ASSIGNMENT

RISK AND DISASTER MANAGEMENT IN CONSTRUCTION

M.S (Civil Engineering)

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Question 01: What is the difference between hazards and threats? Provide Examples

Answer:

HAZARD

A hazard is a condition that poses danger to your organization, and can lead to an accident, incident, or other mishap if not mitigates.

A hazard satisfies ALL of the following conditions:

- **Is a dangerous condition,** such as an object, situation, circumstance, that **poses an unacceptable level of danger**;
- **Occurs once** in the safety mishap lifecycle;
- **Can lead directly to risk occurrence** (i.e., safety mishap, accident, etc.) if not mitigated; and
- **Arise from hazard mechanisms**, such as initiating actions and hazardous sources.

Though it is sometimes confused as other things, such as below, a hazard is ***NOT***:

- Benign objects (birds, mountains, people), which are hazardous sources;
- Safety mishaps, which are another way of saying risk occurrences;
- Damages, which are a product of risk occurrence; and
- Dangerous actions, which are associated with initiating mechanisms.

The only disagreement may be on what constitutes a “dangerous” situation. We advise you seek guidance from your compliance authority on this point.

THREAT:

There are two types of threats that are used differently in different contexts. They are:

- General threats: the amount danger in a given circumstance; and
- Specific threats: a specific object, situation, behavior, etc., that corresponds to a rising level of danger within a given context.

WHAT IS A GENERAL THREAT?

One type of threat is a **general threat,** which refers to the amount of danger in a given circumstance. It is used in the context of “threat level,” such as:

- “There is no inherent threat in operations right now”; or
- “Given our current ERP, how much threat does a fire emergency pose?”; or
- “Terrorism is a [specific] threat that poses great [general] threat to aviation.”

WHAT IS A SPECIFIC THREAT?

A threat can also be a generic term for a specific danger, such as an object, situation, behavior, etc. A specific danger can be identified as:

- Contributing to rising danger – such as a hazardous source or contributing factor; or
- Representing actualized danger – such as a hazard occurrence.

Some examples are:

- “In spring time, migrating birds are a threat we have to mitigate”;
- “That moose is no threat because he cannot get over the perimeter fence”; or
- “We have no plan for a bomb threat in our ERP.”

DIFFERENCE BETWEEN HAZARD AND THREAT

Sometimes, hazard and threat might be used interchangeably. Consider the example of a flock of birds flying close to an aircraft. This flock is both a hazard and a threat.

However, because the concept of a threat is vaguer than the concept of a hazard, a threat is not always a hazard. Consider the example of:

- migrating birds, which are a hazardous source but not an actual hazard, or
- fatigue, which is a contributing factor.

The takeaway here is that a hazard occurs (is “actualized”) when your operations interact with hazard sources. A threat is simply a generic way to describe danger, whether the danger has actualized or not.

EXAMPLES OF THREATS AND HAZARDS

NATURAL HAZARDS	TECHNOLOGICAL HAZARDS	BIOLOGICAL HAZARDS	ADVERSARIAL, INCIDENTAL & HUMAN-CAUSED THREATS
• Earthquake	• Hazardous materials in the community:	• Infectious Diseases	• Fire or Explosion
• Tornado	industrial plants, tanker trucks on major highways or railroads	• Contaminated food outbreak	• Medical Emergency
• Lightning	• Radiological releases from nuclear power stations	• Water contamination	• Active Shooter
• Severe Wind	• Hazardous materials in the campus: gas leaks, sewage break or laboratory spills	• Toxic materials emerging in campuss such as mold or asbestos	• Threat of Violence
• Hurricane	• Infrastructure failure: dam, power, water systems, cyber	• Toxic materials present in campus laboratories	• Bomb Threat or Device found
• Flood	• Other	• Other	• Gang Violence
• Wildfire			• Fights
• High Temperature			• Child Abuse
• Landslide or Mudslide			• Cyber Attack
• Tsunami			• Cyber Malfunction
• Dust Storm			• Suicide
• Volcanic Eruption			• Dangerous Person
• Winter Precipitation			• Missing Student Kidnapping
• Snow Storm			• Campus Bus Emergency
• Other			• Student Demonstration or Riot
			• Dangerous Animal

Question 02: Define risk and provide a classification of risk based on its sources. Provide an example for each risk source

Answer:

Definition: Risk implies future uncertainty about deviation from expected earnings or expected outcome. Risk measures the uncertainty that an investor is willing to take to realize a gain from an investment.

Description: Risks are of different types and originate from different situations. We have liquidity risk, sovereign risk, insurance risk, business risk, default risk, etc. Various risks originate due to the uncertainty arising out of various factors that influence an investment or a situation.

Identification of risk sources provides a basis for systematically examining changing situations over time to uncover circumstances that impact the ability of the project to meet its objectives. Risk sources are both internal and external to the project. As the project progresses, additional sources of risk may be identified. Establishing categories for risks provides a mechanism for collecting and organizing risks as well as ensuring appropriate scrutiny and management attention for those risks that can have more serious consequences on meeting project objectives

Determine risk sources:

Risk sources are the fundamental drivers that cause risks within a project or organization. There are many sources of risks, both internal and external to a project. Risk sources identify common areas where risks may originate. Typical internal and external risk sources include the following:

Typical internal and external risk sources include the following:

- **Uncertain requirements:** The requirement of something that is not considered in the planning stage during determining the scope of work is the uncertain requirements, the causes a major risk.

Example: The Sardaryab bridge was not considered in the planning stage and later on it was the requirement of the project. That put a lot of departments on risk.

- **Unprecedented efforts (i.e., estimates unavailable)**

Example: The depth of the running water of Sardaryab was not known and not accessible and therefore its estimation was not available. It generated a risk factor for the project.

- **Infeasible design**

Example: The design of Shah Alam Sardaryab was really Overdesigned and that increased the project cost and time.

- **Competing quality attribute requirements that affect solution selection and design**

The Competition between the contractors for much benefit and less quality in Mardan Eastern and Western Bypass put the project on risk as poor material and inadequate design of the construction work is carried out.

- **Unavailable technology**

Example: The Unavailability of Equipment and Technical Staff with NIC Contractors over Shah Alam Sardaryab Project originated the Risk Factors.

- **Unrealistic schedule estimates or allocation**

Example: The BRT Project was underestimated and a period of 6 Months was decided for the completion of work that was unrealistic and the project was a disaster due to that.

- **Inadequate staffing and skills**

Example: The inadequate staffing and Skills of NIC Contractors on PRIP Project has put the whole project on risk. The executed work is a big question for the department to answer.

- **Cost or funding issues**

Example: The Funding of the projects of the Country is through State Reserve and developmental funds and due to corruption, it is of the major risks to the project and funds are stopped or finishes before the completion. Takht bhai Rajjar road work has been stopped because of no fund availability.

- **Uncertain or inadequate subcontractor capability**

Example: The Subcontractors hired by main contractor of PRIP project were not having capacity to complete the work and were unskillful. The were unaware of the objective and outcome of the project.

- **Uncertain or inadequate supplier capability**

Example: The Supplier of Material and Resources were corrupt and unaware of the market rates. In the Hattar Haripur project the supplier provided the material from a source that was blacklisted by the client.

- **Inadequate communication with actual or potential customers or with their representatives:**

Example: The communication gap and language barriers increase the risk factors of the project. Like in Kohala road the gap between client and customer caused a risk of time, cost and quality.

- **Disruptions to the continuity of operations**

Example: The Administration Department and Local Government was an obstacle during the execution of Charsadda road. The local political personals was in search of some personal gain that delayed the work continuity.

- **Regulatory constraints (e.g. security, safety, environment)**

Example: The Highway work always face constraints by other departments like sui gas and Wapda. The ShahAlam road face an obstruction by sui gas department that delayed the project execution.

Many of these sources of risk are often accepted without adequate planning. Early identification of both internal and external sources of risk can lead to early identification of risks. Risk mitigation plans can then be implemented early in the project to preclude occurrence of the risks or reduce the consequences of their occurrence.

ON BASIS OF SOURCES THE CLASSIFICATION OF RISK:

- Financial risk
- Procurement Risk
- Environmental Risk
- Technical Risk
- Structural or Design Risk
- Quantitative Risk
- Material Risk
- Labour Risk
- Market Risk
- Time over Run Risk
- Natural Disaster
- Contractor Incapacity

Question 03: How would you assess the performance of a transportation system of a city?

Answer:

Performance assessment of the public transportation system is gaining substantial importance and becoming a prerequisite to making the emerging urban life sustainable. Despite the presence of public transportation since the 1960s, efforts had never been made to evaluate the efficiency of the system in major cities of Pakistan. Urban transportation has a far-reaching influence on a city's sustainable development, particularly for emerging cities whose economies are developing rapidly alongside massive urban sprawl. An appropriate transportation system will be able to support the economy and social activities, as well as contribute to environmental protection and resource-effective utilization. The increasing population of emerging cities has exerted tremendous pressure on the demand for urban transportation.

Performance measurement can be defined as the evaluation or assessment of an organization's output as a product of the management of its internal resources (money, people, vehicles, infrastructure facilities, etc.) and the environment in which it operates. This measurement of performance comprises the collection, evaluation, and reporting of data that are related to how well the organization is performing its functions and meeting its goals and objectives. Performance measurement of the public transportation system is useful in achieving various aims from different viewpoints: assisting in evaluating the public transportation system's overall performance, evaluating management performance and diagnosing problems. The problems can be inconsistency in expenditure regarding the maintenance of the transit vehicles, allocating resources among competing institutions, providing a management control system for monitoring and improving transit services, and other legal and regulatory works. It also paves the way for the techniques which translate into a constant effort at improving services to match the standards.

Transit performance measures can be defined using the passenger, agency, and community's point-of-view. Passenger's viewpoint reflects the passenger's perception of the service. The agency's view reflects transit performance from the perspective of the transit agency like a business. The community's point-of-view measures transit's role in meeting broad community objectives. The performance of public transportation systems can be evaluated according to three broad dimensions: resource-efficiency, resource-effectiveness, and service-effectiveness. The measurement of service quality of the system through indicators for the quality of the service is also relevant.

Previous researches worldwide on performance evaluation usually varies based on the counted point of view (whose point to consider- passenger's or agency's). A group of researchers performed their works based on the operator's point of view, while some others counted the passengers/or communities, while several others considered both. This is one of the most commonly used classifications of performance evaluation of public transportation around the world. The benefit with this classification (if anyone works considering both passenger and agency point of view) is that it provides information on the level of service of the system, the service quality (from the passenger's point of view) along with the cost efficiency of the system, system efficiency and utilization efficiency (agency's point of view) at the same time. What is essential and vital in the performance and delivery of transit service is that it depends significantly upon perspective. For example, the traditional cost efficiency and effectiveness indicators can be considered as performance measures from the transit operator perspective, while they are not linked to customer-oriented community issues, which are fundamental perspectives in service evaluation.

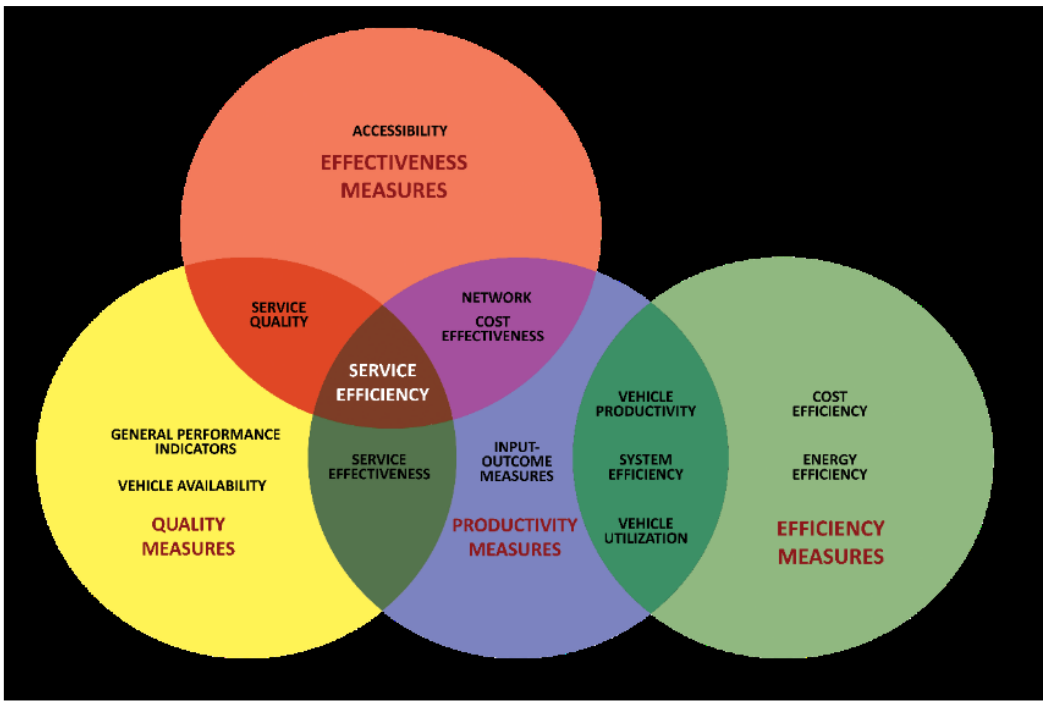

Figure 1- Measures of performance evaluation of public transportation

Quality measures are those focusing on the performance perceived from the rider's perspective. Many researchers consider the customer's point of view as the most relevant for evaluating transit performance; as an example, "customers are the sole judge of service quality." On the other hand, productivity measures are the efficiency evaluating measures that focus on the efficiency indicators as well as the effectiveness of the system. It usually considers cost-effectiveness and

cost-efficiency. For example, the TCRP Report 88 (TRB, 2003) proposes a classification which considers indicators of cost-efficiency-measure of service output compared to the unit of input; cost-effectiveness-measure of outcome compared to the unit of input in terms of cost, and service effectiveness- a measure of outcome compared to a unit of input in terms of service. A similar measure was used which comprises the operator's point of view considering input, output, or outcome measures.

Table 1- Efficiency indicators of the public transport system

Category	Description	Indicators	
System Efficiency	System efficiency measures the input-output ratio of consumption in the transportation process. It depends on several factors like network, finance factors, labor and utilization efficiency	Mobility	
		Productivity	Passenger
			Vehicle-km
		Quality	
		Affordability	
		Infrastructure quality	Availability
			Location
		Safety	
Network Efficiency	Network efficiency measures the ability and capacity of the network to support direct services between areas, coverage of the total route, short distance flexibility	Continuity between roads	
		Balancing of routes	
		Spatial coverage of the network	
		Route Overlapping	
		Network density	
		Average bus stop spacing	
		Service Coverage	
Service Efficiency	Service efficiency indicators are used to measure the performance of the service delivered from the passengers perspective	Reliability	
		Availability	
		Service capacity	
		Accessibility	Distance
			Vehicle availability
		Service coverage	
Utilization Efficiency	Utilization efficiency measures the rate of resource utilization by the existing system	Fuel consumption per km	
		Vehicle capacity utilization	
		Vehicle utilization and break down	
		Vehicle per km	
		Passenger per km	
Cost Efficiency	Cost efficiency measures and compares the amount of investment required/gained to/from the service	Operating cost/vehicle-km	
		Operating cost/passenger-trip	
		Revenue/vehicle-km	
		Revenue/passenger-trip	
		Total revenue/total operating cost	

Question 04: Define security vulnerabilities of a university campus.

Answer:

Higher education can be an intense experience not just for students, but also for the faculty and support staff. Building a safe and secure environment for all stakeholders can greatly improve academic outcomes. The higher ed analytics site surveyed students across the globe about their safety concerns. Student responses covered a wide range of topics: thefts on campus, assault, and more. This breadth of results illustrates that institutions of higher ed have their work cut out for them, but should nonetheless build comprehensive security programs to create the safer learning environments their students and staff need.

There are many different categories of hazards that could potentially affect campuss. Vulnerability include all hazards and threats that could potentially affect the campus and its students and staff. There are several hazards that could potentially impact nearly all campuses, regardless of location or student population. The following conceptualization of hazards is not completely comprehensive, but instead can help campuses and districts understand the types of specific hazards and risks that could affect campuses and to demonstrate the scope and breadth of hazards and risks to be considered when selecting vulnerability assessments.

- **BIOLOGICAL**

Biological hazards that could affect campus include:

- Infectious diseases such as pandemic influenza, XDR tuberculosis, methicillin-resistant Staphylococcus aureus (MRSA)3, or meningitis infections
- Contaminated food problems including salmonella, botulism, and E. coli

Additionally, campuses are urged to consider how existing biological or medical conditions such as allergies, diabetes, or asthmacould affect students in the event of an emergency. For example, because of the stressful situation, students with asthma may have greater difficulty breathing and may need access to medications or inhalers during a shelter-in-place situation. Similarly, students with diabetes may need access to insulin or snacks during a shelter-in-place situation.

- **COMMUNITY**

There are many threats associated with the physical community surrounding a campus. Certain hazards in the community may have an impact or an effect on campus’s emergency management capacity:

- ✓ There are many different categories of hazards that could potentially affect campuses. Vulnerability assessments should take into consideration all hazards and threats that could potentially affect the campus and its students and staff instead of limiting assessments to only specific categories of hazards and threats.
- ✓ Various nearby infrastructures such as a chemical or nuclear power plant that could pose a potential hazard to the campus community in the event of an accidental release of toxins or explosions
- ✓ Military installations or other government facilities that could be hazardous in times of conflict or times of heightened alert
- ✓ Nearby dams or reservoirs that could fail or be targeted for attack
- ✓ Rivers or nearby water sources that could create flooding
- ✓ Hazardous waste sites and underground pipelines for gas, oil, or electricity
- ✓ Railroads lines and highways that are used to transport dangerous cargo
- ✓ Nearby sites of mass transportation such as airports, railroads, ports, rail transits, major highways, and bus stations that could impact campuss and also be impacted during an emergency
- ✓ Potentially dangerous gathering sites such as abandoned buildings or mines
- ✓ Bus or automobile accidents
- ✓ Community venues such as arenas or stadiums which attract large groups

➢ CLIMATE AND CULTURE

The climate and culture of the campus can contribute to or actually cause hazards within campuss. Many campuss and districts already collect data on information related to campus climate and culture that can be obtained and assessed as part of the vulnerability assessment. Issues of climate and culture both in the campus and in the community that could influence hazards include:

- ✓ Drug usage and trafficking
- ✓ Crime both minor and serious
- ✓ Sexual misconduct
- ✓ Hostile environments (i.e., an environment in which groups of individuals feel unsafe or threatened, such as in racial or religious discrimination)
- ✓ Students, personnel, or intruders who may pose a danger to others
- ✓ Bullying and other actions often considered not serious such as truancy

- **NATURAL**

Natural hazards refer to what is commonly labeled as natural disasters as well as types of severe weather. Examples of types of natural hazards to consider in vulnerability assessment planning include:

- ✓ Earthquakes
- ✓ Extreme temperatures (hot or cold)
- ✓ Tornadoes
- ✓ Landslides and mudslides
- ✓ Lightning
- ✓ Tsunamis
- ✓ Severe wind
- ✓ Volcanoes
- ✓ Hurricanes
- ✓ Winter precipitation
- ✓ Floods
- ✓ Wild animals
- ✓ Wildfires

- **PHYSICAL ENVIRONMENT**

Many hazards or risks within the physical campus environment could seriously impact campuses—including structural, maintenance, and grounds hazards.

- ✓ **Structural hazards** refer to actual structural issues within the building such as weak roofs or trusses, building susceptibility to high winds or floods, unreinforced masonry, and unsecured or unsafe doors and windows.
- ✓ **Maintenance hazards** could include unstable bookshelves, exposed wiring, wet floors, unsafe practices in science labs or with chemical elements, exposure to asbestos, unsecured appliances and vending machines, heating and ventilation systems, blocked exits, and general fire hazards.
- ✓ **Grounds hazards** can include issues such as unsafe landscaping; inadequate exterior lighting; poorly maintained playground equipment, sidewalks, stairs, handrails, or asphalt; exposed electrical wires or gas lines; exposed nails; unsecured storage structures; access

to roofs from nearby structures or trees; and proximity of any hazard to bus, automobile or pedestrian traffic.

- **TERRORISM**

Incidents such as APS incident, Bacha Khan University Campus incident, Mashal Death Case have demonstrated that communities and campuses are potentially targets for terrorists, and campuses must be prepared to deal with terrorist threats regardless of where they occur (i.e., campus or community). Terrorist threats may include incidents such as:

- ✓ Explosions
- ✓ Kidnappings or hostage taking
- ✓ Bioterrorism or biological warfare threats
- ✓ Chemical threats
- ✓ Nuclear blasts

- **CRIME AND VIOLENCE**

Threats of violence within or impacting campuss could include issues such as:

- ✓ Weapons in campuss
- ✓ Gang violence
- ✓ Fights
- ✓ Intruders
- ✓ Active shooters

As mentioned earlier with community and campus climates, factors such as crime rates in the area, frequency of child abuse and domestic violence, prevalence of access to weapons, known gang activity, and drug use in the community and campus may contribute more to acts of violence.

Ways to Improve Security on University Campus:

1. Plan Strategically

Security is a key service that most students and their families expect every college and university to provide, but cookie-cutter security programs aren't going to work. Campus security must be strategically tailored to each individual institution and its unique academic mission.

For example, large liberal arts campuses need to support students moving between different buildings as they attend a variety of classes. Meanwhile, science and engineering campuss need

to ensure that students have ready access to sensitive and sometimes regulated materials used for research. And campuss with large athletics programs need to effectively manage crowds on game days.

These colleges are all going to have different definitions of effective security, but each will need to balance their special considerations with more universal security measures that cover the entire campus, including classrooms, dorms, rec facilities, and all the spaces in between.

2. Form Valuable Partnerships

Colleges and universities are well-positioned to become anchor institutions that support their surrounding communities. To do that, they need to form partnerships with local community groups. This could include:

- Partnering with campuss to develop mentorship programs
- Arranging discount plans to encourage students to use local businesses
- Organizing student volunteer opportunities with local nonprofits

For security purposes, partnering with local police forces can be particularly beneficial. Crime doesn't care about "town and gown" boundaries, so sharing resources can be cost-effective and mutually beneficial to both forces.

Developing these bonds between the college and the community builds trust and keeps communication open. Improved communication can help law enforcement better respond to threats that affect the whole area. There are many organizations looking to foster these kinds of partnership initiatives, such as the Coalition of Urban Serving Universities.

3. Train Everyone

Safety isn't just for security staff to understand. Everyone at higher ed institutions needs to achieve an actionable level of security awareness training.

For example, faculty and staff—who have more day-to-day interactions with students than security officers—need to know how to respond when threats arise. This could include assigning emergency response roles to staff so they understand what to do when large-scale incidents occur, or it could mean behavioral threat assessment training for faculty so they can recognize the warning signs of impending violence.

Students are probably the best positioned to improve campus safety and security. In the CollegeStats.org survey mentioned above, excessive drinking and sexual assault were cited as top student concerns. Proper training may improve the likelihood that students will keep each other safe from such threats.

4. Use Technology That Works for You

Don't buy technology piecemeal. You could end up with a bunch of different tools that, although they do their own tasks well, together create a bunch of inefficiencies. Your college or university needs to deploy technology that both fits into your overall security plan and integrates with your other systems.

Because no one knows what new systems will be needed down the road, one of the simplest ways to ensure you're always ready is to deploy security technologies that work with open standards. These are publicly available, accepted design requirements that allow complex security and IT tools to work together.

Another good way to prepare for the future is to use flexible technologies that adapt to your workflows. Here are a few technologies worth considering:

a. Access Control Systems

Electronic access control tools, such as swipe and proximity cards, can help ensure that only authorized students, faculty, and staff enter dorms and other private campus locations. Some institutions have special access control needs too. For example, when there are medical and chemical research spaces, some scientific instruments require radioactive compounds that are federally regulated. Those regulations often include mandated biometric access control.

b. Emergency Alert Systems

Effective campus security programs must include ways for the security office to quickly alert the college community to important events. The goal is getting an alert seen by as many people as quickly as possible. SMS alert systems are now a common solution, because most students and staff have a smartphone on them at all times.

c. Key Management

Securing large numbers of keys can be a daunting task. College campuses may have hundreds to thousands of keys that they need to track. Automating key management can help you redirect staffing resources to productive work while still avoiding the potentially huge costs of lost keys.

d. Asset Management

A large number of student laptops, electronics, backpacks, purses, and other valuables move around campuses every day. Thieves know this, so these assets need to be kept secured when unattended, such as when students are in class or at events. A college's own internal equipment needs to be managed too, including a security office's two-way radios, first aid kits, and hand guns. A customized, automated storage and management system might be a good solution to secure both types of assets.

e. Fleet Management

There are usually a large number of service vehicles, buses, and carts moving around campuses every day, and efficiently managing them can be difficult to do manually. Electronic fleet management systems can be a good way to automate the tedious but important work of ensuring that vehicles are serviced and available when needed.

f. Video Surveillance

Video surveillance systems can fill in the gaps of a security program. No matter how hard you try, there will still be areas that you can't easily secure with other technology or staff. Deploying cameras in at-risk areas such as between blue phone locations, along remote walking paths, or in parking lots can provide more complete campus security.

5. Be Transparent with Incident Reporting

Smart security technology can also help with mandated Clery Act disclosures. Despite recent changes in the statute's enforcement, Clery violations remain a serious concern. Smart security systems are constantly gathering data. Incident reporting is useful for more than just regulatory compliance though. It is just generally good communication. This kind of transparency around student safety can help build trust between security staff and the rest of the college community.

6. Above All, Be Flexible

This might be the most important best practice. Higher education is always changing. Campuss are always looking to provide students with new and exciting experiences. Campus security programs need to manage special events where crowd control is a necessity to keep everyone safe. These could be sporting events, like we already discussed, but they also could be concerts, festivals, and controversial speakers on campus.