

## **IDENTIFICATION AND DEVELOPMENT OF BUILDING MANAGEMENT SYSTEM CHARACTERISTICS IN LATVIA**

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**Abstract.** Building management involves both a certain amount of subject knowledge and specific actions that in the case of management are not limited only to building conservation, but are also associated with effective measures. Implementing a building management process, a customer should be sure that the service provided corresponds to a certain standard, certain level of professional competence. By signing an agreement with a professional and competent building manager, it is expected that a high-quality and professional service will be provided according to modern technological solutions. The topicality of the research is determined by the fact that over the past few years, technological advances in the field of building management call for a high level of professional competence of market players. The goal of the article is to study the scientific articles on building management characteristics and make their comparison with the study programs in the field of real estate management of the Republic of Latvia and evaluate their compliance with contemporary requirements. The present research examines scientists' experience and opinion expressed in the international environment, as well as the recent trends in the building management system, distinguishing the characteristic categories. Results of the research have proven that along with increasing globalisation and information technology development, the property management industry shows a tendency to provide a management system using the building control system and information technologies. Within the framework of the research, scientific research methods – scientific literature review, analysis, synthesis and logical constructive methods have been used.

**Keywords:** Residential housing, property management, real estate management, building maintenance, building management systems.

**Jel Code:** J24; J44

### **Introduction**

Building maintenance is a worldwide issue and it is especially used as a timely corrective measure for damage and structural concerns; which, if not properly taken care of, could undermine the reputation and safety of the structure (Ines F.C., Jorge B., 2010). The principal goal of maintenance is to protect a building from damage (Othuman Mydin M.A, 2014) carried out in reaction to the worsening of a unit as designated by a change in its condition or performance (Pintelon, L. ETC., 2006).

In recent years, an increasing number of the so-called "smart" or "intelligent" houses have appeared on the real estate market. It should be noted that the management of these buildings is associated with in-depth knowledge of the latest technologies. Maintenance and management of these technologies makes it necessary to raise the level of competence of stakeholders involved in the management process.

This research examines scientists' experience and opinion expressed in the international

environment, as well as the recent trend in the building management system, distinguishing the characteristic categories.

The goal of the article is to study the scientific articles on building management characteristics and make their comparison with the Occupational Standard of the Republic of Latvia and evaluate its compliance with contemporary requirements. The main tasks are: to explore scientific literature written in the period from 1997 to 2015; to determine categories of management characteristics; to clarify building management main principles in Latvia; to compare categories identified during research with Latvian study programmes in the field of real estate management; to evaluate and analyse research results, to draw conclusions.

The key questions: What features characterise the building management and maintenance process? What trends are observed? in the building management system development? Does the existing Occupational Standard of Manager

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meet the development level of modern building management system?

**Hypothesis:** With increasing globalisation and information technology development, property management industry shows a tendency to provide a management system using the automated control system and monitoring.

Within the framework of the research, scientific research methods – literature review, analysis, synthesis and logical constructive methods – have been used. During the research, articles in the period from 1997 to 2015 have been studied.

### **Building Management System Characteristics**

High quality maintenance management is urgently needed to increase the life cycle of the property and to minimise unexpected breakdown or deterioration (Mukelas M.F.M. et al., 2012).

Real estate manager works at companies, national and international organisations which operate in the fields related to real estate administration and management.

Buildings require maintenance to ensure optimal performance over their life cycle (Lateef, Abdul, O. Et al., 2009). To achieve this goal, it is necessary to effectively manage the labour factor using sophisticated information technology and good organisational skills (Li Y., Liu F., 2010), as well as operating a variety of engineering systems.

The modern manager will have to rely as much on knowledge from managerial and social sciences as on the traditional knowledge base of building construction techniques and deterioration (Mukelas M.F.M., et al., 2012). High-quality service is the basis of well-educated skilled workers' cycle (Lateef, Abdul, O. et al., 2009).

Due to the complex nature of building infrastructure and heterogeneity of its component systems and assets (Suzuki L.R., 2014), persons who are engaged in the maintenance of buildings should be able to operate in different directions:

safety management, laws, rules, regulations (Deng H., et al., 2008), monitoring and scheduled inspection, construction and repair, engineering maintenance, energy efficiency and financial calculations.

In the scientific literature, the field of building management is associated with a wide range of diverse characteristics and factors. For instance, the Swedish researcher has determined the following specific maintenance objectives: to execute daily housekeeping and cleaning to sustain an appropriately aesthetically pleasing facility, to swiftly react and repair minor discrepancies in the facility, to expand and frequently perform systematically scheduled maintenance checks to avoid untimely failure of the facility and its systems as well as its components, to complete major repairs based on the lowest possible life cycle cost (Imad A., 2009).

In addition, J. Lin, B. Ghodrati, U. Kumar indicate that profound knowledge of the work details and work plan is important for both maintenance engineers at the operational level to perform daily work better and for maintenance managers (at higher management level) to make optimum decisions. At each plant, there can be high-quality management systems, including Quality Management System (QMS), Occupation Health Safety Management System (OHSMS) and Environment Management System (EMS) (Lin J., et al., 2011).

The building management system is also related to repair and restoration work. It is also described in the majority of scientific articles.

The need to rebuild the building justifies the conclusion that each year building technical and normal wear and tear increases, and the building sector is aging (Geipele S., Auzins A., 2015).

Real estate management and construction business are becoming the trend of globalisation especially today (Chen X., et al., 2010). Modern management is increasingly entering new building materials, technical solutions as well as

information infrastructure. As a result, over the past ten years the development is characterised by the so-called "smart" or "intelligent" buildings.

Building information management systems have started to leverage new kinds of digital information infrastructures that integrate activities related to design, budgeting, scheduling, analysis, material management and human resources (Sylvain K., et al., 2014). These systems are based on the flexible communication infrastructure that provides availability of data in different aspects (Vanlande R., et al., 2008).

Management process cannot be carried out without any costs. It means that the process is characterised by management estimate development, construction estimate development, comparison of estimates in compliance with the market prices etc.

According to the researchers from Saudi Arabia, the main characteristics of management process are: to recognise, design and undertake enhancement projects to diminish and curtail the entire building's operating and maintenance costs, to operate the facility's utilities in the most cost-effective way while providing required dependability (Al-Khatam, J.A., 2003).

Management process includes management and construction calculation, financial reports, customer commitment, environmental health and safety ratings (Karodia, A.M., Soni, P., 2007), controlling functions as well as many other applications.

Establishing suitable maintenance strategies is based on the knowledge of the most frequent irregularities, the analysis of the respective causes (Sampaio A.Z., Augusto G, 2015), planning, directing, organising, controlling activities (Mukelas M.F.M., et al., 2012) and the study of the most adequate repair methodologies.

### Research and Discussion

To ensure the validity and reliability of the data, the authors of the research have used 57

different articles written in the period from 1997 to 2015 by the researchers from different countries, for example, the USA, Great Britain, Germany, China, Malaysia, Saudi Arabia, Sweden, Lithuania, Latvia etc.

After summarising the data, categories have also been divided into 3 different subcategories by their frequency: high frequency, average frequency and low frequency (Table 1).

Table 1

#### Summary of categories

No.	Frequency	Category and Number of appearances
1	High frequency	Monitoring and scheduled inspection, 30
2	High frequency	Maintenance operations, 29
3	High frequency	Planning and directing, 28
4	High frequency	Construction and repair, 18
5	Average frequency	Building information management software, 12
6	Average frequency	Maintenance and management cost, 11
7	Low frequency	Energy efficiency, 9
8	Low frequency	Professional knowledge, 9
9	Low frequency	Sophisticated technology, 8
10	Low frequency	Legislation and technical standards, 6
11	Low frequency	Decision making, 4

**Source: author's calculations based on research of scientific literature review**

As a result of the study, 11 categories have been distinguished (see Table 1). Consequently, it has been concluded that 6 categories appeared more than 10 times. The data have shown that the main categories related to the building management system are:

- 1) monitoring and scheduled inspection;
- 2) maintenance operations;
- 3) planning and directing;
- 4) construction and repair;
- 5) building information management software;
- 6) maintenance and management costs.

The research results show (Table 1) that, with regard to the building management system, the category "Monitoring and scheduled inspection" is most commonly used (**30**). This indicates that in terms of the system the first category is exactly

the building monitoring and management system, which has become particularly topical in recent years, when communication has developed and there is a possibility to develop computerised building monitoring systems. The application of these systems is highly important in the non-residential sector.

The category "Maintenance operations" (29) has been used the same number of times in the overall analysis. It includes all the activities related to the building technical repair and maintenance, which is the primary works to ensure the successful building life cycle and functionality.

The category "Planning and directing" (29) indicates that the system is also based on the management system, without which the two above-mentioned categories will not function.

The category "Construction and repair" (18) is used less frequently. This indicates that the system is more associated with the implementation and monitoring functions and less with the functions related to restoration.

The category "Building information management software" (12) is associated with the development of programming in the field of building management. This category has also become the tendency over the past decade and is increasingly used as a system component.

The category "Maintenance and management cost" (11) – under this category there are several subcategories because the costs are related to development, administration, management and restoration.

Each of these categories includes a large variety of detailed features, which together form one large category (Table 2).

In Latvia, the principles of property management are determined in the Law on Administration of Residential Houses. They are as follows: continuity of the management process, selection of optimal management working methods, including optimal costing, providing service quality and building sustainability, the

preclusion of invasion of the safety of an individual during the administrative process and maintenance of environment quality during the management process (Law on Administration of Residential Houses, 2010).

Table 2

**Categories and subcategories of the building management system**

No.	Category	Example (subcategories)
1	Monitoring and scheduled inspection	Monitoring, Controlling Diagnosis, Climate control Identifying failures and damage Conditions and temperature
2	Maintenance operations	Protection, Cleaning services Housekeeping execution Identifying and eliminating the waste Operation of heating systems Operation of cooling systems Operation of mechanical systems Operation of electrical systems Maintenance equipment Ventilation, Assessment Air conditioning equipment Physical condition of a building
3	Planning and directing	Carried out as a result of knowledge Resource allocation Scheduling, Evaluation Provision of communication Safety, Management Quality, Administrative actions Enhancing the productivity Supervision actions, Service
4	Construction and repair	Construction, Renovation Reconstruction, Repair Design, Maintenance materials Material properties
5	Building information management software	Information infrastructure Information technology support Information availability
6	Maintenance and management cost	Maintenance costs Minimisation of the overall costs Development costs, Budgeting Repair costs, Construction costs

**Source: author's calculations based on research of scientific literature review**

According to the Occupational Standard of Real Estate Manager, the real estate manager performs duties related to the management of buildings technological and procedural requirements determined in technical documentation, implement renovation works, demonstrates a profound knowledge of construction management, construction material technology and building operations, selects the most effective real estate management techniques based on the forecasts concerning the

development trends in the real estate market, evaluation results of technological processes, administration engineering calculations and knowledge and apply of modern information technology. (Occupational Standard, 2017).

Evaluating the principles of the Law on Administration of Residential Houses, as well as the Occupational Standard of the Republic of Latvia, the following categories have been identified: *maintenance operations, planning and directing, as well as maintenance, management costs and building information management software.*

To implement real estate management pursuant to legislative framework, good practice management and quality, innovative solutions need a system, which arranges all the processes according to their characteristics, core values, criteria and functions.

The building management system is a set of interrelated processes that make up a single entity oriented to the achievement of a common goal. The sustainable development of the property depends on the organisation of the building management system.

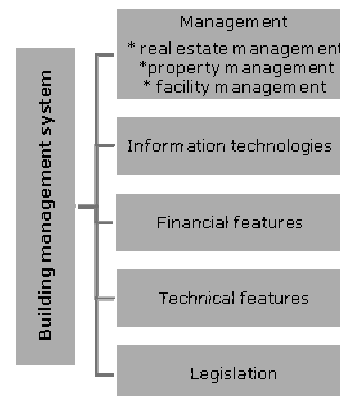
Building management is a complex approach to the proper maintenance of building, engineering system and functionally necessary plot, as well as the provision of services with the aim to benefit from the property and ensure its life cycle extension. To organise the successful management of a residential building, it is necessary to take into account the main management functions and their characteristic features.

By analysing all the features and reviewing the eleven distinguished categories, six broad categories have been identified, among which there is also a mutual synergy.

As a result of the analysis, it has been concluded that dividing all the characteristics into six broad categories, the only category, which is least mentioned (less than 10), is "Legislation". It can be concluded that in the scientific literature it

is considered that the main characteristics of the "building management system" are the ones arising from the execution and implementation, where any of these activities are based on legislation and technical standards that are met, implementing the system as a whole.

As a result of the study, summarising all the characteristics, the authors have distinguished only 5 categories (Fig. 1). In addition, the category "Management" could be subdivided into real estate management, property management and facility management.



Source: author's calculations based on research

Fig. 1. Categories of building management system

Within the framework of the study, the distinguished categories and subcategories have been compared with the curricula of Bachelor study and Master level.

Upon successful completion of the study programme, the graduates who have obtained the Qualification of Real Estate Manager are able: to perform real estate management in accordance with the technological and procedural aspects stipulated in the technical documentation, to analyse the planning and execution of real estate management, renovation works, to demonstrate a profound knowledge of construction management, construction material technology and building operations, to select the most effective real estate management techniques based on the results of evaluation of technological processes and administration engineering calculations, to conduct develop new

forms and methods of real estate management (Riga Technical University, 2017).

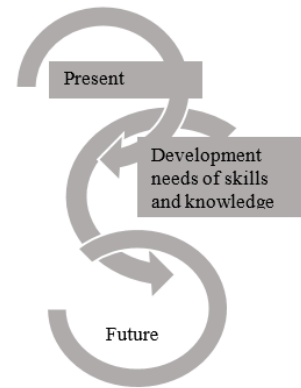
Thus, it can be concluded that gaining knowledge and developing skills in the given programme, students acquire both technological and management skills as well as gain insight into the latest technologies and their implementation in the industry that correspond to building management system categories demonstrated in Fig. 1.

Having obtained the relevant education, persons can work at state budgetary institutions, companies, non-governmental, international and national organisations, which operate in the field of real estate.

There is a key question whether the current programmes fully ensure the appropriate acquisition of the latest directions, especially in technology. The successful acquisition of study courses in real estate management determines the strengths and skills of real estate manager, working in the market, or, in turn, a lack of competences can lead to insufficient competitiveness among similar companies. Consequently, a dilemma appears – what skills and knowledge are necessary to be developed at present and what competences should already be planned to be acquired in the future. One of the solutions is to assess the use and development of skills and knowledge from the company's strategic development perspective. Thus, it can be concluded that in order to determine competence development priorities (Fig. 3), it is necessary to follow the changes taking place in building maintenance, management and construction.

In addition, to enable specialists to develop their skills and knowledge, there is a need for cooperation between companies operating in the field of real estate management and higher education institutions, which implement study programmes in real estate management. Vision of the future depends on the cooperation among institutions such as universities, managers'

associations, property owners' associations, construction associations, employers' associations etc. The development of knowledge and skills is part of the specialist's value scales that creates preconditions for employment potential in the future.



Source: author's based on research

Fig. 3. **Priorities of skills and knowledge development**

### Conclusion

- 1) Within the research, the categories have been identified that indicate that the entire management process involves a range of categories with different characteristics, but the prevailing ones are the categories that have become increasingly important in recent years – monitoring associated with the development of building control system and information technologies.
- 2) By evaluating study courses of the study programme, the authors conclude that they include all the categories distinguished within the research. It proves that the study programme complies with the modern requirements, taking into account globalisation and continuous development in the field of information technology.
- 3) Within the framework of the study, the hypothesis has been proven.
- 4) To ensure the successful sustainability of the building life cycle, it is necessary to take building maintenance measures such as technical and sanitary maintenance and improvement works (cleaning of premises and territory, garbage disposal, deratization and

insect control), maintenance of all real estate structures, including buildings, their own structures as well as existing and related engineering systems (maintenance of water supply, sewerage and heat supply systems, ventilation and air conditioning systems, power supply, low-voltage systems), BMS (building management system) maintenance and monitoring as well as improvement and development of buildings and their substantial parts (repair, reconstruction, renovation) in such a way that these structures and systems meet the requirements specified in building project documents and do not become dangerous either to users, third parties, or the environment.

- 5) Proper management is cost optimisation, maintaining or improving the value of the property. In administering or managing the property, one should recon with problems and costs; otherwise, the property can lose not only the value, but also can technically deteriorate to such an extent that full renovation is required. To ensure that everything mentioned above would be made in compliance with appropriate technical standards, customer requirements and legislative framework, it is necessary to regularly control and monitor the implementation of these measures, which means that their execution is ensured according to modern information technology solutions.

- 6) Specialists consider that the building life cycle is the time period starting from the moment when a building is constructed till the moment when it is demolished. Life cycle performance is both economic and ecological. Taking into account the economic aspects, the important issue is the costs necessary for building construction as well as management and restoration throughout the building life cycle. From the ecological point of view, the effect of building and its maintenance on environment is important.
- 7) By modelling the development of operation of real estate management company, it is recommended to consider its present operation in the management market and future prospects, including the resulting changes in technology, communication and management sectors.
- 8) The collected data are submitted for evaluation and approbation to the Association of Management and Administration of Latvian Housing in order to develop and improve the construction management system.
- 9) The obtained results will be used in future studies of the authors to identify the opportunities for raising and strengthening competences in the field of real estate management, which is related to the harmonisation of environment devoting particular attention to harmonisation of housing policy in the country.

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