Discussion on the Defense Safety Design Strategies of Building’s Outside Environment Base on Rational Choice Theory——Take Changchun as Example

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Abstract: The Rational choice theory is widely used as a framework for understanding, explaining and modeling social and economic behavior of individuals. The outside environment of buildings is one of the most important carrier of some kind of crimes. A proper building’s outside environment can minimise the occurrence of crime. The positivity the accessibility and the visibility of space can affect the occurrence of crime. The paper takes the rational choice theory as foundation and analyzes the relationship between building’s outside environment and crime. And some strategies are put forward on how to improve the quality of building’s outside environment.

1. Introduction

The rational choice theory is one of the most important theories of Sociology, also known as the rational action theory. It is widely used as an assumption of the behavior of individuals and it focuses on the determinants of the individual choices for maximizing the benefit, namely, concerning about whether doing something or how to do it. People tend to get the maximum benefit at the lowest cost. The rational choice theory can be expressed as “income = reward − (effort + risk)”[1]. In this paper the author names this equation as the model of rational choice theory. To analyze using the model, increasing reward or reducing effort and risk can make income greater than zero. In this circumstance, the potential offenders tend to committing crime if the income is greater than zero.

In some particular conditions, the author can ignore the reward. If other special factors are ignored, there are three type of crime models based on rational choice theory. (1) Reduce the effort can make the income above zero(figure 1-a), which can be expressed as I=Re-E↓-R>0; (2) Reduce the risk can make the income above zero(figure 1-b), which can be written as I=Re-E-R↓>0; (3) Reduce the effort and risk can make the income above zero, which can be described as I=Re-E↓-R↓>0. The potential offenders tend to committing crime if the space fits these three crime models.

Figure 1 The influence on income by effort and risk
On the contrary, when the income is less than zero, it means too much risk for the crime committing. The potential offenders tend to give up committing crime. And this is the goal of crime prevention through the environmental design. The three crime prevent models of the defense safety design are: (1) I=Re-E↑-R<0; (2) I=Re-E-R↑<0; (3) I=Re-E↑-R↑<0, these three models can make the income less than zero, so as to make the potential offenders tend to give up committing crime.

The spatial positivity, the accessibility and visibility are major effect factors for the safety environmental design, and they are important to enhance sense of safety. There are three kinds of problems in building’s outside environment: (1) the problem of the positivity; (2) the problem of the accessibility; (3) the problem of the visibility.

2. Problems and defense safety design strategies about positivity of space
The spatial positivity is the situation of the physical environment and atmosphere of space. Negative space has bad psychological indication to the potential offenders, it makes them tending to consider that the potential victims are difficult to get help from others and their defense capabilities are weak. To the potential offenders, this means the reduction of effort and risk, which fits the crime model I=Re-E↓-R↓>0, and stimulate their committing thoughts.

2.1 Defense safety problems related to positivity of space
Jin Ding Ming Cheng community is located at the intersection of Da Ma Road and Dong San Dao Street in Changchun and the atmosphere of the community is weak. The building’s outside environment is not good. It has typical defense safety problems. The problems of the community are found as follows:
(1) The outdoor space is lack of spacial hierarchy and territoriality, which weakens the control of offenders. Thus, the potential victims are vulnerable to the potential offenders, which decrease the effort and risk. And this fits the crime model I=Re-E↓-R↓>0 (the Figure 2-a);
(2) The environment of space is terrible and it indicates he potential offenders that the space lacing administrate, which cuts down the risk. And it fits the crime model I=Re-E-R↓>0;
(3) Lacking dominant atmosphere between different spaces weakens the control of offenders. And it reduces the effort and risk, which fits the crime model I=Re-E↓-R↓>0;
(4) The community lacks social space and the vibe is negative, which suggest the offenders that the people would not help each other. It reduces the risk and fits the crime model I=Re-E-R↓>0 (the Figure 2-b).

![Figure 2](image)

2.2 Defense safety design strategies in regard to spatial positivity
Oscar Newman, American scholar argued that: Crime always happens at the spot that has no clear hierarchy. Analyses Newman’s study is applied with the rational choice theory and the reason is that negative environment means the reduction of the effort and risk. It fits the crime model I=Re-E↓-R↓>0, which makes the potential offenders to make crime decision. Thus, all the problems listed suggest us to take actions in planning and architecture design such as:
(1) Constructing clear spatial hierarchy in outdoor space. People can use the hedge as boundary to form spacial hierarchy among residential buildings. It increases the effort and risk, which fits the crime prevent model I=Re-E↑-R↑<0 (Figure 3-a);
(2) Improving the shabby elevation of the buildings, providing necessary facilities and beautifying the building’s outside environment so as to increase the crime risk. All these strategies fit the crime prevent model $I=Re-E-R<0$;

(3) Separating the traffic space using different color pavement to discriminate the spaces by creating spacial atmosphere. These strategies can increase the effort and risk, which fits the crime prevent model $I=Re-E↑-R↑<0$;

(4) Connecting the buildings by adjusting layout roads. Strategies like setting up rest seats to meet the needs of various groups and facilitating the interaction and communication among neighbors can increase the risk, which fits the crime prevent model $I=Re-E-R↑<0$ (the Figure 3-b).

3. Problems and defense safety design strategies about accessibility of space

The accessibility of space refers to whether a space can be arrived easily and got through smoothly. After eliminating other factors, the space with higher accessibility is more convenient for potential offenders to get in and flee away from crime scene. To the potential offenders, this refers to the reduction of the effort and risk and it fits the crime model $I=Re-E-R↓>0$, which makes potential offenders tend to committing crime.

3.1 Defense safety problems in relation to accessibility of space

Jin Xiu Dong Fang community is located at the intersection of Nan Hu Road and Hui Zhan Street. The density of the road network is too high and lack of separation from surroundings. The defense safety problems of this community are as follows:

(1) The offenders are provided with more run away routes because of the random path in the community treated by residents who are chasing convenience. This reduces the effort and risk, which fits the crime model $I=Re-E↓-R↓>0$;

(2) The community lacks the boundary between community and outside space, which makes the potential offenders can get into easily. It reduces the effort and fits the crime model $I=Re-E↓-R↓>0$ (the Figure 4-a);

(3) It is convenient for offenders to quickly get in and out crime scene due to the motor roads spreads in to all directions. This reduces the effort, risk and fits the crime model $I=Re-E↓-R↓>0$;

(4) There are too many motor vehicle entrances, which makes the potential offenders enter the community and get close to the potential victims easily. This reduces the effort and fits the crime model $I=Re-E↓-R↓>0$ (figure 4-b).
3.2 Defense safety design strategies with respect to accessibility of space
The study of Japanese scholar Itozi argued: the road network density which has an impact on crime can help increase potential offender’s accessibility\(^3\). After analyzing why this study was applied with the rational choice theory, the major reason is that the space with higher accessibility means the reduction of effort, risk and makes potential offenders tend to committing crime. These situations prompt us to adopt strategies in the planning and architecture design:

1. For the problem of the random trails, it is acceptable to cover the original trails with low hedges, which creates rest seats at the same time to clarify boundary. This increases the effort, risk and fits the crime prevent model \(I=R_e-E\uparrow-R\uparrow<0\);
2. People can set roadblock and police box at the entrance of the community and form assured separation to increase the effort. This fits the crime prevent model \(I=R_e-E\uparrow-R<0\) (the Figure 5-a);
3. People can change some roads into dead end roads and increase the difficulty for the potential offenders to escape. This increases the effort, risk and fits the crime prevent model \(I=R_e-E\uparrow-R<0\);
4. People can set two motor vehicle entrances in the community to increase the effort. This fits the crime prevent model \(I=R_e-E\uparrow-R<0\) (the Figure 5-b).

4. Problems and defense safety design strategies about visibility of space
The visibility of space refers to whether a space can be observed. Space with low visibility may became unexpected hidden places for offenders. This reduces the possibility of the potential offenders to be discovered and prevented when they commit. This reduces the risk and fits the crime prevent model \(I=R_e-E\uparrow-R<0\), which makes the potential offenders tend to committing crime.

4.1 Defense safety problems as regards to visibility of space
Dong Fang Zhi Zhu Long Teng Yuan community is located at the intersection of Shi Ji Street and He Fei Road. Basing on the investigation of the community. The author finds that problems of visibility are as follows:
(1) The roads can not get enough surveillance because there are few windows between gables. This reduces the risk (the Figure 6-a);

(2) The outside space is too dark in the night because there are a short of lights. This reduces the risk;

(3) The natural surveillance is reduced by the tall plants between spaces, which reduces the risk (the Figure 6-b);

(4) The shape of the buildings has too much convex, which can be easily used by offenders to hide in. This reduces the risk and fits the crime model I=Re-E-R↓>0.

4.2 Defense safety design strategies in relation to visibility of space

The research of British scholar Paul Stollard suggested that: Improving the visibility can reduce crime happening[4]. Using the rational choice theory to analyze Stollard’s study, it is due to the low visibility of the space, for the potential offenders, it means that the reduction of risk, it makes the potential offenders tend to committing crime. It fits the crime model I=Re-E-R↓>0. This situation suggests us to take actions in the planning and architecture design like:

(1) By increasing windows appropriately between gables to improve the surveillance and increase the risk (the Figure 7-a);

(2) By adding lamps at building’s entrances and besides the road to enhance the illumination and increase the risk.

(3) By separate spaces with low bush and make spaces nearby at the same level to enhance the surveillance and increase the risk (the Figure 7-b);

(4) By improve spatial visibility by clearing up obstacles near building corners to eliminate conditions vulnerable to crime and increase the risk. All these four strategies fit the crime prevent model I=Re-E-R↑<0.

5. Conclusion

The building’s outside environment is the spacial condition of crime and crimes can be prevented if it can be reasonably arranged. According to the rational choice theory, the paper puts forward three models in the defense safety, which are “(1) I=Re-E↑-R<0; (2) I=Re-E-R↑<0; (3) I=Re-E↑-R↑<0”. Meanwhile, the author proposes three defense safety problems and three kinds of strategies, which are the “strategies about the spatial positivity, accessibility and visibility”. Finally, the author achieves goals to decrease negative space of building’s outside and crime rate as well as creates a good and positive defensible space.
Acknowledgement
This paper was Supported by National Natural Science Foundation of China, 51778266

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