REDUCING FEAR OF CRIME THROUGH DESIGN AGAINST CRIME II

Conceptualization and pre-evaluation of a community based security system

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Abstract: As part of Chiba University's Post Urban Living Innovation program, the present research focuses on a Design Against Crime process with the goal of improving the levels of fear of crime and the general crime situation of a local Mexican urban community. As part of a crime prevention intervention, the prototype of a community-based security system is conceptualized, tested, and evaluated by both community members and criminal offenders in order to provide insight for the further development and future long-term implementation of the proposed system and its various elements.

Keywords: Design Against Crime, Fear of Crime, Security Service, Security product, Community

1. Introduction

Chiba University's Post Urban Living Innovation program, PULI, proposes the use of technology to tackle the challenges faced by Japanese and Central American urban areas [1]. As a part of this program, this research focuses on analyzing a local Mexican urban community's current crime situation and perceptions regarding an ICT & Design Against Crime-derived intervention, as well as former and current criminal offenders' perceptions regarding the same intervention, in order to identify relevant insights for the project's future development as well as its possible impact on the community's level of fear of crime.

According to official crime statistics in Mexico, an estimated of 72.4% of the adult population in the country consider their local communities to be insecure [2]. With only 50.2% of the same population showing trust in authorities, only 10.5% of the total crimes get reported.

As a result of this situation, several local governments, like the Sinaloa state government, have launched open invitations for the development of new strategies or solutions to improve the levels of fear of crime and trust in authorities in the state [3]. Fear of crime or insecurity perception can be defined as the derived distress disturbance of encouragement that results from the difference between the perceived risk of being the victim of a crime and the actual fact of victimization [4]. This perceived risk is not only determined by an individual's perception but rather the collective perception of crime [5].

ICT-led situational crime prevention interventions [6], as well as Design Against Crime-derived interventions, [7] have been implemented in the past with success, improving community cohesion and resulting in a better physical security perception by members of urban communities. However, this approach cannot be implemented following the exact same steps in a Mexican community since they don't take into consideration relevant social and cultural factors.

Community-based alarms have been implemented successfully in Latin America, taking advantage of community members' participation for crime prevention [8]. This solution also fails to take into consideration the extended family network, which our previous research has indicated could be an important factor in providing emotional support in cases of the occurrence of crime. Current ICT crime-prevention tools like computer vision solutions and
authentication [9], available to current and future DAC designers, were also ignored by the previously mentioned approach.

2. Purpose

The purpose of the present research is radicated in analyzing the crime situation of a local Mexican urban community in order to generate and evaluate Design Against Crime-led interventions capable of generating a positive impact in the community's crime situation as well as its stakeholders’ levels of fear of crime, trust in authorities, and number of crimes reported.

3. Method

In a previous stage of research, 115 victimization surveys were conducted on members of the south-central area of Mazatlán Sinaloa. Community victimization rates, most prevalent crimes, as well as levels of trust in authorities, family, and other community members were determined. Participants engaged in informal community security methods, as well as communication questionnaires, were conducted on 30 members of the community with similar characteristics to those who presented lower levels of fear of crime. A second set of victimization surveys, as well as communication questionnaires, were conducted on 30 members of the community with similar characteristics to those who presented lower levels of fear of crime in order to analyze their general response in cases of the occurrence of crime as well as their methods of communication.

By analyzing the results of the previously mentioned victimization surveys and questionnaires and organizing relevant information in regards to the offenders, the victims, and the general environment surrounding the crime situation in the area, a crime problem profile [10] was established. Determining the most relevant and common crime and antisocial behavior issues in the community as well as the main stakeholders provides insights into their causes.

By implementing the "think thief" derived method of representing common crime situations based on the offenders' modus operandi as easy to understand stories in order to identify opportunities for intervention in a relevant stage of the crime lifecycle, a general crime scenario for our crime situation was established [11]. This crime scenario consisted of three general stages derived from the most common modus operandi for house robbery, the surveillance stage, where offenders spend the majority of their time during crime occurrence—seven to 24 minutes, according to previous research—surveilling the target household or environment looking for vulnerable access points before deciding to enter the house [12]. The execution stage is where the offender manages to penetrate through the vulnerable access point and is generally confronted by a vulnerable victim—a woman, an elder, or a child—before taking valuable objects and escaping from the scene. The response stage is where the victim reacts to the crime occurrence by either reporting the crime to authorities or, most likely, contacting a family member for emotional support, which presents the risk of spreading the crime impact by promoting awareness of the crime situation.

Taking the three stages into consideration, the surveillance stage by the criminal was identified as the main point of intervention in order to prevent the crime. This was considered because of the time spent by the criminal in a rather vulnerable state in which deterrence signals or a higher level of perceived surveillance could represent an important factor for influencing the offender's decision to commit the crime.

This stage also represents an opportunity for a community member to get involved in the crime situation from a preventive perspective though surveillance or reporting without becoming a vulnerable target. 87 houses of the community area and its surroundings were analyzed to determine possible points of access and vulnerabilities. The front gate and front door were identified as the most vulnerable points with 91.9% of houses utilizing a single lock or key to access the porch of the house, possibly giving the potential criminal an opportunity to search for an internal access point from this area after violating the single lock or taking advantage of an unlocked door.

Considering the available information, the focus could be on prevention through the deterrence of potential offenders as well as the provision of opportunities to take action and offer emotional support through guiding and directly communicating with families and other community members. Facilitating the reporting of crimes to the authorities could be an objective.

The design of a community-based security system was conceptualized using the general idea of a community alarm as the basis (Figure 1). The use of a community-managed, cloud-based interface through which community members can share external security feedback with others of and report incidents through a bot-based digital community manager has been proposed. Also, current ICT-related tools like face recognition for authentication could be used in order to determine whether a possible offender was surveilling or
looking for vulnerabilities in the community. CCTV devices have largely been used for prevention in open social environments [13]. However, no previous research was found on the use of this prevention method in Mexican urban areas.

To test the feasibility and impact of the conceptualized system, a simple prototype was produced and tested. It consisted of face recognition, a camera-driven smart lock, and a cloud-based interface with a bot programmed to interact with unknown people through an external microphone and speaker and with known community members through a smartphone or tablet, thus offering the option to contact family members or report a possible crime situation to the authorities.

Design Against Crime integrates considerations of crime and antisocial behavior within the creative design process [14]. Combining research led the concept generation with evaluations from the crime stakeholders, who included members of the participant community and the actual offenders [15]. Taking this into consideration, both community members and criminals were invited to interact with the prototype in a controlled environment in order to evaluate its functionality. A total of 157 community members and 53 current and former criminal offenders participated in the testing process.

A 5 point Likert scale was implemented to determine levels of trust, efficiency, and perceived risk and security regarding the prototype. The participants were divided into groups. A first group of 50 community members, male and female with an average age of 44.4 years, interacted with and evaluated the face-recognition-driven smart lock through direct interaction with the smart community manager driven by Api.ai [16], which provided a welcome message through the external speaker in case of member identification through face recognition that was provided by OpenCV [17] and the Kairos API [18].

A set of warnings was previously proposed by a group of 25 community members to dissuade people who were not known to be registered members. The warnings included questions and statements like "What do you want or need?", "I don't know you," and "Please leave." These were to be stated in consecutive order and were to be followed by a set of identified characteristics through computer vision based on standard descriptions in crime reports (e.g., estimated height, sex, age, the presence of a hat or glasses, and clothing color). Then, the community member was supposed to threaten to contact the authorities with this information.

A second group of 50 community members, men and women with an average age of 36.34 years, interacted with the face recognition-driven smart lock in the absence of a smart community manager. In this case, the smart lock provided the opportunity to open the door to a recognized member by unlocking the door's safety lock.

This was signaled by the physical sound of the mechanical movement of the lock. If a person was not a recognized registered member, the smart lock would simply close the door and implement the safety lock. Based on the results of the previously mentioned evaluation, a group of 53 current and former criminal offenders, men and women with an average age of 34.64 years, interacted with the face recognition-driven smart lock as unregistered and unrecognized members in the presence of a smart community manager.

A group of 57 community members, male and female, with an average of 39.33 years of age, interacted with the Cloud-based control interface and the smart community manager through a tablet. In this case, it was based in the previously identified crime scenario, and identified communication patterns in case of emergency.

Participants were notified of the presence of a probable offender trying to get into their house and were provided with the option to interact directly with the offender through the camera and microphone, letting the smart community

![Figure 1 Conceptualize security system architecture representation](image)
manager deal with the situation and automatically report the situation to authorities, contacting a family or other registered member to intervene in the situation, or personally contacting the police. As a reward for their participation, participants received a buffet lunch ticket with a value of 50 Mexican pesos or it's equivalent in cash.

4. Results

In regards to the face recognition driven smartlock, A Man U Whitney test was used to demonstrate that community participants reported a higher level of safety towards the face-recognition-driven smartlock prototype when the smart community manager was implemented, with a mean rank = 68.5, which was statistically significantly higher in comparison to the smartlock without the smart community manager in use, mean rank = 32.50, U = 350, z = -6.561, p = .001.

In the case of efficiency, community members also reported a higher level of efficiency perception towards the smart community manager implementation with a mean rank = 61.41, statistically significantly higher than the reported levels of the group of community members that interacted with the smartlock without the use of the smart community manager, mean rank = 39.59, U = 704.5, z = -3.928, p = .001.

Current and former criminal offenders showed similar levels of perceived effectiveness to those of community members towards the prototype when the smart community manager was in use. The median engagement score for criminal offenders (5.00) and community members (5.00) levels of perceived effectiveness to those of community showed a statistically higher perception of risk, mean rank = 68.5, which was statistically significantly higher in comparison to the prototype when installed in a vulnerable access point. However, when compared, the levels of perception of effectiveness towards the prototype in users that decided to use the system automatically (mean rank = 30.19) was statistically significantly higher than for users who clicked the button to contact family members (mean rank = 19.82), U = 387.5, z = 2.939, p = .003.

This seems to indicate that both community members and criminal offenders consider the smartlock effective for prevention when located in vulnerable access points. However, in the case of risk towards entering the house when the smartlock is in use in conjunction with the smart community manager, current and former criminal offenders showed a statistically higher perception of risk, mean rank = 68.5, than community members when interacting with the system as unregistered users, mean rank = 32.50, U = 350, z = -6.561, p = .001.

Criminal offenders’ high level of risk perception towards the prototype when installed in a vulnerable access point seems to be confirmed by a second Mann-Whitney U test comparing the levels of risk perception towards the smartlock (mean rank = 60.18), which were statistically higher than the results of the evaluation of a standard cctv security system in the same space and conditions by 50 current and former criminal offenders, male and female, with an average age of 37.6 years, using the same scale (mean rank = 40.82), U = 766, z = -3.499, p = .001.

In case of the smartphone and tablet Interface, when confronted with the notification of the presence of a probable offender trying to get into their house, 70.17% of participants decided to let the smart community manager deal with the situation and automatically report it to authorities. Of the participants, 22.81% decided to contact a family or other registered member to intervene in the situation. Only 3.50% of participants decided to directly interact with the possible offender personally though the camera and microphone, and another 3.50% decided to directly contact the police.

When asked about their decision, a participant who had decided to automatically report the situation though the smart community manager stated that "the process reduced the stress of calling the authorities and be questioned, making the situation easier." Participants who contacted other members generally described the concept of the smart community manager as positive or a "good idea"; however, a participant provided further insights into the situation by stating that "confronting the criminal or reporting the situation is not enough, sometimes physical help and an actual person attending to the situation is necessary."

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5. Discussion

In the present research, as part of a design against crime process for improving the levels of fear of crime in a local urban Mexican community, a prototype of a security system conceptualized as part of a crime prevention intervention has been tested and evaluated by members of the local community, with the goal of determining relevant insights for further development and future implementation of the proposed system in the area. Relevant points were identified from the perspective of both members of the community and current and former criminal offenders. These showed that the system could be considered effective and secure by both groups when it responded automatically in case of an outsider's detection in a vulnerable access point. However, the fact that the system's prototype was tested in a controlled and simulated environment could have been a relevant factor in
these results, which is why further preliminary and long-term testing should be implemented by installing it in the real environment.

With respect to the elements of the system that represent the interface for administration and control by the community users, as well as the smart security manager, the community's response was generally positive, with a high percentage of participants deciding to use the smart assistant for automatically reporting a simulated crime situation.

However, as well as the previously mentioned access point elements of the system, a long-term analysis the smart security manager uses in a real environment is also necessary before making any statements of it's factual effectiveness in increasing the number of criminal reports or improving the levels of fear of crime.

Other possible relevant elements to consider for the system's improvement and better impact are those related to ergonomics and usability. These also need to be considered in following stages of the research.

6. Conclusion

A prototype of a Design Against Crime community intervention led security systems to utilize current state ICT tools, like computer vision for crime prevention, as well as relevant cultural factors that a local urban Mexican community has proposed, tested, and evaluated by members of the community, as well as former and current criminal offenders.

Different elements of the proposed system, like those that interact with possible criminal offenders in access points, as well as those controlled and managed by the community users, have been considered effective by both groups under a controlled environment and simulated situations.

However, a deeper analysis derived from the installation and long-term use of the system in the actual community environment is considered necessary to confirm the preliminary results as well as to determine if the proposed system represents a positive impact in the levels of fear of crime, number of reported crime incidents, as well as trust in authorities in community members.

Future research will focus on analyzing the data derived from the implementation of the system prototype for a period of two months in six voluntary households within the community, as well as the comparisons of measured levels of fear of crime before and after the system's implementation not only in voluntary household members but also it's surrounding members.

References


