HYUNDAI HIGH TECH APARTMENTS

Organisation	Hyundai Engineering & Construction and Hyundai Telecommunication
Trigger	• Increased levels of crime.
Objectives	• To develop an apartment block designed to prevent unauthorised entry. • To develop an integrated system using security products, electronics and physical barriers.
Tools/Techniques	• Analysis of crime in residential areas, situational factors, resident perceptions and methods of crime prevention. • Comparison and development of security products. • Development of an integrated system. • Computer simulations.
Enablers	• Developments in security systems. • Partnerships between various companies.
Tensions	• Fingerprint technology easily damaged when used on the exterior of buildings.
Impact	• Increased value of the properties. • The company is seen as a provider of 'Intelligent Systems for Home Management & Security'.
Lessons	• Demonstrates the value of partnerships and the importance of research. • Shows an integrated system using physical and electronic security measures, with effective management.

Synopsis

The case concerns an 'integrated crime prevention apartment' designed to protect occupants from burglary and improve personal security. It was triggered by an increase in residential crime rates in apartment blocks in Korea. Driven by Hyundai Construction, the security measures were developed in collaboration with an equipment manufacturer and a professional security enterprise. The high-tech apartment was equipped with an integrated crime prevention system designed to work in conjunction with an automatic home management network. On-line security systems to improve surveillance were combined with physical security systems such as locks and natural surveillance. Thus, areas within the building identified as potential spaces in which crime might occur were transformed into 'safe space'. Such an approach has increased the value of properties and improved the company's image.

Background to Hyundai High Tech Apartments

According to the Korean Institute of Criminology's study of crime in residential areas, large, tall buildings without a dominant space at its core, suffer from a high incidence of crime. Such complexes have a lot of different levels, with corridors that do not allow a clear line of vision for the residents or visitors, which increases vulnerability to crime and induces fear of crime. Thus, changing the building's structure has the potential to significantly reduce levels of crime, if applied across the board. The types of changes required include increasing the proximity of the reception area to other parts of the building, clearly identifying how space is supposed to be used, redesigning spatial layout and introducing window and door systems to prevent unauthorised entry.

In 1990, the Hyundai Construction Company set out to develop an apartment block designed to prevent burglaries and other crime associated with unauthorised access. The company's former Director of the Electronic Department, Doo-Young Kwak and the Assistant Director, Chang-Hwan Choi, collaborated in the development. They set about analysing city and residential crime statistics, as well as gathering data on the usage of space and residents' awareness of the structure of apartment blocks. The aim was to identify the link between the spatial structure of buildings and the occurrence of crime and to 'design out' vulnerable areas.

This case is based on interviews in Korea with Chang-Hwan Choi and Sam-Young Won, Hyperion Hyundai Engineering & Construction.

Figure 1: Interviewees

Other companies involved in developing the integrated system included architects, engineers, equipment providers, Hyundai Telecommunication, Tears Bio-matrix Co., SOK Co., Jung-Pung Product, Perimeter products, Korea Circuit System Co., CAPS (Korean Security Corporation) and URO Electronic Industry Co. (Japan).

Design Process

Principles

Based on the research, the Korean Construction Association presented the following recommendations for reducing crime in residential buildings:

- The scale of the structure for the complex should be as small as possible.
- Differentiate between the facilities within the interior of the complex.
- The function of the buildings and the interior space should be readily apparent and satisfy the needs of residents.
- The building's main entrance should represent a clearly defined boundary.
- Ensure the parking area is as close as possible to the complex entrance in order to facilitate entry to the building.

Fingerprint System

The system comprised an unmanned entry security system involving a home automation system connected to a fingerprint identification device located on doors to the block, individual apartments and the entrance to the car park area. This prevented unauthorised access to the building. Fingerprint recognition was chosen, as opposed to iris or vein recognition, as it was more competitive in terms of price and was easily applied to the door size being used. The automated system and the fingerprint identification mechanisms are pictured below:

Figures 2 and 3: Fingerprint door systems

A remote inspection or meter reading system was designed to automatically monitor energy use within the apartments (i.e. electricity, water, gas). The system produced comprehensive management reports that negated the need for inspectors to enter the building. Consequently, would-be thieves could not gain access to the building disguised as meter readers.

Techniques and Modifications

The systems were based on designs sketched by Professor Dae-Woo Lee from Seo-il University and tested using computer simulations.

The fingerprint system was designed to overcome the limitations of ID cards and PIN numbers, which can be forgotten or lost. However, the fingerprint system had to be modified to incorporate a PIN code, as door designer Professor Dae-Woo Lee, Seo-il University, explains:

"We had problems with frequent damage done to the fingerprint reader because the device is exposed to the exterior. To resolve this problem, we borrowed from the principle of a camera shutter and applied it in designing the actual fingerprint reader inside the door. In order to access the reader, one must input a PIN number. Then, the fingerprint reader would slide out. We've innovated the design and the mechanism to carry out such a process".

Access Monitoring

Residents monitor entry of visitors through the entrances using the home automation system, comprising an intercom device for telephone/text messages and image verification.

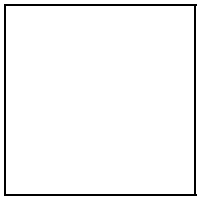

Figure 4: Home automation system

This unmanned security facility at the public entrances controls access to the building and thus increases the safety of residents. There are also a variety of alarms to detect thieves, burglars, smoke and gas, all connected to the security centre operated by the professional security enterprise SOK Co. Limited. CCTV has been installed in the children's park, basement parking area and lift.

Integrated System

The concept of an 'Integrated Crime Prevention System' was constructed and used to promote the new apartments (see below).

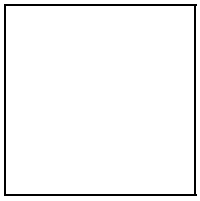

Figure 5: Integrated Systems

Impact

The new apartment block promoted a secure residential area by isolating dangerous areas, improving the system of natural surveillance and implementing an electronic system of surveillance. When combined with effective management, the system ensures the safety of residents and improves their sense of personal security. The electronic system also reduces the costs of employing a security guard.

The introduction of such as system has enabled Hyundai Engineering & Construction Company to become a leading enterprise in the field. The company has raised the price of its apartments, which have continued to increase in value. The company has also begun marketing itself as a provider of "*Total Intelligent Home Management & Security Systems".*

Lessons Learned

Natural and electronic surveillance are the key features of this design, with the two approaches fully integrated for maximum effectiveness. Some of the features also produced additional benefits for residents. For example, the remote meter reading systems prevents access by would be thieves and allows residents to monitor and improve the energy efficiency of their homes.

The integrated system helped partner companies in the development stage produce specific products to improve the security of residents. Co-operation between construction, telecommunication and equipment manufacturing companies, all working to the same objective, was key.

This case demonstrates the value of research to establish the links between crime and building design, as this provides a basis upon which to 'design out' crime. In the UK, research shows that flats and maisonettes are vulnerable when occupied by low-income families. The reason for this is that thieves usually target their own neighbourhoods, rather than the more prosperous suburbs (Girling, 2000).

References, Further Reading and Related Case Studies

Girling, R (2000) Crime. Sunday Times Magazine. October, pp51-60.

Korean Institute of Criminology (1998) *Criminal Victimisation in Korea.*

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Classification Index

Ekblom's crime classification	Misappropriation (theft), misbehaviour (violence against the person, criminal damage, anti-social behaviour).
BCS crime classification	Theft, violence against the person, criminal damage.
DAC	Protecting people and properties
Primary motivation	Transformation of buildings vulnerable to crime area into somewhere safe.
Type of designer	Architect/technical experts
Approach	Architectural design and high tech products
Sector	Private housing
Location	Housing
Author	Sunju Kim

DAC Hyundai apartment