment for adopting BIM” [3], was added and presented in Table 2. These data sources show improvement of indicators that are typical for planned product diversification.

Table 2: The indicators of diversification efficiency

N	Indicators	Before diversification (actual)	After diversification (predictable)
1	Net income (CZK)	2.098.405	5.336.670
2	Current ratio	2,2	3,1
3	Value of assets (CZK)	1.410.000	1.410.000
4	Return on assets (ROA)	1,48	3,78
5	Staff numbers	19	19
6	Numbers of high-qualified staff	18	18
7	Average monthly salary of staff (CZK)	55.223	60.745
8	Average monthly salary of high-qualified staff (CZK)	56.567	62.223
9	Diversification related cost (CZK)	2.668.500	0

Source: Own calculations.

Strategic direction of diversification

When construction company assuming entry to the market of the goods and services produced on BIM technology, it should appreciate of existent and future market sizes. The strategic direction for the company development will be formed according to a received data.

The primary analysis of the operational environment and its potential possibilities was carried out by Morphological analysis and shown in Figure 3.

Figure 3: Morphological analysis

	Initiation	Design	Execution	Operation
Modeling/Contracting	Schematic Architectural Model Development	Architectural Model Development	Architectural Contracting Works	
	Schematic Structural Model Development	Structural Model Development	Structural Contracting Works	
	Schematic Air Systems Model Development	Air Systems Model Development	Air Systems Contracting Works	
	Schematic Electrical Model Development	Electrical Model Development	Electrical Contracting Works	
	Schematic Plumbing Model Development	Plumbing Model Development	Plumbing Contracting Works	
	Schematic Fire Protection Model Development	Fire Protection Model Development	Fire Protection Contracting Works	
			Manufacturing	
	Scheduling	Scheduling	Scheduling	Occupancy Procedure
	Schematic Model Coordination	Model Coordinating	Model Coordination	Facility Maintenance
	Initial BIM Estimating	BIM Estimating		Decommissioning Procedure
	Field Coordinating	Field Coordinating		
	Mobile Project Tracking	Mobile Project Tracking		
	Logistics	Logistics		
		Commissioning		
Coordinating/Analyzing				

Source: Own data.

In the considered direction of a diversification the preference that realization of the new goods and services of the construction company will occur in a growing market is exercised. Such type of organisation may also take full advantage of opportunities in its own or related industries, look for acquisition candidates, increase market share and/or allocate resources to products that have a definite competitive edge.

Conclusion

If forecast of the BIM direction of diversification is positive, as a further step the construction company should decide how to enter to the market using BIM technology. To define the potential buyers and their needs, this becomes possible only for each concrete set of goods and services. Since for market sharing into consumer groups is necessary to be guided by certain parameters because each group may request separate work, goods or services and, marketing complexes. However the received data in this article contains sufficient proof of the expediency of the product diversification based on BIM. This promotes to the expanding a range of products and services, the need of capital investment, reducing of risk and costs of production, optimize existing delivery system, increasing competitiveness etc.

Acknowledgment

Research described in the paper was supported by the Czech Technical University in Prague grant No. SGS12/011/OHK5/1T/11. The financial support is gratefully acknowledged.

References:

- [1] McGraw Hill Construction: *The Business Value of BIM in Europe*. 2009
<http://construction.com>
- [2] Ekonomika stroitelstva, red. I. S. Stepanov, Moskva: Uraj-Izdat, 2007, 620 s., ISBN 978-5-94879-660-4.
- [3] Kalinichuk, S., The volume of initial investment for adopting BIM, Rozpočtování a BIM [CD-ROM]. Praha: ČVUT, Fakulta stavební, Katedra ekonomiky a řízení ve stavebnictví, 2012, ISBN 978-80-01-05081-1.
- [4] Eastman, C., Teicholz, P., Sacks, R., Liston, K.: BIM handbook: a guide to building information modeling for owners, managers, designers, engineers and contractors (2nd. ed.). Hoboken, New Jersey, USA: John Wiley & Sons, Inc., 2011.
- [5] Forbes, L., Ahmed, S.: Modern construction: lean project delivery and integrated practices. Boca Raton, FL, USA: Taylor and Francis Group, LLC, 2011.
- [6] Succar, B.: "Building information modeling framework: A research and delivery foundation for industry stakeholders." *Automation in Construction*, 18, 2009, p. 357–375.
- [7] Czech Statistical Office. <http://www.czso.cz>

Ing. arch. Sergey Kalinichuk

Phone: (+420) 776 767 392

E-mail: sergey.kalinichuk@fsv.cvut.cz

Department of Economics and Management in Civil Engineering

Faculty of Civil Engineering

Czech Technical University in Prague

Thákurova 7, 166 29 Praha 6, Czech Republic

doc. Ing. Aleš Tomek, CSc.

Phone: (+420) 224 354 521

E-mail: tomek@fsv.cvut.cz

Department of Economics and Management in Civil Engineering

Faculty of Civil Engineering

Czech Technical University in Prague

Thákurova 7, 166 29 Praha 6, Czech Republic