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Building Safety and Security through Architectural Design

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Abstract

Everyone has the right to life, liberty, and security of person. Security is a type of protection from or say it is the resilience against any type of potential harm of other unwanted force or threat that is caused by others, by restraining the freedom of others to act. Beneficiaries in this study of technical referents of security in any building may be persons and social groups, objects, and institutions, ecosystems, or any other entity or phenomenon endangered by changes that are sudden. A building is called smart when It is capable of resisting all types of endangered changes and protecting the people in its building envelope. Technology is one such medium that is prevalent nowadays. Smart buildings are intelligent buildings that provide smart facilities that use information and communications technology-based systems with services and technology to customize the overall building performance.

Keywords: Buildings, resilience, information, institutions, endangered

INTRODUCTION

Security is a type of protection from or say it is the resilience against any type of potential harm of other unwanted force or threat that is caused by others, by restraining the freedom of others to act. Beneficiaries in this study of technical referents of security in any building may be of persons and social groups, objects and institutions, ecosystems, or any other entity or phenomenon endangered by changes that are sudden. Security defined through a smart building is a building that is capable of resisting all types of endangered changes and protecting the building from sudden changes [1]. It involves a continuous process right from understanding the requirements of safety in the environment through the context of the site; it then follows the process of designing a form suitable to requirements or analysing the planning. If we analyze these factors at the foundational level, from design to logic synthesis, and from register transfer level to behavioral synthesis, it becomes beneficial in enhancing the system design of the building. The implementation of the design is an important process as it involves a great period of time. This is a necessary step and involves a lot of individual efforts and requires skills as well. The next step of verification is procedure of completion of the construction process and the last step of maintenance which is the continuation of providing services even after the construction of a building is completed.

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LITERATURE REVIEW

To study the architectural design of buildings around the environment in the context of "security" as a key feature. To study the building systems through Building safety and security through architectural design and planning. To understand the Security pertaining to the building and the architectural elements like fencing, boundary, bollards, etc. [2]. To obtain a deep

understanding of designing and planning the building while adopting security as a smart criterion. To analyse different steps or ways for encouraging safe techniques catering to all types of disasters. These all are advantageous to identify the need for a smart structure, with a framework gathering the efforts of the brick-and-mortar community, physical security, crime prevention through environmental design, and the principles of urban affairs, crisis management, and identity management. Security and safety as a criterion for designing is not only important in current scenario but has been considered in historical contexts as well. Omnipresent examples are there throughout the world where protection is standardized for universal design. In India, the Kumbhalgarh fort of Rajasthan can be reviewed where the great ruler of the Mewar dynasty Raja Kumbha made the fort in the 15th century (Figure 1). The fort is famous for its largest wall which resembles the great wall of China, the wall measures 3600 ft in height and runs for about 38 km. The structure is further reclaimed as a world heritage site that is under the group Hills forts of Rajasthan. It is located smartly on the western Aravalli hills which is nearly 100 km away from the city of Udaipur [3]. The edifice, which is perfectly poised between 11 peaks of the Aravalli mountains, was constructed over a 15-year period under the competent supervision of Mandan, the renowned architect of Kumbhalgarh Fort in Rajasthan. It is one of the most significant and perhaps the only impregnable forts in the state due to its strategic placement on a high ridge hidden by the nearby peaks. Due to its flawless utilization of contours, it was never successfully seized in battle, and the Mughal army only managed to seize it once. Kumbhalgarh Palace holds a very important position in history and in the hearts of the Rajput-Style Architecture as the birthplace of the renowned Maharana Pratap. The firm rounded bastions catches attention of tourists when they enter the magnificent fortified structure with its grand scale and proportion, towering loftily above to provide excellent safety [4]. The forts which carefully considered architectural elements have turned it into an impregnable bastion of Rajput dominance giving importance to secure design. The Kumbhalgarh fort has seven magnificent gates, known as Pols, that are very tall and are there to guard any entrance. As you stroll over the beautiful fort's ramparts, which are proportionately large enough for eight horses to march simultaneously, you may see many such design details and hear the echoes of history. The wall surrounding Kumbhalgarh Fort, India's version of the Great Wall, is the second-longest wall in the world, running 36 km overall in curvy paths and varying in breadth from 15 to 25 ft in various locations. There are tapering apertures all the way along the strong wall, allowing archers to shoot at the opposing forces while being protected from their crimes like counterattacks. It is intentionally difficult for opposing army elephants and horses to move quickly up the ramp inside the fort that leads to the top of the hill. Ingenious traps have also been constructed in numerous locations to catch the enemy off guard, such as the use of moats around the exterior of a structure. Additionally, everyone is surprised by the fort's design and height, which is 1100 m above sea level on the Aravalli range. This remarkable secure strategic fort is Kumbhalgarh.

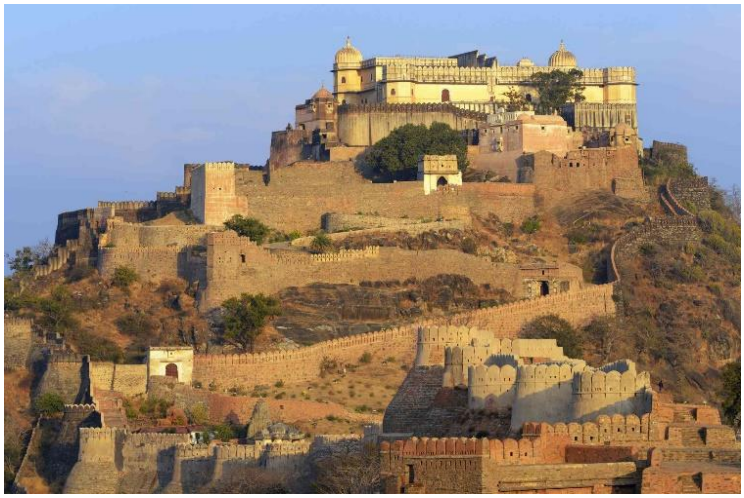

Figure 1. Kumbhalgarh Fort.
Source: *AWL Images.*

OBSERVATION

Security defined through a smart building is any building that is capable of resisting all types of endangered changes and protecting the building from sudden changes. Building safety refers to the initiatives taken to protect a building, its occupants, and its assets from unauthorized access, theft, vandalism, and other criminal threats. Building security can include physical security measures such as security cameras, access control systems, alarms, and security personnel (Figure 2), as well as policies and procedures to prevent security breaches and respond to security incidents. The requirement of security required for a building will depend on several factors such as the building's function, location, and perceived level of threat. It involves a continuous process right from understanding the requirements of safety in the environment through the context of the site, it then follows the process of designing a form suitable to requirements or analysing the planning [5]. If we examine these at the grassroots level through security information monitoring while detecting suspicious behaviour or by getting trigger alerts hence turns beneficiary to improve the system design of the building. The next step of verification is the procedure of completion of the construction process and the last step of maintenance which is the completion by providing mechanical, electrical, and plumbing services even after the erection of a building is completed.

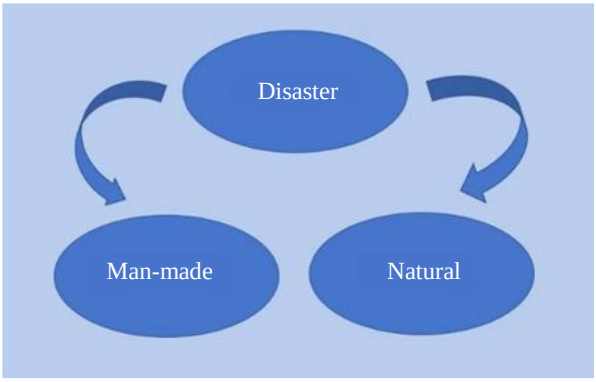

Figure 2. Cause of harms.

METHODOLOGY

Technology and architecture have a great interconnection with each other. Technology helps as an aid to improve the overall performance of buildings through the help of new technologies coming up in the market like CCTV surveillance, fire alarms and many other techniques. The factors affecting building performance are: location, weather station, outdoor temperature, floor areas, exterior wall areas, average lighting power, people, exterior window ratio, electrical costs, and fuel costs. Lighting is another factor that is used to create a safe environment [6]. A well-lit structure reduces the risk of accidents and makes it easier to spot potential dangers. An ample amount of lighting helps to eliminate criminal activity by making it more difficult for criminals to hide in the shadows. Architectural design should ensure that there are clear sightlines throughout the mall, with unobstructed views of walkways, stores, and other common areas. This can provide safety by making it easier for security personnel to observe activities in the area. Mall design should incorporate security mitigation such as surveillance cameras, emergency phones, and access control systems to help deter crime and respond quickly in case of an emergency. Good wayfinding design can help shoppers navigate the structure more easily, reducing the risk of accidents and improving overall safety. Each planned area should be well defined and ensure that emergency exits are clearly marked and easily accessible in every complex. The map of different spaces should also allow for quick and efficient evacuation in case of an emergency. Another method is Landscaping which can help to create a safe and inviting atmosphere in the city. Design should ensure that there are no blind spots where criminals could hide, and that landscaping features do not obstruct views. Adequate space should be provided in the mall design to allow for easy movement of people and goods. This can help to prevent overcrowding, reduce the risk of accidents, and facilitate emergency response.

Role of Technology

Technology is essential in building and maintaining secure architecture (Figure 3). Technology plays a crucial role in designing and implementing safety in building. Secure architecture involves creating a framework that protects information and IT assets from unauthorized access, modification, disclosure, or destruction [7]. Encryption technology helps protect sensitive information by converting it into an unreadable format that can only be deciphered with a key or password. Different technologies therefore help to improve the safety efficiencies. Energy is a regulating factor which controls technology and thus the amount of energy spent on ensuring safety affects spatial reliability. All living organism constantly take in and release energy, similar is the case with infrastructure which requires natural and artificial energy in different forms. In an enclosed space, networks, scans devices entering the structure for known vulnerabilities can help and provide recommendations for fixing them.

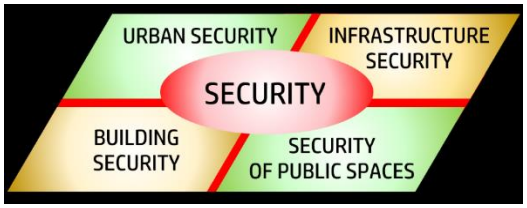

Figure 3. Need for security.
Author's photograph.

However, it is important to note that there is no such technology which can guarantee complete security, and a comprehensive security plan should include a combination of technology, guidelines, and procedures to protect against crimes.

Role of Physics

Physics plays an important role in secure architecture in several ways. Cryptography is the practice of securing communication from third-party interference. It involves the use of mathematical algorithms to encrypt and decrypt signals. The security of these algorithms is largely based on the laws of physics, such as the difficulty of factoring large prime numbers. Quantum cryptography is a branch of cryptography that uses the principles of quantum mechanics to create unbreakable encryption keys, making use of the laws of physics to secure communications. Physical security measures, such as biometric authentication, rely on the laws of physics to ensure that only identified people have access to secure areas or data. Biometric authentication techniques such as fingerprint or iris recognition are based on the unique physical characteristics of an individual, making it difficult for unauthorized individuals to gain access [8]. Physics also helps to regulate shape in design strategies governing the motion or circulation of people throughout the structure. Physics plays a critical role in the design and implementation of secure systems. For example, the physical properties of semiconductors can be used to create security features with the help of heat control detectors at the time of calamity.

The Universal Declaration of Human Rights includes the right to security in Article 3. This idea will inevitably change as new threats to our way of life emerge from the virtual world, even though they directly affect us. We need safe physical environments to live in as well as safe virtual settings to interact with various spaces. The goals of law enforcement and military organizations are like a consequence to follow, as much as likely to anticipate new threats and broaden their reach to decisive mitigation, that is detailed and summarized in three great new missions of the government of different countries which are listed as below:

Protect Citizen Privacy

Privacy is always considered as an essential element which design buildings to prevent obstructed views.

Protect city IT Infrastructures

All structures require technology, so it is made sure that the materials used for constructing the buildings are always checked of for its quality and its drawbacks.

Protect Public IT Services

Urban structures in the cities are always equipped with necessary electrical, plumbing, mechanical systems that may be an element of harm in buildings, therefore it must be provided with mitigation.

It is not necessary to crop one's territory to manage its protection. Smart steps past secure can be resourceful, a concept which is used to refer to acts and systems whose purpose may be to provide security at first instance (security company, security forces, security guard, cyber security systems, security cameras, remote guarding). Security can be physical or virtual. It includes all spaces with public interaction and spaces that cater to large human spaces. All human space is given equal importance through the factor of "security" as a necessity. Security by architectural designing and planning can be achieved by carefully working with the project from the initial state at the beginning from understanding the project at an initial level to understanding the requirement of people and their necessities.

Role of Urban Design

A man and his built environment have an interdependent relationship that cannot be separated. Human psychology has a very severe intensity of reaction towards any type of harm that happens to them. Any type of alarming situation, be it attacks, earthquakes, landslides, or thefts, particularly can make the situation uncomfortable for humans. Urban areas are barrier-free, they do not have a specified boundary or any limits displayed in maps but regulations and awareness are required in the environment to improve the quality of life and liability [9]. These spaces require the ejection of wisdom in the foolish planning methods and rather tailor it to the new modern security needs to manage and solve the troublesome idea of adding the same theory of prevention with a perfect physical security that turns into a non-questionable logical envelop. Crime can be prevented through environmental design in a physical urban model by implementing CPTED guidelines and discouraging crime through design of buildings, landscaping, and outdoor environments; these are considered as major agenda for the agencies of many urban areas. The key objectives of this process include understanding the cause of criminal activities. Afterwards, it includes studying the detailed aspect of exasperating activities followed by surveillance in different urban areas through various design methodologies.

RESULT AND DISCUSSIONS

The concept of security and safety in buildings through architectural design and planning is essential to modern society. Many architects and planners have been working on the process of making buildings smart. There is a growing demand for secure and safe buildings, particularly in urban areas, due to increasing crime rates and the potential threat of terrorist attacks. The research on security in buildings focuses on identifying and mitigating security risks through the implementation of various security measures, including physical security, technological solutions, and security policies. Security measures provided through physical appraisal in buildings can involve different measures like vulnerability assessment, accessibility control in buildings, visual security system, physical security through people, Map evacuation routes in plans, identifying shelters and hiding places, or providing emergency communication system.

Technological solutions involve using smart building systems to monitor and control the building's security features, including lighting, air conditioners, and access control. Security policies focus on creating guidelines and procedures for building occupants and staff to follow to ensure their safety and security. The research on security in buildings is multidisciplinary, involving expertise in architecture, planning, technology, and security management (Figure 4). Researchers are exploring new approaches to building design and technology integration to improve security without

compromising the building's aesthetics and functionality [10]. The research also focuses on understanding the human factors involved in building security, such as occupant behaviour and emergency response protocols. The research on security in buildings is particularly relevant in today's world, where the threat of terrorism and the need for secure buildings has become increasingly important. Research aims to develop effective security measures that are both cost-effective and efficient, while also being practical and easy to implement. It has the potential to enhance public safety and security, while also supporting economic development and improving the quality of life for people in different urban and rural areas.

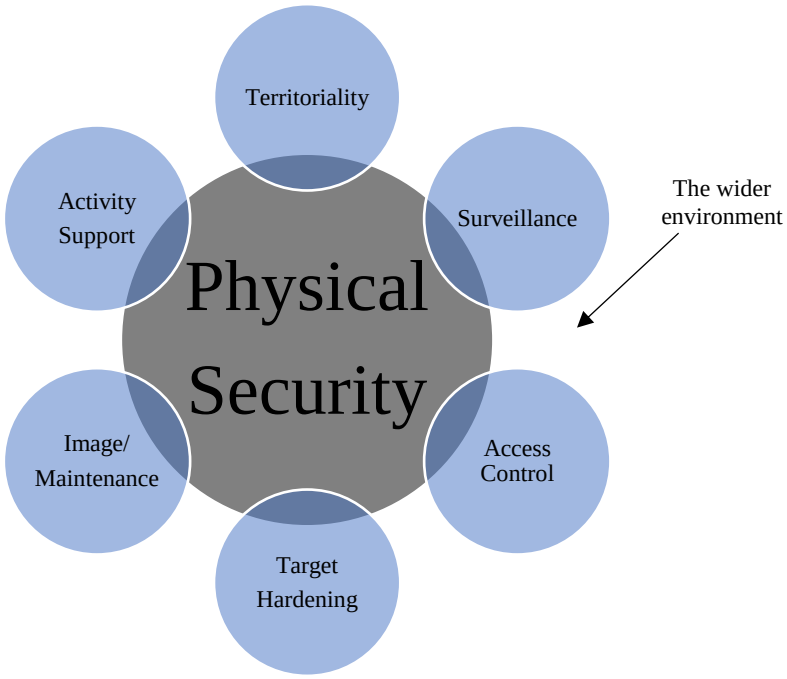

Figure 4. Security measures.
Source: *Author's Photograph.*

Figure 5. The Taj Mahal Palace.
Author's photograph.

The positioning of the building in close proximity to the Arabian Sea is one such instance where a slight flaw is present. (Figure 5). The wedding disturbance at the hotel diverted attention away from

the physical interruptions occurring in the surrounding environment. Mumbai is one such city which is still continuously developing with a massive growth in population due to industrialization since independence. Tourist from different places visit the Taj hotel despite the dynamic situation and inhibit different areas. The associated group of people stayed in the hotel rampaging through different type of terrorist activities, they found safety at the banquet of the hotel which was confined at a different area which functioned as an effective space providing shelter from the outside circumstances. Despite the growing political and public awareness of installed hazards, not much has been done to strike a balance between the desire for economic and social progress and the need for human safety and environmental protection. Another aspect of defective planning is the absence of design elements like a confined boundary wall, bollards, GIS at required distances etc. So, it can be inferred that these intricate components hence should be kept in mind while planning spaces to provide mitigation to resist these kinds of slow-onset disasters. Some buildings that consider building security are hotels, shopping malls, IT centres, and IT parks.

CONCLUSION

One such building which served as an engineering marvel and an architecture feat is the Taj Mahal palace. In 2006, a significant human-caused disaster took place in Mumbai when a violent terrorist attack occurred, resulting in substantial harm. The Mumbai disaster situated various questions regarding environmental, political, ethical, social, and ethical questions about the proper functioning of the city. The building had regular activities going on in it during which a sudden noise of weapon attack and gun firing was detected.

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