

Developing a Security Policy for the Use of CCTV in the Northern Border University

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Abstract—The use of closed-circuit television (CCTV) in universities is a challenging task due to global strong opposition to its implementation at education institutions. The ministry of higher education of Kingdom of Saudi Arabia (KSA) has initiated a plan for monitoring educational institutes across the Kingdom. Therefore, this paper proposes a new framework for developing a comprehensive security policy for using CCTV in the Northern Border University, which streamlines the implementation, usage, and securing of the CCTV footage contents. In this regard, a new policy was developed combining the principles of activity theory, international standards, and design science methodology. It considered six key elements from both theoretical and practical perspectives, namely government rules, technical aspects, training, security requirements, users, and legal issues. Based on them, a standard 12-principal policy was developed; to help organizations easily implement and evaluate the developed policy and secure the contents, the principles were classified into three categories: performance, security, and policy management. The findings showed that the implementation of the policy developed in this study not only improved the security measures of the university, but also built trust among the stakeholders due to the high internal security and effective evaluation of the surveillance system.

Keywords—Closed circuit television; security policy; surveillance; educational institutes

I. INTRODUCTION

Numerous social issues are happening in the world today, including crime, robbery, and intrusion. Anyone can become a target of a crime at any time, whether it be against their body, property, or even life. Different crime-preventive strategies are developed to minimize its effects. In this regard, one of the most extensively adopted technologies is CCTV surveillance systems [1]. People are experiencing various technological developments in contemporary society, such as the use of CCTV systems in crime avoidance and public wakefulness. Most people actually trust that CCTV systems can secure them because if criminals feel that they are being viewed, they will not hazard their lives to pledge crimes or other unusual acts [2]. The fast identification and, in some cases, prevention and disruption of crime are two common objectives of all CCTV monitoring systems. The existence of a CCTV monitoring system, according to [3], instills confidence in people and lowers their crime-related anxiety. Additionally, CCTV systems offer practical corporate management tools that can be used to safeguard employees and encourage health and security efforts [4]. They also facilitate the process of inquiries, provide investigators with vital sources of evidence, and help to prove

individuals' innocence or guiltiness [5]. Furthermore, these systems can be useful in workplaces with unsuitable working conditions for production and control management. A great deal of information could be archived and studied when required.

A CCTV system can be created to match any installation situation, whether it is inside or outside, extremely visible or completely hidden, static or mobile depending on the recording position [6]. With a total of 5.9 million cameras (out of which 750,000 are placed in critical spaces like hospitals and schools), the United Kingdom (UK) is a country with one of the highest numbers of CCTV systems deployed worldwide, putting its nation the maximum-viewed one with roughly one camera for each 11 people. Airports, schools, streets, parking lots, and shopping malls all have these cameras installed. This technology's primary goal is to keep an eye on actions and prevent problems in numerous areas of individuals' lives and activities [7]. For instance, it is predicted that all state schools in the UK have operational CCTV systems to reduce violence and illegal activities [8]. CCTV cameras in educational institutions give parents and guardians the assurance that overall child safety and security is being taken seriously. Considering that a CCTV system is constantly watching its surroundings, it is one of the best applications to identify potentially risky and hazardous circumstances. In the past few years, numerous studies have been carried out in this area to identify such potentially dangerous scenarios. For instance, [9] developed a method for automatically identifying an attempted theft. The study [10] also used the CCTV network to automatically identify fires in buildings and in high-risk regions. In addition, police can use CCTV networks to identify automobiles on the road that are either stolen or have a history of criminal behavior [11]. This study aims to critically evaluate the existing studies in this domain and explore how CCTV can safeguard the students and employees' lives and working environments in the Northern Border University (NBU), Saudi Arabia. As a result, the deployment of CCTV systems in NBU is discussed from legal, cultural, religious, traditional, and technological aspects.

The situation of the CCTV deployment in a university in Saudi Arabia seems to be an important research topic from both the cultural/social and scientific viewpoints, considering what has been discussed above. On the other side, the educational institutes of the country seem to be in urgent need of more CCTV systems deployment. Social and cultural factors, especially those related to education, must be carefully considered by policymakers in order to achieve a more

balanced and successful plan. Overall, the analysis on the installation of CCTV systems in a university is innovative from both technological and social perspectives, and the conclusions could be beneficial to all educational institutes with comparable social and cultural frameworks. To achieve this goal, this paper makes multifold contributions: first, developing a new security policy containing 12 principles for using CCTV in NBU by combining the activity theory, international standards, and design science methodology; and second, categorizing the principles into three groups to be easily implemented and applicable to different educational institutes. The research paper identifies a research gap in the area of CCTV surveillance systems in educational institutions, specifically focusing on the case of Saudi Arabia. While the paper provides a comprehensive analysis of the challenges and policy recommendations for implementing CCTV systems in the Northern Border University, there is a need for further research to explore the actual effectiveness and impact of these systems on enhancing safety and security in educational settings. Additionally, future studies could investigate the perceptions, attitudes, and experiences of students, teachers, and other stakeholders regarding the use of CCTV surveillance in educational institutions, as well as its potential implications on privacy and ethical considerations. Understanding these aspects would contribute to a more nuanced understanding of the benefits and potential drawbacks of CCTV systems in the Saudi Arabian context and beyond.

The rest of the paper is organized as follows: the next section discusses the related work, followed by research methodology in Section III. Then, Section IV discusses not only the implementation of the CCTV policy, but also the practical, theoretical, and legal challenges of the policy. Next, Section V describes how the developed policy was implemented in the NBU clinic. Section VI presents the findings and discussions. Finally, the paper concludes in Section 6.

II. RELATED WORK

As stated earlier, the literature evaluation must consider a wide range of criteria that typically play a part in CCTV deployment to achieve the study's objectives. In particular, it is important to carefully study topics such as the crime hindrance component of CCTV deployment, permissible and ethical concerns, technological limitations, and cultural and religious contexts. The purpose of installing security cameras in homes, offices, schools, and other locations is a significant query presented in this study. By using a security system, businesses may be able to protect their assets from theft and other crimes by using a solution that could be comparable to the necessity for health insurance when the person is correct. In parking lots [12], in small enterprises [13], on buses [14], in public locations [14], as well as for security and criminal detection, CCTV systems have been a popular tool for ensuring protection against unwelcome situations. Note that CCTV systems are not regarded as an innovative approach to preventing crime. Since most CCTV systems established by the government only cover and monitor public areas, they are unable to prevent physical and sexual attacks committed in private spaces; they are, rather, well known to function in open spaces. CCTV cameras in such areas have a reputation for

detecting and identifying less serious crimes such as sudden heated arguments between people. But the police usually take a very long time to respond to these incidents, and these persons are only arrested much later [15]. The success of CCTV surveillance depends heavily on the human component when it comes to its deployment. When the most modern and efficient technology is considered, surveillance systems must be taken into consideration as well. This is exactly the case when the system depends on automatic non-human workers [16]. Because of the significance of operator attentiveness and the fact that the produced CCTV models overlook the perceptual cognitive activities associated to the operator's visual monitoring, it is understandable why many CCTV models do not function as predicted. Regardless of whether you are in favor of or opposed to the use of CCTV, the validity of such a surveillance system is a continuous concern. In a number of instances, according to [17], the personal freedoms of residents have been violated in favor of the installation of CCTV systems, which have been shown to be ineffectual at reducing crime [18]. A straightforward TV monitor created by Walter Bruch and deployed in 1942 in Germany to safeguard and keep an eye on the notorious V-2 rockets is thought to be the earliest known use of the CCTV technology. However, the technique was not accepted and employed on marketable grounds in the USA until 1949 [19]. These straightforward systems were primarily implemented in sensitive and logistical military locations, but they have since been shown to be quite useful for securing both companies and public areas. To retain the data acquired, crude reel-to-reel recording devices were subsequently devised in the late 1950s for the earlier versions of these cameras that had no recording capabilities. Manually switching the magnetic tapes turned out to be a time-consuming and expensive process. The widespread availability of video cassette recordings in the middle of the 1970s, which was swiftly merged into surveillance systems and provided a new application for the cameras, can be said to have been a significant development in the history of CCTV systems. With this technology, the cameras could be installed and left to operate independently, allowing reviewers to later evaluate the material captured. This technique had a drawback because the tapes needed to be replaced frequently or rewritten. Multiplexing and digital video recording, which emerged in the 1990s, made it possible to integrate and display video signals from various CCTVs on a single monitor. This development improved the effectiveness of CCTV systems and contributed to an increase in their appeal in virtually all sorts of businesses and public spaces. Additionally, since the turn of the millennium, digital technology has advanced enough to allow digital video recorders (DVRs) to replace VCRs, simplifying and improving the usability of CCTV systems [20]. To quickly identify and maybe prevent crime and disruption is a common objective of all CCTV monitoring systems. There have also been assertions that the mere presence of a CCTV monitoring system serves to reassure the people and serve as a deterrent, lowering their fear of crime [21]. CCTV systems also offer useful corporate management features, which may be used to safeguard employees and assist health and safety programs [22]. Additionally, it aids in investigations, gives authorities an important source of evidence, and can exonerate those who are not responsible [23].

Additionally, it can be useful in workplaces with unsuitable working conditions for production and control management. Data gathered by CCTV allows for the storage and later evaluation of all information. A CCTV system can be made to match any installation situation, whether it is indoor or outdoor, visible, or hidden, static or mobile, depending on the recording position. There are 5.9 million cameras in the UK alone, with 750,000 of those cameras placed in sensitive locations including schools and hospitals. This works out to around one camera for every 11 residents of the country. These cameras are set up in parking lots, roadways, airports, schools, and retail centers. This technology's primary goal is to keep an eye on behavior and prevent problems in numerous spheres of a person's life and activities [23]. According to estimates, all state schools in the UK have CCTV systems in place to deter

crime and illegal behavior [8]. CCTV camera installations at educational facilities give parents and guardians the peace of mind that the general security and protection of their children is being taken seriously. A CCTV system's best application would be to identify potentially hurtful and risky conditions because it is constantly watching its surroundings. In the past few decades, numerous research projects in this area have been carried out in an effort to identify such potentially dangerous scenarios. The research [9] for instance, suggested a system that would automatically identify an armed burglary. The study [10] used the CCTV network in a similar way to use automatic fire detection in buildings and high-risk regions. Police can also employ CCTV networks to detect automobiles on the road that are either looted or have a history of illegal activity [24]. Table I summarizes the key literature.

TABLE I. SUMMARY OF THE LITERATURE REVIEWED IN THIS STUDY

Author and year	Title	Framework	Findings
[25]	Security and the Political Economy of International Migration	A security paradigm analyzing policy development through a case-study approach	Policymaking in the United States, Germany, France, and Great Britain, four leading industrial states
[26]	Redrawing the line: Borders and security in the twenty-first century	Framework to monitor border security	Attempts to limit territorial access and border security
[27]	Airport screening, surveillance, and social sorting: Canadian responses to 9/11 in context	Framework to monitor airport conditions	The creation of a coordinated plan under the new Canadian Air Transport Security Authority, together with the use of Advanced Passenger Information (API) and the Passenger Name Record (PNR) as tools for tracing travelers (CATSA)
[28]	Security is coming home: Rethinking scale and constructing resilience in the global urban response to terrorist risk	Monitoring urban security to minimize terrorists' attacks	Worldwide urban resilience to terrorism threat
[29]	Surveillance, security and social sorting: emerging research priorities	Surveillance and security measures for social sorting	This framework has been examined and criticized for its impact on governance in general and civil liberties in particular.
[30]	China on the edge: China's border provinces and Chinese security policy	Security policy for Chinese frontiers border.	As a result, the country developed a security policy, a minority policy, and a border management policy.
[31]	European foreign and security policy: states, power, institutions, and American hegemony	European foreign and security policy	The actual making of foreign policy in institutions for security.
[32]	Using a deep convolutional neural network and surveillance cameras, scalable flood level trend tracking	Framework for Flooding control in Urban areas	This method is flexible and can be used in situations such as floods and different surveillance camera models without requiring on-site camera calibration.
[33]	Integrating the procedures of reporting port security incidents and the follow-up investigation to build a national maritime security policy: a case study in Mexico	National maritime security policy	To enhance port security measures in urban countries to report incident and follow the investigation
[34]	Pedestrian detection for advanced driver assistance systems using deep learning algorithms	To recognize pedestrian for advanced driver assistance systems using CNN	This technique is used in many applications such as surveillance. Advanced robotics, intelligent vehicles, advanced drivers Assistive Systems (ADAS)
[35]	The Making of Post-Socialist Citizens in South Korea?: The Case of Border Crossers from North Korea	Border Security from North Korea	Aims to capture the complex process through which former socialist North Koreans are remade as South Koreans.
[36]	An analysis of video Surveillance technology	Automated monitoring systems using cameras to monitor their surroundings.	The qualities, benefits, and drawbacks of various existing surveillance systems were compared, and the results are given in this study.
[37]	Geopolitics of security and surveillance in Nepal and Afghanistan: A comparative analysis	A comparative analysis for security and surveillance	Security logic presents specific racial and gender bodies as suspects and examines how individuals inhabiting these spaces experience, understand, and challenge these security regimes.
[38]	Assessment of Trans-Border Surveillance Strategies on National Security at Isebania, Migori County, Kenya	Framework for Border Surveillance Strategies on National Security	The purpose of this document is to provide a framework for implementing border surveillance strategies related to national security. Research has shown that modern and effective methods have been found to be effective and are recommended by researchers. There is a need for the country to adopt technology at its borders as well as deploy skilled personnel to manage it at the right time as soon as possible.

Despite the extensive literature on security policies related to CCTV systems, there has been very little research on issues with educational institutes in Arabic countries. In addition, to the best of our knowledge, no study has addressed yet the security policy for using CCTV systems in Arab Education institutes. Therefore, in this paper, we propose a framework for developing a security policy in this regard.

III. RESEARCH METHODOLOGY

The policy development for CCTV implementation has three main issues: first, people do not like to see their movements are recorded; second, sharing of this information in case of investigation, and third, every organization has its own distinguished organizational structure. This paper aims to propose a policy that can resolve all the above issues. Therefore, a combination of activity theory, international standards, and design science methodology is used to develop a new CCTV policy for NBU.

Fig. 1 presents the recommended structure for the CCTV policy of NBU. This paradigm emphasizes six key elements from both theoretical and practical standpoints. These locations serve as the overall perimeter and purview of the CCTV implementation within the NBU specifically, as well as throughout the kingdom's educational institutions generally.

A. Placement and Application of CCTV

This should be presented considering the theoretical concerns regarding the deployment and use of CCTV surveillance systems at NBU, as well as delicate subjects such as cultural and religious considerations.

B. Security and Risk Management

This will discuss several security issues and risk management concerns pertaining to CCTV surveillance in educational settings.

C. Legal Issues

The significance and necessity of the legal framework for CCTV surveillance systems will be covered in this article. This has proven to be a difficult task, particularly considering the religious and cultural foundations of Saudi Arabia's educational institutions. This section also contains legal paperwork from both the national and international levels in support of the deployment and implementation of CCTV systems.

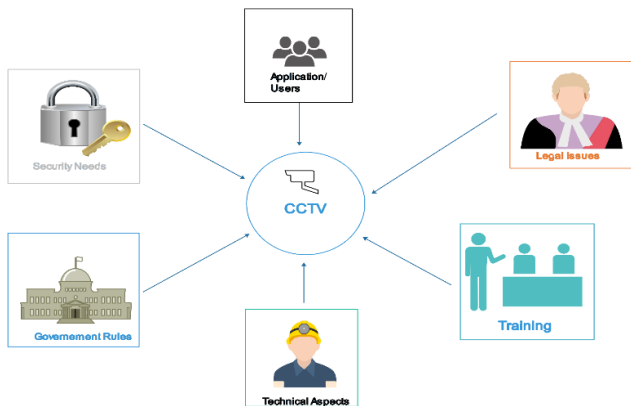


Fig. 1. Key elements from the practical and theoretical perspectives for the Northern Border University CCTV policy.

D. Technical Aspects

Technology limitations may be a factor in the difficulties that may arise with the implementation and deployment of CCTV surveillance systems in NBU. This section aims to pinpoint the areas where technical limitations can have a negative suggest the deployment of successful CCTV systems and to suggest methods in which technological development might significantly reduce these limitations.

E. Staff Developmental Training

This section tries to emphasize the significance of effective and practical training programs and the pertinent education needed to build a sizable workforce that is trained and accountable for supporting CCTV management. The proper certification obtained through education and training can increase employee productivity and knowledge of the delicate challenges associated with monitoring and controlling CCTV footage and evidence.

F. Governmental Rules and Policies about the Surveillance

The Saudi Arabia government is expected to develop a reasonable and practical set of policies for the placement, installation, and administration of CCTV surveillance systems in order to produce effective and efficient systems of surveillance in a university. This section discusses pertinent issues about the Saudi government's CCTV system protocol.

Considering these six key elements, the CCTV policy for the NBU is advised. The organizational structure and university culture provides the basis for these elements. All these elements collectively provide a standardization for the CCTV policy applicable to NBU. The working framework for the policy development is presented in Fig. 2.

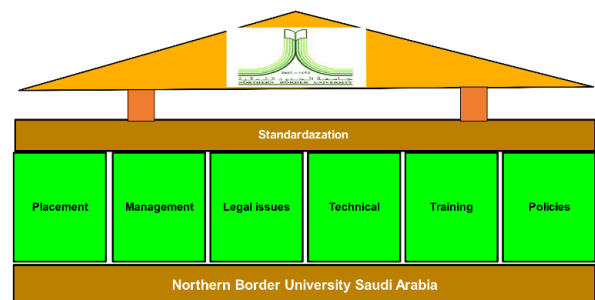


Fig. 2. Framework for the developing security policy for using CCTV in NBU.

IV. IMPLEMENTATION OF THE CCTV POLICY

This section provides the details related to the implementation and evaluation of developed CCTV policy. The practical and theoretical implications are also discussed in this section. In addition, the legal and ethical challenges are explained in this section.

A. Practical Implications of the CCTV Policy

There are two key issues that merit consideration when assessing the practical elements and ramifications of CCTV surveillance system deployment. The first is how CCTV deployment will be designed and developed in the future according to cultural, legal, and other sociopolitical factors. Secondly, how to implement the CCTV.

1) *Design facets of development:* The installation of CCTV surveillance systems in Saudi Arabia has so far raised questions regarding their efficacy and financial usefulness. Although there is often hostility to its placement in public locations, the popular perception of its potential to reduce crime may be favorable. Advanced technology and a culture with strong cultural and religious boundaries are a delicate combination that requires careful consideration. The government of the Kingdom of Saudi Arabia has so far managed to deal with difficult regimes. Modern technology has made it possible to install sophisticated cameras in public areas. Additionally, the deployment of mobile CCTV surveillance will be made much simpler soon when drone technology is fully standardized because considerations regarding camera placement would no longer be necessary. However, it appears that there is more at stake than just the technological feasibility and economic limitations of CCTV surveillance systems. As previously noted, the layout of CCTV surveillance and its upcoming development plans must closely follow the issues presented below:

- Considering the findings, several techniques must be used to combat the problem of misuse in surveillance. The first requirement is that ethical and management obligations and responsibilities are included in the staff's education and awareness programs. Second, hiring and educating more female employees can make a big difference in this circumstance. Finally, as the results of the literature review demonstrated, there were few and poor supervision hours and weekly frequency of all recorded films. It is the responsibility of the project manager or risk manager to ensure that there is an increase in service quality and supervision frequency to lessen the possibility of employee exploitation.
- According to the literature, 42.3% of highly educated individuals oppose the use of CCTV surveillance system. Thus, spreading correct and unambiguous information about CCTV technology and its possible advantages can greatly lower worry about CCTV.
- Concerns about protection and security, particularly those related to the incidence of crimes and thefts. The government has previously been successful in similar safety and security measures simply as the public recognized that the security risk was considerably bigger than other hazards related to CCTV controlling.

2) *CCTV development and governance:* Saudi Arabia is still developing the installation and use of CCTV cameras, but some common practices have been developed to effectively manage the technology. In the case of a new technology like CCTV, the arrival of regulation is closely tied to the process of technological dispersal (Wood & Webster, 2009). CCTV surveillance systems in Saudi Arabia are mostly based on UK and European standards, but a set of local regulations based on cultural and traditional values of the population is needed, especially for educational institutions.

The main goal of governance is managing various initiatives and activities efficiently and fairly; in other words, acting responsibly and being accountable and transparent. Policymakers shall adhere to all governmental policies and guidelines regarding the process of implementing and deploying a CCTV surveillance system at NBU. The deployment process should be documented at every stage, highlighting the regions that will be impacted and outlining the actual costs and advantages of the placement. Such paperwork must also outline certain potential upcoming developments, their advantages and disadvantages, and the procedures for their control. The public must have access to these documents and be able to comment on them.

NBU should work to create a center of excellence for the CCTV investigation protocol. The implementation and ongoing management of all CCTV systems at the institution must be completely under the control of this center. As previously stated, this center needs a respectable budget to carry out its delicate work of instructing students, offering training courses for staff, estimating the correct costs and paybacks of any deployment task, gauging the projects' actual efficacy, and lastly gathering and collecting valuable statistics for the calculation of threats and doubt arising from new projects in the future.

B. Theoretical Implication of the CCTV Policy

After being launched and executed, the project should be regularly validated. Conducting regular surveys of the participants is the finest method of project validation. Therefore, it is advised that a regular survey of students, instructors, and technical personnel be carried out. The outcomes will assess the efficiency of all 12 principles of CCTV surveillance. The policies, infrastructure, and training will all be updated as necessary to reflect the findings and results in the services.

C. Legal and Ethical Challenges of the CCTV Policy

The widespread use of CCTV has always prompted certain moral and legal concerns. Additionally, the widespread misuse of CCTV footage and the absence of ethical guidelines around "dumb" CCTV surveillance have both been shown in many instances. As a result, it is only reasonable to say that the broad adoption of such CCTV systems would not be supported by the entire populace and would be closely scrutinized in terms of how the data gathered by CCTV. The current legal framework for the control of CCTV data is relatively constrained and largely focused on data protection laws, which are not the best fit for CCTV data. In a similar vein, the evolution of Japanese data security has demonstrated that CCTV is subject to very lax data security regulations. Despite the fact that CCTV installations are becoming more and more common in Japan (placed in public, semi-public, and even semi-private spaces such as office cafeteria areas), this issue is still not seen to be a problem and is not adequately regulated [39]. Strict rules and regulatory measures are now both required and desirable since the number of CCTV systems in public locations throughout the world has been increasing exponentially. Regulators will be less effective if a nation is not committed to protecting privacy and does not have the institutional safeguards to safeguard it [18]. In essence, according to [18], CCTV surveillance has

changed the notion of privacy, which has made the job of regulators and attorneys in most European nations more difficult. By doing a comparable assessment on data privacy and legislation in Africa, [40] demonstrated how underdeveloped the continent is at the moment. The study has concluded that because of Africa's lack of self-governing experiences, its collectivism culture, and its solid religious heritage, the continent continues to lag far behind the legal status of Europe in terms of the implementation and effective use of CCTV cameras in open places. This is done by considering issues such as data privacy policies, culture, and religion. Other ethical concerns with CCTV surveillance include the lack of reciprocal eyes, which occurs when the subject of the monitoring is unaware that he or she is being watched and/or who is doing so. Data are compiled with an increase in interest from unauthorized parties, hence exacerbating the privacy problems as smart CCTV systems with facial detection are implemented.

V. IMPLEMENTATION OF DEVELOPED POLICY IN THE NBU CLINIC

The developed CCTV policy can be implemented for several fields of NBU. For example, a CCTV was installed for the NBU clinic to monitor and record the patients. The purpose of implementing the CCTV Policy for the clinic of BNU is to ensure the safety and security of both patients and staff at the clinic. This policy outlines the measures that will be taken to ensure the security of the clinic, including the installation and use of CCTV cameras and video recording systems. These measures will help to deter any criminal activity and provide a safe environment for both patients and staff. Additionally, the policy will ensure that the clinic is compliant with all relevant laws and regulations. Fig. 3 shows the details and implementation of the CCTV policy for the NBU clinic.

Policy statement	<ul style="list-style-type: none"> This policy will cover the CCTV surveillance system in the NBU clinic. It will ensure a fair and secure use and implementation of the CCTV. This policy will cover all the equipment, software, technical staff, users, authentication, authorization, and any other issues related to the CCTV surveillance system in the NBU clinic.
Users	<ul style="list-style-type: none"> This policy will cover the use of the CCTV surveillance system. It will ensure the rights and authentication of the users. It will also distinguish among the manager, authorized users, and patients in the clinic.
Management and Maintenance	<ul style="list-style-type: none"> It will be the responsibility of the authorized technical team to manage the security of the CCTV system, its maintenance, and 24/7 availability. They will also ensure the backup, recovery, and availability of the data at the time of need.
Training	<ul style="list-style-type: none"> The NBU managers will make the arrangement to provide necessary training to the users of the CCTV surveillance system, managers, IT staff, and other relevant personnel.
Policy Update	<ul style="list-style-type: none"> The management of NBU will review the NBU clinic surveillance system time to time and will make necessary modifications according to changing requirements.

Fig. 3. CCTV implementation in the NBU clinic to monitor the patients and security.

VI. FINDINGS AND DISCUSSION

To protect kids, the Saudi Arabian Ministry of Education reportedly declared that 33,000 schools across the country would soon have CCTV camera systems installed. This initiative's primary goal is to encourage a culture of safety and security among instructors and pupils as well as among the private security guards who might be employed to enforce safety standards. Additionally, there are 5 million students and 700,000 teachers in Saudi Arabia, who are carrying out their jobs in their institutes. If these measures are successful, this will significantly increase the personal safety and security of one-third of Saudi students and teachers. The installation of CCTV surveillance systems is therefore highly wanted in Saudi Arabia due to the country's developing infrastructure and industry.

However, most evaluations have produced ambiguous and conflicting conclusions when taking into account the situation studies of CCTV efficiency in the United State and European countries [41] [42]. However, in brief, as most academics have argued, the issue of whether CCTV systems might be useful should be taken into account in conjunction with a wide range of social, cultural, legal, economic, and religious aspects influencing our recent existence [43] CCTVs are expected to be installed in Saudi Arabia's most significant regions, including educational institutions.

The NBU is advised that in the short-term certain norms of conduct should be adopted by the personnel who are engaged in all aspects of CCTV surveillance. As a result, the 12 guiding principles listed below are ideal places to start when it comes to establishing CCTV surveillance at NBU in the first place. In Fig. 4, these principles are classified and summarized in a way that is easy to understand.

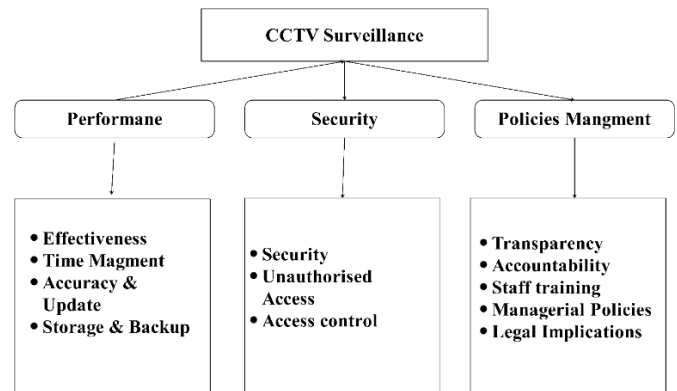


Fig. 4. Categorization of the key principles for implementing, securing, and evaluating the policy.

- **Effectiveness:** To protect the public, CCTV surveillance cameras should be deployed as effectively as possible to promote public safety and law enforcement.
- **Time Management:** A CCTV surveillance camera system must only ever be used for a specific purpose with the legal intent to deter crime.
- **Accuracy and Updates:** An accurate and current database should be used to support any surveillance camera system.

- **Storage and backup:** Images and other types of information should only be kept for a specific amount of time before being deleted entirely.
- **Security:** It is important to carefully assess and reevaluate on a regular basis how using a surveillance camera system may indirectly affect people and their privacy.
- **Unauthorized Access:** Images and data from surveillance cameras should be saved private and safe to prevent unwanted access and usage.
- **Access Control:** Any access to saved data should be controlled, and stored data should only be disclosed when it is required for a specific purpose or for rule execution.
- **Transparency:** When deploying a surveillance camera system, transparency must always be practiced regardless of any individual or private gain.
- **Accountability:** There must be clear accountability for all activities employing surveillance camera systems, including the collection, saving, and utilization of images and data.
- **Trained Staff:** CCTV system operators should be fully trained and qualified in order to handle technical, operational, and competency standards relevant to a system.
- **Managerial Policies:** Before using and deploying CCTV cameras, managers or supervisors have a responsibility to provide clear rules, regulations, and procedures.
- **Legal Implication:** To guarantee that all legal requirements are properly followed in practice, a regular review and auditing mechanism should be in place. This policy is developed by considering the requirement of the security management team. All the factors from design stage to the implementation and evaluation stages are considered in this policy. To make the implementation process easier, a comprehensive list of principles is categorized into three categories. These categories cover the different actors from top management to security staff. This policy is applicable to NBU as well as any educational institutes governed by the Ministry of Higher Education in KSA. The policy is critically analyzed and evaluated to check the social challenges, security measurements, authorization, and the roles offered to the human actors. Thus, the categorized principles will help the organizations to implement the policy for implementation of CCTV systems in their environment.
- Upon analyzing the findings and engaging in thorough discussions, it becomes evident that there is a need to address the identified research gap in the field of CCTV surveillance systems. While previous studies have explored the effectiveness of such systems in various contexts, there remains a lack of comprehensive understanding and evaluation of their performance, particularly in the specific setting of educational institutions. Therefore, this research aims to bridge this gap by providing a detailed analysis of the implementation and impact of CCTV surveillance systems in Saudi Arabian schools. By investigating the challenges, benefits, and implications associated with their deployment, this study offers valuable insights into enhancing the safety and security measures in educational environments. The findings shed light on the unique considerations and potential improvements required to ensure the successful implementation and operation of CCTV systems in schools, thereby advancing the state-of-the-art in this domain.

VII. CONCLUSION AND FUTURE WORK

In this paper, the authors evaluated different challenges in implementing the CCTV surveillance system, in general, and KSA. According to the guidelines of the Ministry of Higher Education of the Kingdom, a detailed CCTV policy was advised in this study for the Northern Border University keeping in view all the challenges of the sharia, culture, and educational institute requirements. The policy also considered the requirements of the key stakeholders as well as the students and staff members. The policy was made based on the standard principles that were categorized into three classes: performance, security, and policy management. In the security section, the aim was to maximize the benefits of the surveillance system and, at the same time, ensure data security. If this policy is implemented in all its aspects, it will not only ensure the university's safety, but also build trust in the stakeholders. Exploring emerging technologies, such as machine learning and video analytics, can also be a promising area for future research to enhance the capabilities of CCTV surveillance. Furthermore, investigating the long-term effects of CCTV implementation, including any unintended consequences or potential privacy concerns, would contribute to a more holistic understanding of its implications. Lastly, considering the perspectives of various stakeholders, such as students, teachers, parents, and policymakers, can provide valuable insights into the acceptance and effectiveness of CCTV surveillance in educational environments. These future research directions will contribute to the ongoing development and improvement of CCTV systems in educational institutes.

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