



Primo Piano - Housing needs, the Internet and cyberspace at the forefront in the UK and Italy

Roma - 21 nov 2021 (Prima Notizia 24) Modern construction methods and smart technology can revolutionise the building process and the way we live.

Population growth and demographic changes have led to a global housing shortage. According to research carried out by the Heriot-Watt University National Housing Federation and by the Homeless Charity Crisis Organisation, the UK will face a shortage of four million housing units by the end of 2031. This means that approximately 340,000 new housing units will need to be built each year. The houses built shall meet the demands of home automation and increasing environmental constraints. Traditional building technology is unlikely to meet this demand. It is relatively expensive and too slow in fulfilling the necessary procedures and complying with all rules and regulations. Furthermore, the quality and capabilities of traditional construction methods are also limited. The only solution is modular production based on the principles of factory automation. This solution uses cordless and battery-free controls and sensors to perfectly integrate with home automation. Modular buildings are based on a combination of construction methods called Modern Method of Construction (MMC). They include the use of panelling systems and components, such as roof and floor boxes, precast concrete foundation components, prefabricated wiring, mechanical engineering composites and innovative technologies. With the opening of several factories, the UK has started to use the MMC to build prefabricated and fully equipped houses in modular form, which can be loaded onto trucks for transport across the country. This type of on-site assembly enables the house to be completed in days rather than months, thus reducing costs significantly. Modular buildings have become popular in Europe. In Italy, a pioneering company is the RI Group of Trepuzzi (Lecce), which is also operating in the fields of logistics and services and building health care facilities, field hospitals and public offices, which are cost-effective and quick to construct. The impact of modular construction is expected to be significant and factories producing up to five thousand houses per year could become the best builders in the sector. The construction standards of these new technology houses are higher than those of traditional houses. Thanks to better insulation, the electricity bill could be only half that of a traditional house. Modular houses have kitchens and bathrooms, and are equipped with power and lighting via power cables, which are also modular, and wireless controls, in addition to the increasingly important network and telecommunications infrastructure. Structural and modular wiring are derived from commercial electrical and industrial installations to ensure efficient and minimal electrical installation work. As technology changes, this standard installation is adaptable and offers a high degree of flexibility. Experience in industrial and commercial construction shows that traditional fixtures are labour-

intensive, rather rigid and still expensive. In contrast, on-site prefabricated modular cabling and the IDC system combined with wireless controllers and sensors can be fully installed at low cost. These are proven technologies and are moving from commercial to domestic use scenarios. With the help of CAD support for modular cabling, all power cables are laid in the ceiling or wall space. The installation of wireless energy harvesting equipment simplifies the installation process as no switches and duct installation are required. For the first electrical fixing through the wall, the cable takes less time because there is no need to coordinate the position of the switch with the wall bolts. The level of dependency of on-site installation activities has also been reduced. Sensors, switches and wireless energy harvesting controls can be installed anywhere in the building, even in hard-to-reach areas. After installation, the principle of energy harvesting will be used. Switches and sensors are powered by the surrounding environment and there is no need to replace old batteries and other maintenance equipment. Moreover, this flexibility and this reliability enable the system to be expanded at any time. The modular construction technology enables it to adapt to various types of houses and meet the needs of today's life through flexible shapes and various exterior decorations. This is not exactly the same as the old prefabricated houses, "granted" in Italy to earthquake victims who have been waiting for years for a decent, civilised home. The roofline can also be customised to suit local customs and architecture. Through the combination of innovative product technology and good design, the aim of the smart home is to provide security and comfort. The usual requirement is to place the light switch and dimmer (or potentiometer) in the most convenient place. Driven by the kinetic energy collected by the switch itself, they can be placed anywhere. They do not require wiring, but can send wireless signals to the receiver inside or near lights or DIN-rail mounts (German Institute for Standardisation). In addition, there is no need to use batteries and no need to replace them. This saves all the inconvenience and environmental risks that can be caused by replacing batteries. Since this type of equipment has reached a wide range of applications, lighting and home entertainment will choose battery-free products. Besides controlling brightness and colour, self-powered switches can also be used to control sound systems or blinds. A key application of the smart home is the switch that can turn off/on devices that do not use traditional electricity when leaving or coming back home. Energy harvesting technology also supports other sensor-based applications. For example, self-powered sensors can be wirelessly connected to an intruder alarm. Furthermore, by installing light-activated touch sensors on windows, lighting and heating can be turned off when no one is at home. Another source of energy is the temperature difference between the heating radiator and the surrounding environment. For example, this energy harvesting enables a self-powered heating valve to perform heating control via a room temperature controller according to specific conditions. From factories to offices, from multifunctional buildings to smart homes, wireless energy harvesting technology has been tested in approximately one million buildings worldwide. Most sensors, switches and other self-powered energy-harvesting devices can communicate at a distance of up to 30 metres in a building and meet the EnOcean international wireless standard, which encrypts messages below 1 GHz by sending a short message. There are also some self-powered devices that integrate EnOcean energy harvesting technology and can communicate directly with the lights via the well-

known Bluetooth or Zigbee (wireless communication standard based on the IEEE 802.15.4 specification, maintained by the ZigBee Alliance). This makes it possible to use green, battery-free switches and solar sensors to flexibly control other applications, such as LED lights or speakers. Now that wireless sensors for energy harvesting can frame data at home, it will be a huge step forward to aggregate information and perform useful analysis. They process data through the Internet of Things (IoT), which refers to the path in technological development whereby, through the Internet, potentially every object of everyday life can acquire its own identity in cyberspace. As mentioned above, the IoT is based on the idea of “smart” items which are interconnected to exchange the information they possess, collect and/or process. It also uses Artificial Intelligence (AI) to keep track of living patterns and activities in modular homes. Energy analysis is an application that can currently help homeowners further reduce energy consumption through AI. Looking to the future, the combination of the IoT and AI will bring many benefits. Geographical data, weather and climate information, as well as activities, water and energy consumption and other factors will be very useful for planners, building organisations, builders and landlords. Perceived architecture represents the next generation of sustainable building systems. Smart buildings will soon be able to integrate the IoT devices on their own, as well as generate large amounts of information and use it to optimise buildings. This provides a whole new dimension to the service and to the business and home economics model. This is particularly relevant for the ageing population, as these smart technologies can radically change the lifestyles of the elderly people and their families. They are expected to bring transformative benefits in terms of health and well-being. The key elements of such a home include smart, non-invasive and safe and secure connections with friends, family members, general practitioners, nurses and health care professionals, involving the care of residents. Technology based on battery-free sensors connected to the IoT will help prevent accidents at home, resulting from kitchens utensils and overflowing toilets, etc., and keep up with residents' interactions with healthcare professionals.

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