The implementation of BIM in Slovakia – state of the art

Alojz Kopáčik, Ján Erdélyi and Tomáš Funtík (Slovakia)

Key words: BIM, implementation, Slovak BIM Association (BIMAS), survey, standardisation

SUMMARY

The present state in the field of BIM implementation in Slovakia will be presented and discussed. The paper brings information about the activities of the Slovak BIM Association (BIMAS), the role of which is the systematic implementation of BIM in Slovakia. Activities aimed at the dissemination of experiences for professionals, education activities in cooperation with STU in Bratislava and the first steps leading to standardisation of BIM in Slovakia are described and explained. In 2017 survey of BIM exploitation was performed in cooperation with the key professional organisations including the Chamber of Surveyors. The results of this survey will be presented also.

SUMMARY (optional summary in one other language in addition to English, e.g. your own language)

Článok prezentuje aktuálny stav implementácie BIM na Slovensku. Prináša informácie o aktivitách BIM Asociácie Slovensko, ktorého úlohou je systematická a sústavná implementácia BIM na Slovensku. Článok prináša informácie o aktivitách orientovaných na šírenie skúseností medzi odborníkmi, vzdelávanie v spolupráci s STU v Bratislave a na prvé kroky v oblasti štandardizácie procesu tvorby a implementácie BIM na Slovensku. V roku 2017 bol vykonaný prieskum, v spolupráci s profesionálnymi organizáciami včítane Komory geodetov a kartografov, orientovaný na využívanie BIM. Článok prináša výsledky tohto prieskumu.

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1. INTRODUCTION

The information technology is more and more present in the buildings life cycle, starting their design, realization and finally during their usage. This enable the intensive digitalisation of the all process and bring the possibility of their automation and effective management. The progress in this field bring the implementation of BIM, which enable the usage of the buildings virtual model during the all life cycle of the building. Actually, BIM involves all type of constructions, buildings, tunnels, bridges, power stations, etc.

2. INFORMATION MODEL OF THE CONSTRUCTION

The information model of the construction is in fact parametric object-oriented 3D data information model, which includes information about the structures, elements and they parameters. Includes all information connected with development and usage of the virtual data model, which is used not only for documentation of the architecture, but for simulation of the realization and operation of the new or renewed object. The final parametric model is the data reach, object oriented and intelligent representation of the object. The scope of BIM is not the model creation but the creation of through, reliable, simple changeable and completed information about the construction, as well as to make these accessible for all participants at the construction process (project). The base of BIM is the interoperability and parametric behaviour of their objects, due to change of any parameter generate aggregation file (matrix) of changes in all aggrieved model parameters and objects [1].

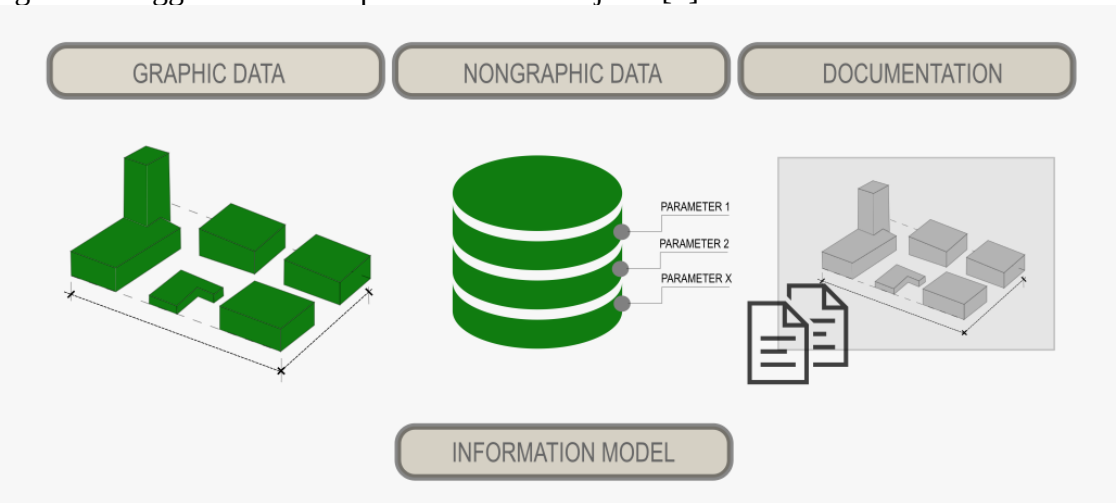

Fig.1 Information model structure

According data consists the model from 3 parts. It could be characterised as the combination graphic and non-graphic data (information) and documents connected with the project in case, when each data are implemented in one Common Data Environment (CDE). In some definitions are involved into the model structure the meta data also. To have the complete BIM, this information should be completed for each product, material and system used (designed) in the project. The detail of BIM is defined with their Level of Development (LOD) which describe the specification of the information model from the point of view their graphic and non-graphic part.

Graphic information could be in form of 2D or 3D data and are represented using their shape and structure in space. In most of cases build 3D model, their geometric representation (in native format of change), which allow the visual orientation, bring information about the position and context and define the relations between rooms, spaces and other elements in the model. Despite it is adjusted that the graphic representation (3D model), which includes the geometry represent 5% of information about the all project, is this part of the model is necessary to coordination (for example collision detection) and are used for connection and definition of system relations.

Non-graphic data are in direct connection (association) with the graphic model, are referenced with concrete model element. BIM enable set to any element of the construction information about physic and functional charactersitics and parameters – atributes. The advantage is, that these data are simple researchable and extracting, contribute to effective access to information. Completition of these parameters is today offten not suficient and without coordination. Only small part of producers has the information about their products in form of object libraries and accesable as support for the design process. Information, which should the model include could be defined by Level of Infromation (LOI). Using LOI is the detail of the non-graphic part of the model defined in each design phase. The required level of detail should include all information, which are defined in the agreement between the customer and the constructor.

LOD are defined for levels up to 500 by [2]:
LOD100 – the element is in the model represented by symbol or another general representation, which can´t fulfil the requirements for LOD200. The basic information about the model elements (price per elements, basic information about the capacity of VZT, etc.) could be derived from other model elements.
LOD200 – In detail of LOD200 could be the element represented general by graphic and which is connect with basic geometrical characteristics (value, shape, position, orientation), non-graphic information could be connected, also.
LOD300 – The element is represented as separate system, object or equipment defined by number, volume, shape, position and orientation and relation to other elements. It could be connected complementary information of non-graphic character.
LOD400 – Model elements are represented as separate system, object or equipment defined by number, volume, shape, position and orientation and relation to other elements. Are working out in high detail included their documentation for production with information necessary for

montage and installation. It could be connected complementary information of non-graphic character.
LOD500 – The model elements are defined with real volumes, shape, position and orientation. Information is valorised in-situ. It could be connected complementary information of non-graphic character.

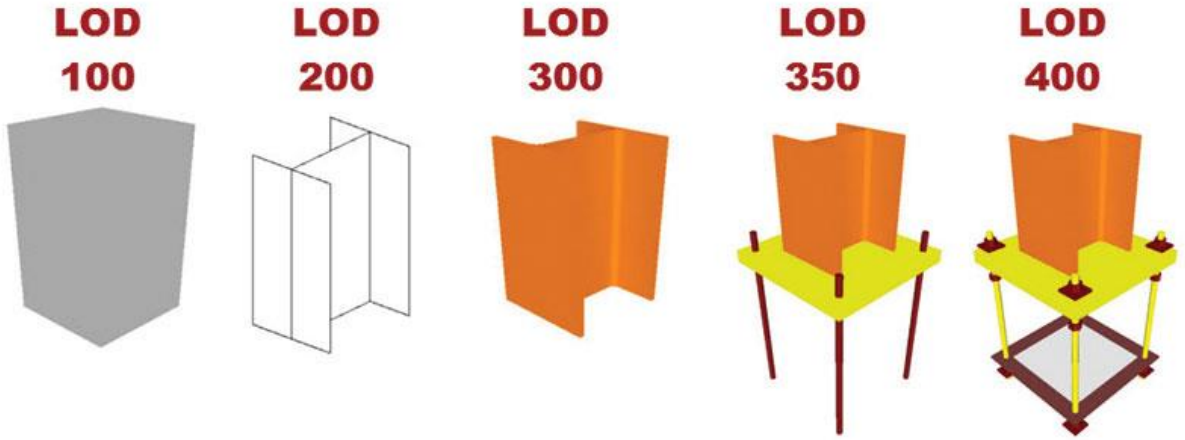

Fig.2 Different LOD of steel column

The last part of the information model builds documents. Not all characteristics and notices about the building is appropriate to save in the form of non-graphic data. For example manuals, specifications or official signed documents, agreements and certificates, which are documents about the time schedule of the project and not the project (construction) same, which are generally in form of pdf, jpg, etc. files. At this level of detail could be included for example video file with manual for maintenance. The documents should be good organised, marked and archived with access for all, who need this information.

In case of BIM of existing building, when we are speaking about object digitalisation, is often problematic to define the accuracy. It is not possible to define the accuracy with one number for the all model. It should be to make difference between the accuracy of measurement and the accuracy of the final model. It is a ambition to define the Level of Accuracy (LOA) today. With definition of LOA deals the for example the regulation of US Institute for Building Documentation – Specification version 2.0. There are defined different types of buildings (objects), different LOD, relative and absolute accuracy as well as the accuracy of measurement and the final model of different parts of BIM.

3. BIM IMPLEMENTATION

Many states discuss and prepare the implementation of BIM in projects supported by public sources from 2007. The EU parliament approved two new directions for Public Projects (EUPPD) in 2014. Base these documents BIM will be the strategic equipment for enhancing

transparency, velocity of public procurement and not least equipment for increasing the quality of the projects by effective management of costs. In the same year has the EU Commission authorised the EU BIM Task Group to create the document for BIM implementation in public sector.

The main goal of the EU BIM Task Group was, create the manual with common guides for public procurement as well as technical aspects of BIM usage for public sector. This was aimed, when the „*Handbook for the introduction of Building Information Modelling by the European Public Sector*" was published (www.eubim.eu).

Direct response to creation of the EU BIM Task Group in Slovakia was the establishment of BIM Association of Slovakia (BIMAS). BIMAS is non-governmental organisation, which activities are devoted to BIM implementation to all fields of civil engineering practice, starting design, realisation and maintenance during the all life cycle of the building. The main goal of BIMAS is propagation, popularisation and development of BIM usage and implementation in Slovakia.

3.1 Popularisation and education

BIMAS organize the "National BIM Conference" at yearly base, which targeting mainly the participants of the investment process. The conference goals are experience change at international level, education and training for professionals, promotion of projects uses BIM in Slovakia and abroad, targeting specifics of design and realization when BIM is used and build space for discussion of experts and professionals working in civil engineering construction.

In cooperation with the Faculty of Civil Engineering of the STU in Bratislava are organised conferences and workshops oriented to BIM, their implementation in Slaovakia. Some of them are focused to geodetic professionals, for example the series of conferences for engineering surveying (IPG), which conference IPG 2017 brings a half day course about BIM for 110 participants from Slovakia.

Fig.3 Participants of IPG 2017

Many activities of the association are oriented to education of the future generation of participants of the investment process, students of civil engineering faculties. Students are motivated to develop their knowledge and skills by participation at ”BIM CHALANGE” competition. The students have 5 hours to create the design of specific structure (building) in detail of documentation at LOD which is needed for building approval. The mission is defined at appropriate level for the student´s skills and the given time. During the competition are valuated mainly the skills in BIM usage of participants, parallel with acceptance of all standards. The aim of the competition is to present effective instruments for minimisation of manual work by design and creation of documentation. Due to short time, these could be presented in limited frame (amount) during the event.

Fig.4 BIM CHALANGE 2017 winner

The next activity of the association is the series of lessons devoted to BIM - BIM4FREE, which bring the students basic information about BIM principles completed by experiences from practice given by top experts of Slovak companies. These events are organised at all 3 civil engineering faculties in Slovakia at STU in Bratislava, TU Košice and ŽU Žilina.

Fig.5 BIM4FREE participants in Bratislava

At the Faculty of Civil Engineeing of the STU in Bratislava was implemented the subject BIM with 13 week duration course. Lectures are focused for development of information technology in building industry, guids and adventages of BIM usage in design, calculus, detection of colisions, object oriented cooperation of experts during the all life cycle of the building and the rolle of surveyors in this process.

3.2 Standardisation

Creation of standards, regulation and guidelines is the integral part of BIM implementation worldwide. Fast development was achieved in the field of standards as well as at international and European level. International activities are represented mainly by „ISO/TC 59 Building and civil engineering works“ and other TC of ISO (Fig. 6). There are many professional organisations whit activities in the field of BIM – mainly the Building SMART.

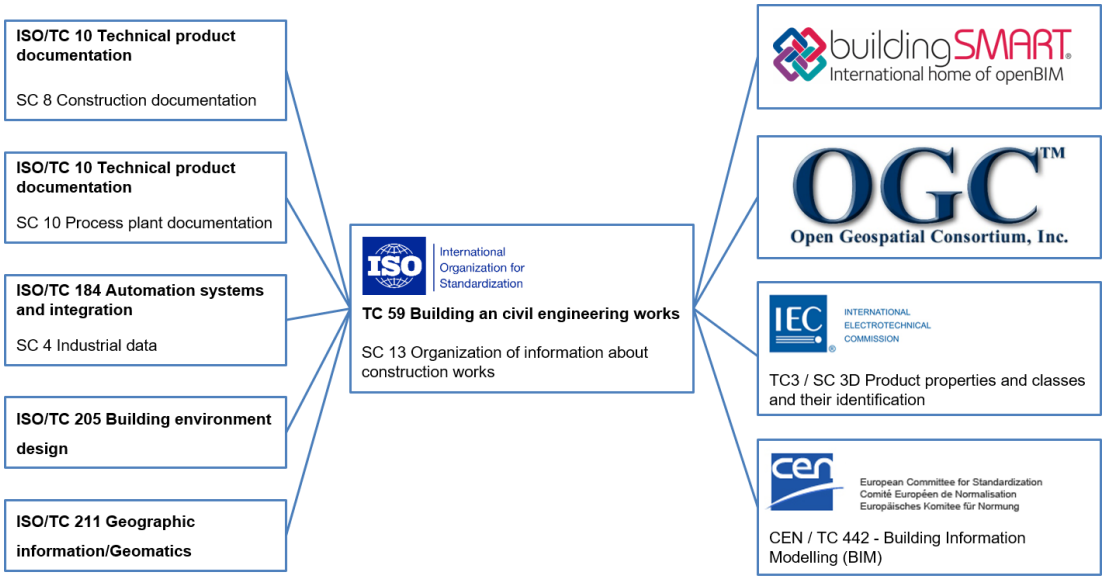

Fig.6 TCs and professional organisations for BIM

The standardisation in European area is managed by „CEN/TC 442 Building Information Modelling (BIM)“, whit 5 Working Groups – „WG 1 Strategy and Planning“, „WG 2 Exchange information“, „WG 3 Information Delivery Specification“, „WG 4 Support Data Dictionaries“ a „WG 5 Chairperson's Advisory Group“.

The implementation of European standards into the system of national standards is the task of member associations. In Slovakia this task belongs to the activity of the Slovak Office of Standards, Metrology and Testing, which has established the TC 121 BIM – Information Modelling of Buildings in 2017. It was decided to focus the activity of the TC 121 for implementation of EU and international standards and not for creation of national standards.

During the first year of activity of the TC for BIM were implemented standards STN EN ISO 16739, STN EN ISO 29481-2 and STN EN ISO 12006-3. In preparation are standards:

- **prEN ISO 19650-1** Organization of information about construction works - Information management using building information modelling -- Part 1: Concepts and principles,
- **prEN ISO 19650-2** Organization of information about construction works - Information management using building information modelling -- Part 2: Delivery phase of assets.

4. PRESENT STAY OF THE BIM USAGE IN SLOVAKIA

In 2017 was realised measurement between professionals, whit the scope to determine the level of usage of BIM in Slovakia. The measure was made in cooperation of professional bodies – the Slovak Chamber of Civil Engineers, the Slovak Chamber of Architects, the Chamber of Surveyors and Cartographers, Association of Slovak Enterprisers in Civil Engineering and publishing house EUROSTAV. The query was oriented to working field of the attendance, skills with BIM usage, identification of their motivation to use BIM. The attending persons was explaining the time needed for BIM implementation in their companies and the barriers which they meet in BIM usage at different projects. The measure attended 2327 persons from these were 199 surveyors. Next are presented some results using graphs, where the first number represent the percentage from all attendance and the second percentage calculated from the surveyors attended the measure.

The question about the BIM usage was this answering up to 50% of attendants negative, in the group of surveyors it achieved 60% (Fig.7). BIM is in Slovakia used mainly in the phase of design and preparation, only, which explain the higher level of negative response. Positive is the interest of more than 30% of professionals for this topic, if they don´t use BIM today.

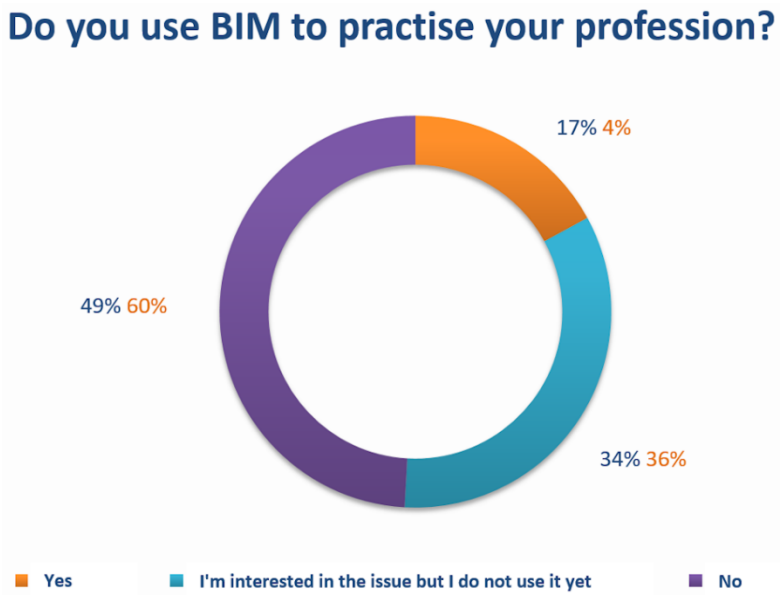

Fig.7 Usage of BIM

The hlaf of attendants is the meaning, that BIM will be implemented in a horison of 5 years. Should be sad, that today is missing any legislation, which could motivate the professional for BIM usage, in Slovakia. Base this could be expected the usage of BIM next 5 years at the ”voluntary” base, only. Higher motivation could be seen by private sector, which is interrested to save costs by the realisation of large projects. Experiences abroad underline the fact, the implementation of BIM needs ca 5 year period.

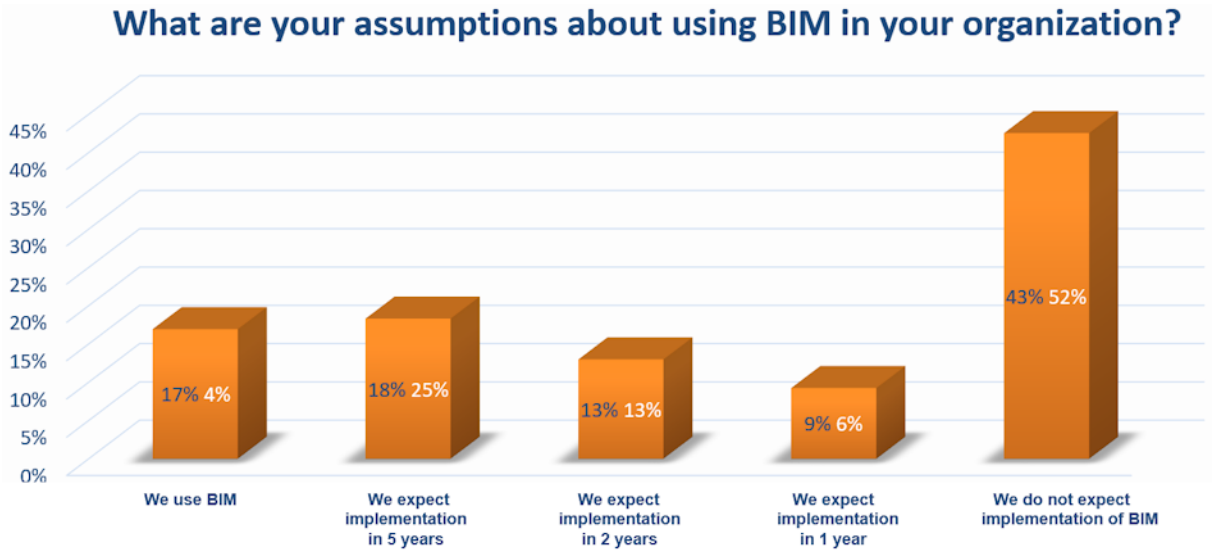

Fig.8 Expected time to implement BIM

As the main barriers of BIM usage, marked by the attendants of the measure, are missing standards, low number of experts in this field, small number of seminars and low interest of investors (Fig.9). Positive is, only one thirds of attendants is the meaning, the price of BIM is to high. All these negatives are in the main focus of BIMAS, which existence is a good starting position for the future development, but the acceleration of all processes is expected mainly in the state sector. The active cooperation of all subjects including the TC 121 will be helpful for the future implementation of BIM rules in Slovakia.

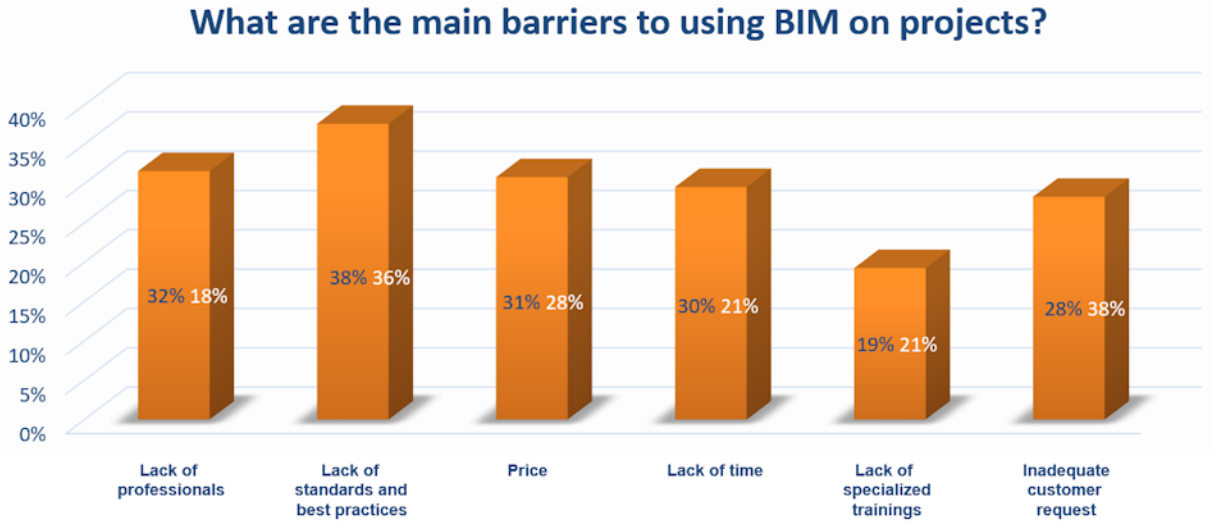

Fig.9 Barriers of BIM usage

5. CONCLUSION

Most of EU countries have in the field of BIM implementation a similar story. The process was started by enthusiast and innovators, private companies, which take a big effort to assure state, to take account this and be paying attention to this topic. The support of European Commission, as well as the all Europe is remarkable, today. There are many new projects, which results are helpful in implementation of BIM into the daily practice at different level and point of the construction industry, in Slovakia. There is the possibility to use the results and experiences of EU states and manage the own way based on materials and documents prepared abroad. It could be the way whit smaller effort expected, but should take account, it will be not simple.

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BIOGRAPHICAL NOTES

Alojz Kopáčik is Professor at the Slovak University of Technology. Lectures from Geodesy for CE, the Underground and Mine Surveying and Engineering Surveying, Measurement systems in engineering surveying and Surveying for Civil Engineering (in English). Past Chair of FIG C6, member of different WG's of FIG and IAG. Chairman of the TC 89 -

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