# The Advantages of Application of Preservative and Security Systems in Banks

Rouhollah Hakemifar

MA of Industrial Management, Managing Director, Consulting Engineers of Horizon Design and Development Company, Iran

**Abstract:** In today's world, the more expanded the urban life and industries get, the more complex and widespread the dangers and different forms of crime. Therefore, the methods adopted to prevent such dangers must be varied. The leading method for doing this has been using electronic security systems which have expanded into intelligent security systems due to the growth of technology and IT. Accidents may happen due to a wide range of human errors created by personal traits resulting in errors and conditions, which can be prevented by security systems. Two sets of factors can lead to accidents: direct (insecure actions and conditions) and contributing (physical conditions and management policies). Each accident is evaluated in terms of human force, machinery, physical conditions, and social setting. Another main hypothesis put forth in the present study is investigating the impact of security systems on the productivity of the banks measured through productivity indexes and theories. The findings revealed that:Using security systems influence banks and the society from various social and economic perspectives.Electronic security systems facilitate fulfilling the managers' tasks in all organizational levels.Online control, shorter control periods, and economizing energy and time are the main advantages of such systems. If the importance of using security systems on the whole bank systems is clear, they could have positive psychological impacts on staff, leading to more peaceful conditions for them during working hours.If banks are equipped with smart security systems, security will increase.Standard security systems can help security officials better detect crime.Based on this study, it was revealed that using security systems improves productivity considerably. A smart security system includes: CCTV systems, fire alarm, and alarm systems. Incorporating these systems while following standards in each system is the key factor in choosing such systems.Security systems can be a preventive factor in banks and if an accident happens, it could be researched.

## Introduction

In today's world, due to the expansion of urban life and industries, various forms of crime, dangers and threats are complex and widespread, making prevention methods change and improve. The main technical strategy in security systems engineering and security technology formed through the development of IT in security systems is the total smart security system and security control centers.

Purposes of the study

Various purposes are served in using security and alarm systems in banks, including:

- Boosting security and safety in banks and the area
- Reducing current variable costs
- Increasing accuracy and speed as well as reducing errors resulting from using smart systems
- Improving human force and staff performance
- Facilitating the middle and top executives' tasks
- Saving time and energy
- Online and synchronized access of the managers to the banks (virtual presence)

- Improving the quality of the service provided to the customers and increasing the accuracy of reports submitted to the managers
- Keeping and increasing peace and morale among staff and customers
- Managers' access to statistical objectives

## Literature review

Regarding the advantages of using electronic security systems, a number of studies have been conducted inside and outside of Iran. Moreover, particular methods for protecting banks according to universal standards have been proposed by several credited European companies. However, regarding the evaluation of the influence of such technology, no body of literature was found.

## Definition of the issue

As technology improves and total electronic security systems are used, banks gain the possibility of preventing crime as well as searching for and identifying criminals.

In this study, a particular method for protecting banks is introduced and the importance and advantages of using such systems are discussed.

Lack of accurate monitoring, failing to observe standards, using low quality systems are the most

important problems in developing these systems in Iran.

This study tries to justify and highlight the advantages of the use of such systems.

**Issue presentation**

Generally speaking, using security systems is economical and, in other words, it is worth it to be invested on since it can meet the expectations. Over the past years, security has been frequently threatened and the number of robberies has increased dramatically. Now the question is how we can improve security through the use of electronic security systems (e.g. CCTV, fire alarm, alarm system), so that it eventually leads to more productivity. Using such technology help managers achieve goals such as providing better service to customers, cutting down on costs including giving salary to human forces and the police. They can also benefit from constant monitoring through these systems which eliminate the need for physical presence to monitor each branch of the bank. Another advantage is that they can respond to customer complaints more easily.

**The necessity and reasons of choosing this issue**

Over the past years, all banks were required by the Ministry of Interior and the police to be equipped with total smart security systems, and since there were no standard pattern in using such systems and since managers have to be informed about the benefits of these systems, we decided to explore this plan in depth.

**Significance of the study**

All bank networks can be considered as the beneficiaries of the results of this study. This study can be used as a scientific tool for the police and banks and as an incentive to use such systems in all parts of the society including financial institutes.

**Hypotheses**

- Using security systems improves safety in banks.
- Using security and protective systems improves productivity and economizes on costs.
- Operated following all standards, security systems facilitate the managers' tasks.
- Using a security system particularly designed to be used in banks can save time and energy and boost human morale.

**Methodology**

In order to test the first hypothesis, the number of events is sampled in 2 populations (equipped and unequipped branches) and then the average number of events in both populations is estimated.

Other hypotheses are tested through questionnaires and interviews done by physical security experts. The evaluation is quantified by assigning numerical values to each question.

**Theoretical framework and literature**

**The place of safety**

Safety is considered as a universal desire to eliminate factors contributing to injuries. As a concept and action for controlling losses, injuries, and harms happening to people and their belongings, safety has changed into a complicated methodology although this concept does not have a firm theoretical basis since, like other developing sciences, it is in a transition phase.

Since safety is considered as a factor for reducing, controlling, or eliminating accidents in the workplace or other parts of the society, preventing accidents from happening is a crucial phase in improving safety. Nowadays, organizations are under much pressure to improve their safety. This pressure includes economic, social, and governmental rules. Understanding the causes of accidents is a prerequisite of improving safety. In Iran, the police have been forcing financial institutes and unions to use electronic security systems.

Over the past years, accident researchers have been trying to develop theories preventing from causes of accidents which fall into two main models:

1- The behavioral model
2- 2- the conditional model

In behavioral models, the human is considered as the main cause of accidents, while in conditional models, the interactions between the human and the conditions are taken into account in examining accidents. There are a large number of variables which influence the conditions of the accidents and are difficult to evaluate due to lack of enough knowledge.

If all elements contributing to accidents are well-identified and quantifies, it might be possible to quantify the interactions contributing to the accidents. Until a few years age, all existing theories regarding accident causes were quantitative, therefore, they were not used in controlling and preventing from accidents.

Measuring is a key prerequisite for control and prevention. Tarrant describes current attempts in controlling accidents as trial-error due to a lack of proper controlling tools for evaluating their efficiency. Therefore, by using statistics and quantifying variables contributing to accidents, they can be prevented.

**The importance of safety**

The importance of safety is so clear that all small and big companies realize that in order to prevent from accidents, they have to invest in it. Moreover, the employees have also realized the importance of safety and are ready to invest and cooperate in all aspects. Therefore, in most industrial countries, the employees in companies allocate some part of their salaries to

safety. Almost a considerable part of heavy and international industries consider safety, prevention, and high safety standards as a way to develop friendly ties among employers, employees, and consumers and as a factor to expand their goods and service markets.

The existing statistics regarding accidents do not show dangers, the costs of consequences of postponing actions, pauses in production, emotional and human effects, and chaos in work order. These side effects are not clearly covered in accidents statistics while safety experts believe that in safety, the emotional and human consequences are much more disastrous than economic costs.

Creating and keeping safety in the workplace is an important requirement of organizations, done by managers in all levels (top, middle, and operational), especially in industrial societies. Setting safety rules and regulations and proper methods for enforcing them are one of the main responsibilities of the managers.

The managers' responsibilities regarding safety first include planning and decision-making, then providing incentives and solutions to follow rules, and finally facilitating operational actions based on safety priorities and making sure the predicted methods are done properly and based on the needs. However, in some cases planning safety is assigned to the supervisors who, due to lack of enough knowledge cannot improve safety and, consequently, this responsibility is shifted to top managers.

**Management and its role in safety**

Most problems resulting from not observing safety standards and great losses happening to light industries and manufacturing centers in the early 20<sup>th</sup> century were due to the indifferent attitudes of top managers toward safety. During the early years of the 20<sup>th</sup> century, physical injuries and accidents were the biggest problem of industries. In the U.S, 500 out of each 1 million producers die each year. Most industrial countries have been facing similar numbers of accidents. Moreover, the number of people injured or handicapped in most industrial countries in the early 20<sup>th</sup> century does not exist. Although most losses are financial, what is clear is the key and constructive role of management in safety. The complicated features of industry and technology and services in today's societies demand the attention of managers to safety matters. Enormous investments made in nuclear plants or explosive storehouses and aeronautics industries are evaluated in terms of keeping safety in the workplace and often at the highest levels of management.

According to safety experts, the responsibilities of the management at any level regarding safety are based on a number of principles including:

1- The leadership and management responsibilities
2- The social responsibilities
3- The legal responsibilities
4- The moral and human responsibilities

**Management and the safety culture**

Protecting human lives and souls is one of the most important concerns of macro-managements in every society. In order to protect human lives and prevent from dangerous accidents and to improve safety at different levels, extensive planning is conducted in manufacturing factories, service sectors, public places, etc., which are all beneficial to the society, employers, employees, and the public. CCTV systems, fire alarm and extinguishing, alarm system, transportation control, automatic doors, pedestrian overpasses on busy street, water treatment, lighting in roads, equipping industrial machinery with safety equipments, equipping staff with safety equipments and thousands of other actions performed to protect human lives and souls are examples of improving safety. Fortunately, both in general conditions and industrial, service, and office workplaces actions for preventing from accidents, improving safety, and equipping places with safety equipment are expanding and improving. However, improving safety culture requires a considerable degree of attention.

Making sure that the public recognizes the disastrous consequences of not observing safety rules is one of the main concerns of improving the safety culture.

The safety culture generally involves the knowledge and understanding a society possesses regarding accident prevention.

Whenever a study regarding improving safety is conducted and asks about safety initiatives, the managers of organizations and industries and safety experts provide a list of these initiatives typically including providing equipments, training as to how to use those equipments, and guides to prevent accidents. This shows a lack of careful attention to improving the safety culture. Safety culture involves knowledge of the importance of safety and preventing from any activities which are against safety standards. If the safety culture is internalized in a society or a workplace, the management succeeds in improving safety by keeping and boosting the staff's culture and beliefs. To do so, the managers must hold firm beliefs regarding safety standards.

A fundamental problem in our country is a lack of proper safety culture among top executives of especially financial institutes. This problem has 3 aspects:

1- The managers do not or hardly accept to adopt safety systems and refuse to invest in this regard.

2- The police have been forcing banks to use these systems, which, in near future, might work.

3- If a bank is equipped with a smart security system, they do not try to improve the safety culture among their staff.

**Analysis of security systems in banks**

Control and security systems not only cut down on personnel costs but also enable managers to fully monitor and control the banks. This is reflected in the indispensible, firm and developing place of these systems among industrial, financial, official, and social centers in the world, including Iran. Dramatic changes and developments in the communication technology and information transmission paths, as well as the possibility of incorporating several systems have made the use of such systems more convenient. Due to similar needs and problems most organizations around the world are facing, and since there are solid standards in this regard, using these standards provides a proper path to choose the best solutions and equipments.

Central information archiving, transmitting information through local networks, regular phone lines, and high-speed telecommunication lines, transmission automation, remote access to all facilities of the system (planning, level of access definition, etc.) are the main features of these systems and the main reasons of their popularity in banks, traffic and road control systems in Europe and America. In planning the system and choosing software and hardware, it is crucial to consider all needs as well as the possibility to be expanded among all parts of an organization. Therefore, it is vital to choose a modular system so that it is possible to equip different parts of an organization separately and in proper time rather than equipping the whole organization.

Some of the main existing security and monitoring systems commonly used in the Iranian banks are:

1- CCTV
2- Alarm systems
3- Fire alarm systems

**CCTV**

Developing and implementing CCTV systems in various industrial, financial, military, business, and residential applications are used in order to have control on the surroundings and improving image recording and transmission through different paths.

Investigating the process of development and evolution of productions and the solutions provided by pioneering CCTV makers shows that over the past years, there have been remarkable advances in the options and facilities of these systems. They have produced such novel improvements as smart systems, incorporating several systems, the possibility of having access to all systems with one tool, improving the quality of recording, information classification for easy access, using the system by different users (management, control and monitor), remote control of the systems through various paths, centralizing information, information transmission automation, modularity of the systems, improving options if needed, etc.

**Methodology**

**Determining sample size to estimate population mean ($\mu_x$)**

Data with interval and ration scales are averageable. For these types of data, the mean interval estimation is used to determine the sample size:

$$\overline{X} \pm \varepsilon \Rightarrow \varepsilon = Z_{\frac{\alpha}{2}} \sigma_{\overline{x}} \qquad (4\text{-}2)$$

$$\varepsilon = Z_{\frac{\alpha}{2}} \frac{\sigma_x}{\sqrt{n}} \qquad (4\text{-}3)$$

Since the widths of all confidence intervals are twice as large as this value, if the SD is considered as constant value, the only way to reduce the intervals width is to reduce the SD. Therefore, since the SD of $\overline{X}$ is $\dfrac{\delta_x}{\sqrt{n}}$ and $\delta x$ is a constant value, the only way to achieve a smaller SD is to choose a larger population. However, how large must this population be? The sample size depends on $\delta x$, confidence level, and the desired width of the confidence intervals.

When sampling is conducted with replacing from a limited population or without replacing from an unlimited population, in a way that it guaranteed ignoring the modification of the limited population, if the 4-3 equation is solved for n, we will have:

$$n = \frac{Z_{\frac{\alpha}{2}}^2 \sigma_x^2}{\varepsilon^2} \qquad (4\text{-}4)$$

If sampling is conducted without replacing from a limited population, it is required it modify the limited population. Therefore,  must be defined with modification factor, $\sqrt{\dfrac{N-n}{N-1}}$ :

$$\varepsilon = Z_{\frac{\alpha}{2}} \frac{\sigma_x}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}} \qquad (4\text{-}5)$$

Which, when solved for n, will be:

$$n = \frac{N\, Z_{\frac{\alpha}{2}}^{2}\sigma_{x}^{2}}{\varepsilon^{2}(N-1) + Z_{\frac{\alpha}{2}}^{2}\sigma_{x}^{2}}$$

(4-6)

If we could ignore modifying the limited

population, 4-6 will reduce to 4-4.

Knowing the value of $\sigma_{x}^{2}$ is required for determining the sample size. However, as it was mentioned before, the SD of the population is unclear for estimating $\mu_{X}$. Therefore, $\sigma_{x}^{2}$ must be estimated. Common ways of estimating $\sigma_{x}^{2}$ are:

We could take the preliminary sample from the population and calculate the SD and use it as $\sigma_{x}^{2}$. The observations used in the preliminary sample could be considered as a part of the final sample. So that:
n (estimated sample size) – n₁(preliminary sample size)= n₂ (the number of observations needed for completing the sample)

(4-7)

3- The estimations of $\sigma_{x}^{2}$ might be available from other studies.

If evidence support that the population is virtually normally distributed, it could be concluded that the domain width is almost 4 0r 6SD and $\sigma_{x} \approx \dfrac{R}{4}$ or $\sigma_{x} \approx \dfrac{R}{6}$. R is the range of changes the estimation of which requires the availability of the largest and the smallest variables in the population.

**Determining the sample size for this study**

If a study involves statistical work, the sample size must first be determined. Considerable care must be taken in determining the sample size because choosing a sample larger than required leads to a waste of resources. While taking smaller samples often lead to results which are impractical. Therefore, we discuss how to determine the sample size. The formula for determining the sample size depends on what is required. Typically, sample size formulas are related to those data scales which are categorized

qualitatively and quantitatively. We present methods for determining the sample size using mean estimation.

**The mean population comparison test**
**The methodology of the study**

In this study, the first hypothesis was tested by using two populations in each bank (equipped and unequipped) and, after determining the sample size and the type of distribution, the frequency of events in each population is calculated so that safety is quantified. Then, using statistics and the test for comparing the mean of two populations, the hypothesis is proved. Data were gathered using library research and the types and numbers of events were calculated using questionnaires and interviews.

The methodology adopted here is a non-examinational one which involves an error-based experimental research in which the researcher does not have direct control over independent variables since they have already occurred and cannot be manipulated. By simultaneous changing of the dependent and independent variables, without direct intervention, conclusions are made regarding the relationships among variables (Kerlinger, 1981).

Since the present study was conducted to investigate the role of using security systems in banks and their importance in today's world, the descriptive method is adopted because it is tried to describe conditions as they really are.

The other hypotheses were tested using productivity tables and questionnaires. A number of indexes were selected out of 50 influential ones and, using these questionnaires, the productivity, mean, and median were calculated.

**Population**

The population consisted of 2 banks, bank No. 1 (with 1800 active branches) and bank No.2 (with 1700 active branches). The information for the first bank is divided into two populations until October 2005:

1- The population fully-equipped with security systems (200 branches)

2- The population partially-equipped (1600 branches)

And the information for the second bank is divvied into two populations until October 2005:

1- The population fully equipped with security systems (150 branches)

2- The population partially-equipped (1550 branches)

**Sample**
**a)** Sample for the first hypothesis

Since this study is supposed to be highly reliable, the first hypothesis was tested using the statistics related to the number of events over the past three years recorded by security experts in two banks. The events having happened at 21 fully-equipped and 100 partially-equipped branches belonging to the first bank and 18 fully-equipped and 120 partially-equipped branches belonging to the second bank were tested.

**b)** Sample size for testing other hypotheses
Given the definition provided of the population, the number of informant experts in each bank was 5. 5 experts were selected from companies designing and installing the security system in banks, making the sample size 15.

**Measuring tool:**

Proof:
1- Hypothesis

2- 2- test statistic                claim:

Contradiction:

$$\begin{cases} H_0 = \mu_1 < \mu_2 \\ H_1 = \mu_1 \geq \mu_2 \end{cases}$$
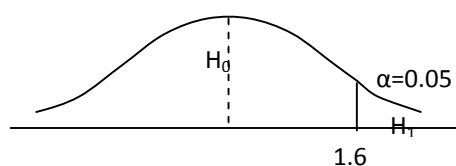
$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{\delta_1^2}{n_1} + \dfrac{\delta_2^2}{n_2}}} = \frac{(1/61 - 5/79) - (1/58 - 7/59)}{\sqrt{\dfrac{23/13}{21} + \dfrac{357/21}{100}}} = \frac{1/83}{2/18}$$

$$\Rightarrow \quad z = 0/839$$

3- Critical point $z_\alpha = z_{\%5} = 1/64$

4- Decision-making



Comparing the t statistic with the critical value reveals that the t statistic is in $H_0$. Therefore, at the %95 confidence interval, it could be said that the number of events in equipped branches is smaller than that of unequipped ones.

**Proving the second, third, and fourth hypotheses based on the information taken from the productivity questionnaire**

The number of events is taken from the information in banks; however, the influence of security systems on productivity was quantified using standard tables and questionnaires. It should be noted that in order to get better results and adjusting the questionnaire with the purposes of the study, a number of modifications were made in the questionnaire and its indexes.

**Findings**
**Proving the first hypothesis based on the information taken from the bank**

First, we investigated events in 18 fully-equipped branches and 100 partially-equipped ones to get $\delta_x$ and $\varepsilon$, so that we can get the actual sample size. After that the researcher has continued the hypothesis confirmation.

The security indexes influencing productivity are extracted from the table of indexes assessing productivity in the organization. Then, these indexes are analyzed to achieve the questionnaire for the influence of security systems on the productivity of the banks.

This questionnaire was given to 15 experts (5 from bank 1, 5 from bank 2, and 5 from designing and installing companies). The analysis of the answers to each question and the results are presented in the form of tables and graphs.

In this study, in order to prove the qualitative indexes using the questionnaire and interviews developed, for the central index, the mean or icon were determined using the SPSS with %95 accuracy, since data were ranked.

1- hypothesis     contradiction
$$\begin{cases} H_0 : \mu \le 3 \\ H_1 : \mu > 3 \end{cases}$$
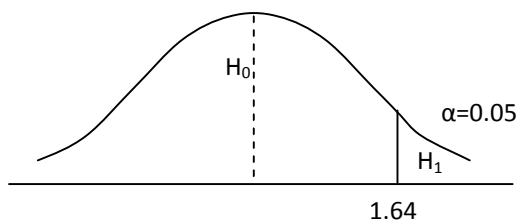                              Claim

2- Test statistic
$$z = \frac{(\bar{x} - \mu_0)}{S_{\bar{x}}} = \frac{3/6676 - 3}{\dfrac{1/2176}{\sqrt{15}}} = 2/07$$

$$\Rightarrow z = 2/07$$

3- Critical point
$$z_\alpha = z_{\%5} = \pm 1/64$$

4- Decision-making



After comparing the test statistic with the critical value, it is revealed that the test statistic is within
$H_1$. Therefore, at %95 confidence level, it could be concluded that $H_1$ is proved, indicating an increase in productivity.

**Testing the third hypothesis**
Questions 1 and 2 (indexes 2 and 11-1), 8 (index 16-5), 16, 17, 18, and 19 (index 23) and 20, 21, 22, 23, and 24 (index 32) are particularly related to the hypothesis of facilitating the managers' tasks. The calculations show that the average of the responses is greater than 3. Therefore, the hypothesis is proved.

**Testing the fourth hypothesis**
Questions 16, 17, 18, and 19 (index 23), 20, 21, 22, 23, and 24 (index 32), and 30 and 31 (index 2 and 39-1) are associated with saving time and energy. The calculations show that the average of the responses was greater than 3. Therefore, the hypothesis is proved.

**Conclusions and suggestions**

**Conclusions drawn from hypothesis 1**
Given the values calculated in two populations of bank 1, the first population including equipped branches:

$$(\mu_1 = 1/58 ,\ \overline{X}_1 = 1/68 ,\ \delta_1 = 1/11 , n_1 = 21,\ N_1 = 200)$$

And the second population including unequipped branches:

$$(\mu_2 = 6 ,\ \overline{X}_2 = 5/79 , \delta_2 = 18/79 , n_2 = 100,\ N_2 = 1600)$$

The calculations proved the hypothesis. So we can say with %95 confidence that the average number of events in equipped branches is fewer than those in unequipped branches, which means $\mu_1 < \mu_2$. All values taken from the Sepah Bank also prove this hypothesis.

**Conclusion based on hypothesis 2**
According to the productivity tables and the indexes influenced by using security systems, all responses serve to prove this hypothesis. It was proved that the average responses were greater than 3.

**Conclusion based on hypothesis 3:**
Some parts of the indexes 11, 16, 23, and 32 are directly related to facilitating the managers; tasks. Given the fact that most responses to these indexes were positive, this hypothesis is also proved.

**Conclusion based on hypothsis 4:**
Indexes 23, 32, and 39 are associated with saving energy and time, and index 19 is associated with the influence of these systems on the calmness among clients and the staff. Almost all responses prove this hypothesis.

**Other results**
In today's world, as urban life develops and industries expand, dangers, threats, and crime become complicated, too. Therefore, they require various forms of prevention. The leading strategy has been using electronic protection systems giving rise to total smart security systems as technology and IT improve.

Accidents occur due to a wide range of human errors resulting from personality traits and conditions contributing to errors.

Two sets of factor contribute to accidents: direct ones (unsecure actions and conditions) and contributing one (physical conditions and management policies).

Each event is quantified based on human forces, machinery, physical setting and social setting. Another issue investigated by the present study is the influence of using such systems on the productivity quantified by productivity indexes.

Using security systems influence banks and the society from various social and economic perspectives.

Electronic security systems facilitate fulfilling the managers' tasks in all organizational levels.

Online control, shorter control periods, and economizing energy and time are the main advantages of such systems

If the importance of using security systems on the whole bank systems is clear, they could have positive psychological impacts on staff, leading to more peaceful conditions for them during working hours.

If banks are equipped with smart security systems, security will increase.

Standard security systems can help security officials better detect crime.

Based on this study, it was revealed that using security systems improves productivity considerably.

A smart security system includes: CCTV systems, fire alarm, and alarm systems. Incorporating these systems, while following standards in each system, is the key factor in choosing such systems.

Security systems can be a preventive factor in banks and if an accident happens, it could be researched.

**Suggestions based on the findings**

**Suggestions regarding improving security in banks (1st hypothesis)**

According to the analyses, a factor improving security is using standard security systems especially designed for financial networks. In Iran, a majority of banks are being equipped by security systems; however, since little attention is paid while choosing such systems, and since too much attention is paid to the price instead of quality, in most cases, they do not have the ability to detect crime and banks equip their branches only to evade responsibility and respond to the police. Moreover, it is suggested that banks use expert guide in choosing the equipment or hold special training courses for their staff so that they can technically compare such systems.

**Suggestions regarding improving productivity in banks**

In order to improve productivity in banks, these equipments must be monitored constantly. Therefore, it is suggested that these systems should be smart and designed so that they help the staff in the best way to improve productivity.

**Suggestions regarding facilitating the managers' tasks (the third hypothesis)**

Since keeping safety is the manager's responsibility, it is suggested that while carefully investigating the selected system, in situ monitoring and recording be planned so that the information is recorded in archive. Using a trusted and high-sped path improves mentoring and control on branches.

**Suggestions regarding saving time and energy and improving morale**

Planning in reducing time and energy wasted by managers and staff can improve the function of any banks. It is suggested that managers and staff possess up-to-date information about these systems and how they work. It is also suggested that, prior to installing such systems, all staff get trained regarding the advantages of these systems so that they develop positive attitudes toward these systems and do not consider them as intruders to their privacy.

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