

Idea of an Intelligent Building - Development Prospects

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An ever-increasing number of offices as also residential buildings are being realised by designers and investors in accordance with the concept of an intelligent building. Houses of the new generation are being constructed. This is possible thanks to dynamic progress in the development of computer and microprocessor engineering techniques. Putting into reality the idea of the 'intelligent building' will become one of the most interesting assignments of Polish building industry in the rapidly approaching XXI century.

The term 'intelligent building' first appeared in the eighties. The idea behind this conception is aspiring to create a friendly, work supporting, effective environment. The revolution in telecommunications and information technology along with change in the standards of office work, have caused computer networks and modem systems of automation and protection, to invade buildings.

From the technical point of view, an intelligent building is an object in which all the subsystems co-operate with each other, forming a friendly environment for man. For users of an intelligent building, the most important issue is realisation of the following aims: object management which includes both control of human resources and automation systems in the building and also efficient management of the building space in such a way that the costs of its utilisation are minimised. The possibility of optional installation of modern systems and equipment should be facilitated by the architecture itself. Therefore, the specifics of all the building elements should be taken into account right at the designing stage.

The following features characterise an intelligent building: integration of telecommunication systems in the building, central management and supervision system and utilisation of structural cabling as the carrier of signals controlling most of the systems in the building. Presently, there is no building in Poland that could be characterised by the three features mentioned.

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Introduction

The term 'intelligent building' first appeared in the eighties, although the idea itself was conceived much earlier. Intelligent buildings appear in the stories and novels of science fiction writers Ray Bradbury (1988), Arthur C. Clark and also Stanislaw Lem as early as in the fifties. The basic premise of this conception is aspiring to create a friendly, work-supporting, effective environment. Originally, the concept of the intelligent building only covered the alarm, lighting and air-conditioning systems. The revolution in telecommunications and information technology along with change in the standards of office work, have caused computer networks and modern systems of automation and protection, to invade buildings.

Dynamic development makes the most advanced technologies available to an ever increasing group of customers. Costs of constructing and outfitting a modern building are decreasing with respect to the advantages that flow from utilisation of such an object. Much has changed in architecture, interior decoration, cabling, automation and furnishing of offices from the moment the idea of the intelligent building originated. And all the indicators suggest that the rate at which newer designs keep emerging in the market will continue in future as well.

An intelligent building adapts perfectly to modern technologies by featuring an uncommonly flexible and open structure, since the basic characteristic of a modern building is its 'capacity' to adapt to new technical designs without the necessity of reorganising and modifying its intrinsic structures.

The building space – its flexibility and convertibility – is one of the basic characteristics of an intelligent building. Advanced technology in building industry enables designing and executing construction systems conforming to the principle of the open plan. Technology here performs a subordinate role to the idea. Selection of the construction system has basic significance for the possibility of performing rapid and relatively inexpensive functional changes in the building. Large-space office buildings enable

unrestricted configuration of workplaces. Open plan – method of designing the functions and construction, consisting in releasing space from intermediate supports and allowing unrestricted interior arrangement, appeared together with modernism during the period of fascination with technology. The first conceptions of 'open plans' originated then. Open interiors enabling flexible utilisation of space are serviced by means of installation systems accommodated under the floor or above the ceiling.

Historically, the 'open plan' concept surfaced even earlier. Already during the last twenty years of XIX century, D. Burnham, Roche, Holabird and other representatives of the famous 'Chicago School' removed interior walls leaving only the network of the construction skeleton.

The architectonic trend called High-Tech that emerged at the beginning of the seventies grew from the search for optimum energy balance of buildings being constructed and the ecological awareness of society. High-Tech attempted and still attempts to find solutions for problems of modern architecture.

The Pompidou Center established in the year 1977, is, it could be argued, the first high-tech realisation in the world. The architects Richard Rogers and Renzo Piano applied the open plan concept in a public utility object, for the first time. In the same year, Swindon Norman Foster builds the Sainsbury's Center of Visual Arts in Great Britain, one of the first intelligent buildings constructed worldwide.

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Integration

Integration concerns, first of all, the following systems: automation of ventilation and air-conditioning,

automation of heating system, automation of comfort in the premises, electric power systems, lighting control, fire detection and signalling system, access control, signalling of burglary and robbery, closed-circuit television surveillance, etc. The concept of integrating systems consists in combining the management of functions which, up to the present, were realised separately. An integrated system is the combination of at least two different types of systems. Linking between the individual systems is realised by means of a communications bus and a common transmission protocol that provides full information interchangeability between the various systems.

A very important role in intelligent buildings is fulfilled by integrated signalling systems. They detect all kinds of hazards and events that could negatively affect the processes occurring in the building. Included within the framework of signalling systems are, among others: protection systems against fire, alarm systems and other systems protecting life and property.

Signalling systems are also used in conjunction with other subsystems such as: industrial television, heating and ventilation systems, electric power supply, lighting and sound amplification systems. Through integration of all these elements, it is possible to obtain a complete picture of the state of the whole building. Extensive use of structural cabling not only for transmission of information data and voice but also as the carrier of control signals of most of the systems in the building, enables maintaining a single standard of cabling infrastructure in the whole building. This is conducive to lowering of costs both at the investment stage as also during utilisation. Adequate flexibility in designing along with excess structural cabling ensures immense possibilities in adapting the system to changing requirements of users and to technological progress.

The concept of an 'intelligent building' comprises issues that can be concentrated into seven subject groups:

I. Designing and construction of intelligent buildings in "unfinished state":

1. designing with attention to functionality and flexibility,
2. intelligent building infrastructure,
3. designing the building construction taking into consideration the requirements of handicapped persons,

II Parameters of intelligent buildings:

1. definitions of the parameters,
2. methods of measuring and estimating the parameters characterising intelligent buildings,
3. simulating and modelling the functions realised,
4. requirements set for intelligent buildings by various groups of users.

III. Elements, systems and services in intelligent buildings:

1. internal transport systems (lifts, pneumatic post, etc.),
2. air-conditioning, heating, ventilation and air treatment and filtering systems,
3. non-conventional and ecological sources of energy and electric supply systems,
4. lighting and lighting control,
5. direct digital control systems,
6. safety and protection,
7. integrated systems and integration of services in intelligent buildings,
8. telecommunications and teleinformation systems,
9. intelligent building management systems.

IV. Utilisation of intelligent buildings:

1. maintenance and preservation,
2. services and facilities rendered.

V. Intelligent office:

1. ergonomics,

2. modern workplace equipment,
3. group work.

VI. Intelligent residence:

1. modern single- or multi-family house,
2. advanced and integrated electronic and information systems.

VII. Economical, commercial, legal and sociological aspects of intelligent buildings.

Dynamic development of technology requires designers to adapt buildings under design to modern standards. By analysing what has happened over the past few years, it can be stated unhesitatingly that the rate of these changes will definitely be maintained over the coming years. Intelligent buildings have proved themselves in practice and it seems that we are 'destined' to such designs. Although this idea is not yet widespread in our country, it is clear that with every year the situation is changing for the better. Certainly, one of the reasons that is limiting the development of intelligent buildings in Poland is the poor financial condition, and also the difficult situation in the building industry. Very slowly however, intelligent office and also public utility buildings are beginning to appear. In Poland, there are about 300 of them - mainly office buildings. This is associated with the enormous boom for these types of objects financed by western capital. They are most frequently characteristic of distribution of intelligence, that is, they are provided with only a part of the systems.

In Warsaw

One such object is the Warsaw University Library building of total area 63,700 m², blending with the Botanical Garden, the Vistula Roadway and the Vistula Valley.

The University Library has a complex electronic system supervising all the functions realised by the building. The specific aspect of the object requires

advanced protection system against fire coupled with the ventilation and air-conditioning system. The project of the fire signalling system for the new University Library building was elaborated by the firm INSTEL S.C.

In spite of the difficult situation in the building industry, Warsaw is one big construction site. If all the office buildings designed get constructed, then within the next three years, over a million square metres of new commercial area will come into existence. Among the giants, the first place is held by the project of the Reform Center along Aleje Jerozolimskie (200,000 m²). Deserving attention is the 'fifty-thousander': DAEWOO at ul. Towarowa (project), Puawska Financial Center (building nearing completion), Warsaw Financial Center at ul. witokrzyska (under realisation) and Polish National Insurance – PZU at Rondo ONZ (UNO Roundabout) (project). All these objects are intelligent buildings of the highest class, that will usher Warsaw into the third millennium.

Conclusions

Many firms are convinced that renting a cheaper office of outdated space organisation is often more expensive than renting an office in a modern building which provides excellent conditions and hence improving work quality. Ever more often, low utilisation costs – resulting from application of the latest designs, low administration costs, higher standard and additional services, are beginning to play an important role in the struggle for the client. Hence, many firms are interested in the high standard that is provided by an office building realised in the convention of an intelligent building.

It is evident that irrespective of the technological revolution, the aspiration will always be towards decrease in electric power consumption, increase in air-conditioning output, simplification and reduction of cabling, enhancing the mobility of persons using the building and also improving their safety and health.

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