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SWOT Analysis – Implementation of BIM Model in Facility Management

Matouš Kosina1\*, Petr Matějka2

1CTU in Prague, Faculty of Civil Engineering, Department of Construction Management and Economics, Thakurova 7, Prague, 166 29, Czech Republic, matous.kosina@fsv.cvut.cz

 1CTU in Prague, Faculty of Civil Engineering, Department of Construction Management and Economics, Thakurova 7, Prague, 166 29, Czech Republic

Abstract

The object of this paper is to figure out the possible reasons why BIM is not used in Facility management and also to find out if implementation of BIM in Facility management is advantageous. Facility management maintains all the components of the building including technologies and also tracking and optimizing the operational costs. Operational costs make over 70 % of the life cycle cost. BIM model can be a good source of input data for Facility management, because it gathers all the data from the construction phase.

Keywords

BIM, Facility management, COBie

Introduction

One of the most monitored indicators in construction business is Life cycle cost. These costs include the costs of energy, water supply, maintenance or renovation costs, and they make up over 70 % of the total life cycle costs. One way to effectively manage these costs is Facility management. Facility management is very important part of building administration, because one of its goals is to maintain a building in the best possible condition by taking care of maintenance of all the components including technologies and also tracking and optimizing the operational costs. Using information technologies, such as CMMS or CAFM systems make it easier to gather and administrate the operational data and analyze them. Some of the CAFM or CMMS systems support the integration of BIM models, which is a good source of input data.

Today, using BIM in construction processes is not very common in the Czech Republic. And if so, it is only used in construction phase. But BIM model can be very useful in the operating phase as well. During construction, all the data and information about particular components are gathered into the BIM model. BIM model represents digital database of physical and functional characteristics of the building. The data from the model can be later transformed and integrated into the CAFM or CMMS systems and used in the Facility management of the building [[1](#Red12)]. The problem is the standardization of the information base, because the data have to be in exact form to be used in CAFM systems. There are already some standardized systems for transforming the data from the construction phase into the operating phase, for example COBie *(Construction Operations Building information exchange)*. COBie is a standard that delivers gathered information about assets in unified spreadsheets.

 The advantages of implementing BIM in Facility management are [[2](#3)]:

* Unified information base
* Effective support for analyses
* Real-time data view
* Inventory of assets including location information
* Exact area management
* Reducing the number of failures of the equipment
* Improving work efficiency
* More efficient hand over for operating phase
* Possible connection with other systems (for example Building Automation System)

The goal of this paper is to figure out the possible reasons why BIM is not used in Facility management, and also to find out if the implementation of BIM in Facility management is advantageous.

Methodology

To fulfill the goals of this paper, SWOT analysis was used. The factors entering the analysis were defined and then evaluated. The factors were defined according to accessible information and facts (Table 1). The value of each factor was set according to possible impact of each factor. For Strengths and Opportunities the scale from 1 to 5 (5 - highest importance) was used and for Weaknesses and Threats the scale of -1 to -5 (-5 - highest importance). Then the weight of each factor was set, so the total in each category equals 1. The total value is a product of value and weight. The evaluation is in Table 2.

Strengths

Unified information base

* All the data are in the same format and in a predefined database.

Easy data handling

* The data transformed from the BIM model are available all the time and can be actualized.

Real-time data view

* If the data are actualized, it is possible to get the latest data at any moment and react.

Analysis making and evaluating

* Easy analysis making (for example energy consumption) and evaluating with use of BIM data.

Improving work efficiency – reducing costs

* The data are accessible from one interface, there is no need to use more resources.

Reducing the number of component failures

* BIM model contains the information about needed inspections and repairs. It helps in optimizing the plan of maintenance.

Weaknesses

Lack of input data during system implementation

* When the system is implemented on existing building where the data were not handled correctly and responsibly during construction phases.

Absence of BIM experts

* Using BIM is not common in the Czech Republic, so there are no experts experienced in implementing BIM in Facility management.

Higher incoming investment

* It is more costly to create BIM model than usual 2D documentation.

Opportunities

Evolving field, sharing outcomes

* Gathering data and its evaluation can bring new information and experience that can be used in other projects.

Fast reaction to energy price changes

* If current data is used and analysis is made, it is possible to optimize current system for changes energy prices.

Reducing life cycle costs

* Thanks to optimizing the energy consumption and maintenance plan, life cycle costs are reduced

Threats

Changes in legislation

* Possible changes in legislation can cause the need of changing current data administration

Unwillingness of the contractors to use BIM

* After crisis in construction business, contractors do not want to take the risk of low return of investment during BIM implementation

**Table** 1 **- Factors entering SWOT analysis (source: authors)**

|  |  |  |
| --- | --- | --- |
| **INTERNAL FACTORS** | **S - Strengths** | **W - Weaknesses** |
| Unified information base | Lack of input data during implementing the system |
| Easy data handling | Absence of the BIM experts |
| Real-time data view | Higher incoming investment |
| Analysis making and evaluating |  |
| Improving work efficiency - reducing costs |  |
| Reducing the number of failures of the components |  |
| **EXTERNAL FACTORS** | **O - Opportunities** | **T - Threats** |
| Evolving field, sharing outcomes | Changes in legislation |
| Fast reaction to energy price changes | Unwillingness of the contractors to use BIM |
| Data standardization |  |
| Reducing life cycle costs |  |

**Table** 2 **- Evaluation of SWOT analysis (source: authors)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Weight** | **Value** | **Total** |
| **Strengths** |
| Unified information base | 0,1 | 3 | 0,3 |
| Easy-to-handle data | 0,15 | 4 | 0,6 |
| Real-time data view | 0,25 | 5 | 1,25 |
| Analysis making and evaluating | 0,2 | 5 | 1 |
| Improving work efficiency - reducing costs | 0,15 | 3 | 0,45 |
| Reducing the number of component failures | 0,15 | 3 | 0,45 |
| *Total* | 1 |   | **4,05** |
| **Weaknesses** |
| Lack of input data during system implementation | 0,5 | -4 | -2 |
| Absence of BIM experts | 0,3 | -4 | -1,2 |
| Higher incoming investements | 0,2 | -3 | -0,6 |
| *Total* | 1 |   | **-3,8** |
| **Opportunities** |
| Evolving field, sharing outcomes | 0,1 | 3 | 0,3 |
| Possibility to react fast to energy price changes | 0,4 | 5 | 2 |
| Data standardization | 0,1 | 3 | 0,3 |
| Reducing life cycle costs | 0,4 | 5 | 2 |
| *Total* | 1 |   | **4,6** |
| **Threats** |
| Changes in legislation | 0,1 | -2 | -0,2 |
| Unwillingness of contractors to use BIM | 0,9 | -5 | -4,5 |
| *Total* | 1 |   | **-4,7** |

Results

After evaluating each factor itself, the total values were added up for each category and then for internal and external factors. The final values are in Table 3.

**Table** 3 **- Final values of SWOT analysis (source: authors)**

|  |  |
| --- | --- |
| Internal factors | 4,05 + (-3,8) = 0,25 |
| External factors | 4,6 + (-4,7) = -0,1 |
| **Total** | **0,25 + (-0,1) = 0,15** |

The results show that if we consider internal factors, the implementation of BIM in Facility management is advantageous, the total value of Strengths is higher than the total value of Weaknesses. If we consider the external factors, however, the implementation is risky. It is mainly caused by the unwillingness of the contractors to use BIM. The highest weight is given to this factor. The situation can be solved by specifications of selection process – documentation created in BIM may be demanded.

This paper could be suitably followed by a deeper analysis of the factors and their impact. For example a questionnaire for the contractors about their willingness to implement BIM in their processes. Another follow-up can be an analysis of the Facility management information systems (CAFM, CMMS systems) and their suitability with the BIM models.

References

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