



# Research on Community Safety Management of Property Companies Based on Big Data Analysis

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**Abstract.** Aiming at the possible community safety problems faced by property companies, the evaluation index system under the background of big data is established. Relevant independent variables and research hypotheses were designed, a research model was established through the analysis of relevant safety theories, variable elements were established based on the safety accident occurrence theory, the influence hypothesis between relevant variables and community safety management was proposed, and the research hypotheses were verified by structural equation. The results show that all hypotheses are verified. The result provides guidance and reference for the property management company for the security management of the community based on big data analysis.

**Keywords:** Property management company, Big Data analysis, Community safety management, Index system, Comprehensive evaluation

## 1 Introduction

Community safety management of property companies is often focused on a single aspect, lacking a system. In this sense, the property company's understanding of community safety management needs to fully grasp the current situation. Thus, the improvement and promotion of community safety management need to be studied from a systematic perspective. Yu pointed out that the existing level of community property management is low, the situation of community security is disordered, and the improvement of the present situation of community security management has become an important part of the property company business. Harkin studied the community safety partnership, that is, the impact of the relationship between police and community residents on community safety, and believed that the relationship between the two was an important factor causing community personal safety problems<sup>[1]</sup>.

There are few studies on community safety management from the perspective of overall safety management. There is a lack of theoretical support and empirical investigation on community safety management of property companies. Therefore, from the perspective of accident occurrence, a more scientific research hypothesis is established, and structural equation model is used to conduct an empirical study on community

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safety management. With the limitations of domestic and foreign research on community safety management of property management companies, the following possible innovations can be proposed.

1. Based on the occurrence principle and theory of safety accidents, the evaluation index system of community safety management of property management companies is established with image analysis. In the construction of the follow-up index system, previously proposed theories are used as the basic basis.
2. The structural equation model was used to verify and analyze the data, and the mediation variable was designed to make the influence of each independent variable on the dependent variable more clear.

## 2 Research design

### 2.1 Dimension determination

Based on accident cause theory, energy accidental release theory, and seamless organization theory, the evaluation index system of the community safety management of the property management company is constructed. The accident cause theory points out that major safety accidents come from people's unsafe behavior and state. On this basis, the accidental energy release theory also puts forward two viewpoints of environment and safety accident management and describes the mechanism of safety accidents in detail<sup>[2]</sup>. Both human behavior and state and the nature of the environment are related to the failure of safety management. The accidental release of energy or energy over the normal threshold cause safety accidents. The principle of safety accidents is shown in Fig. 1.

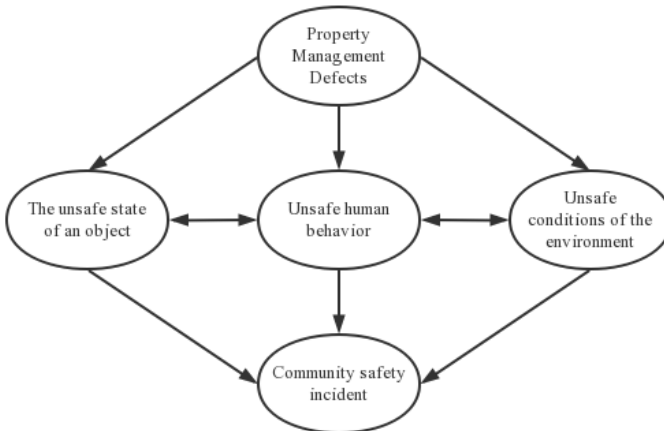


Fig. 1. Community safety accident schematic diagram.

People, resources, and the environment are the basic elements of safety analysis. The cross effect of unsafe behavior, unsafe object state, unsafe environmental condi-

tions, and management defects is used to explain safety accidents. Thus, the occurrence of accidents is the result of the joint action of four factors. Therefore, these four elements respectively constitute the four dimensions of the index system: personnel factor, resource factor, environment factor, and management factor<sup>[3]</sup>.

## 2.2 Variable design

Dependent variable: Community safety management, that is, personnel, resources, environment, management factors exert different impacts on safety management.

Argument: Human factors, resource factors and environmental factors are taken as independent variables, and the dimensions of independent variables are the second-level indicators under each indicator dimension, namely resident behavior, resident safety cognition, living resources, safety resources, living environment and surrounding environment.

Mediating variable: Based on the influence of human factors, resource factors and environmental factors on community safety management, there may be indirect effects of two intermediary variables -- property management and company management.

## 2.3 Research hypothesis

H1a1: Personnel factors have a positive impact on the community safety management of property companies.

H1a2: Personnel factors have a positive impact on property management.

H1a3: Personnel factors have a positive impact on company management.

H2a1: Resource factors have a positive impact on community safety management of property management companies.

H2a2: Resource factors have a positive impact on property management.

H2a3: Resource factors have a positive impact on corporate management.

H3a1: Environmental factors have a positive impact on the community safety management of property companies.

H3a2: Environmental factors have a positive impact on property management.

H3a3: Environmental factors have a positive impact on corporate management.

H4a1: Property management has a positive impact on the community safety management of property companies.

H4a2: Corporate management has a positive impact on community safety management of property management companies.

H5a1: Property management and corporate management mediate between human factors and community safety management.

H5a2: Property management and corporate management mediate between resource factors and community safety management.

H5a3: Property management and corporate management mediate between environmental factors and community safety management.

### 3 Empirical analysis based on structural equation

#### 3.1 Research model

According to the schematic diagram of accident occurrence, human factors, environmental factors and resource factors may have a direct impact on community safety management. From the perspective of the property management company, the internal management of the company and the property management of the community may be the intermediate influencing factors of the three dimensions of human factors, resource factors and environmental factors.(Fig. 2).

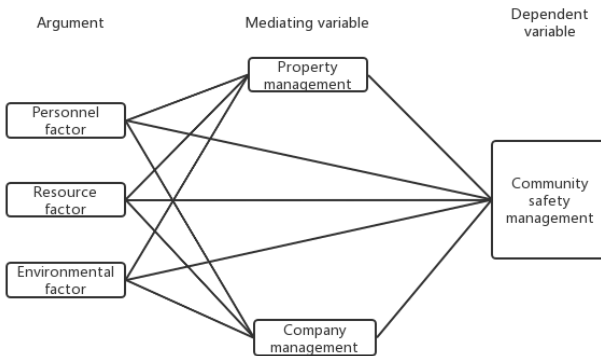


Fig. 2. Research model.

#### 3.2 Correlation analysis

In this study, AMOS 24.0 software was used to output research data for correlation analysis, as shown in Table.I. The data on the diagonal of the table is the AVE square root of latent variables, and the lower triangular part is the correlation coefficient among latent variables. When the AVE square root value of each variable is larger than the correlation coefficient between variables, it indicates that variables and variables have better discriminative validity.As shown Table I.The data show that the variables are at the level of  $p < 0.01$ , so it can be seen that the pair correlation coefficients  $r$  between latent variables are all greater than zero, and the phase relationship values of different latent variables are all smaller than 0.9, meeting the criteria<sup>[4]</sup>. Therefore, it can be seen that there is no multicollinearity problem between latent variables in this study, and it has good discriminative validity.

**Table 1.** Correlation coefficient between latent variables and AVE square root value

	Per- sonnel factor	Environ- mental factor	Re- source factor	Compa- ny man- agement	Property management	Safety management
Personnel factor	0.74					
Environ- mental factor	0.44	0.751				
Resource factor	0.333	0.417	0.739			
Company management	0.338	0.359	0.36	0.792		
Property management	0.371	0.432	0.312	0.405	0.8	
Safety management	0.353	0.384	0.348	0.36	0.372	0.795

### 3.3 Confirmatory factor analysis

**Table 2.** Model fitting variable

Comm on varia- ble	$\chi^2$	df	p	Chi-squ are degree of freedom ratio $\chi^2/df$	IFI	RMS EA	T LI	C FI	N NFI
Crite- rion of judgment	-	-	> 0.05	<3	>0.9	<0.1 0	> 0.9	> 0.9	> 0.9
Nu- merical value	2452. 223	1 209	0	2.028	0.90 9	0.05	0. 903	0. 908	0. 903

As can be seen from Table 2, It can be seen that CMIN/DF is 2.028, meeting the standard of less than 3. The values of RMSEA and RMR were 0.05, respectively, meeting the standard of less than 0.08. The values of NNFI, IFI, TLI and CFI are 0.903, 0.909, 0.903 and 0.908, respectively, which are all greater than 0.9. Therefore, the values of fitting variables are within the standard range, and the model fitting effect can be considered to be better.

### 3.4 Path analysis

The standardized path coefficient obtained after calculation is shown in the TableIII, where Estimate is the standardized path coefficient, which specifically means that

when the unit quantity of independent variable changes, the dependent variable changes at the same time, while P value represents the significance of the path. When P value is less than 0.05, it indicates that there is a significant influence between variables. The hypothesis was verified according to the path coefficient results. As can be seen from the table, the 11 direct path coefficient values in the model were all greater than zero, and the P value was less than 0.05, which met the significance requirement. Therefore, the 11 hypotheses of the research design were verified.

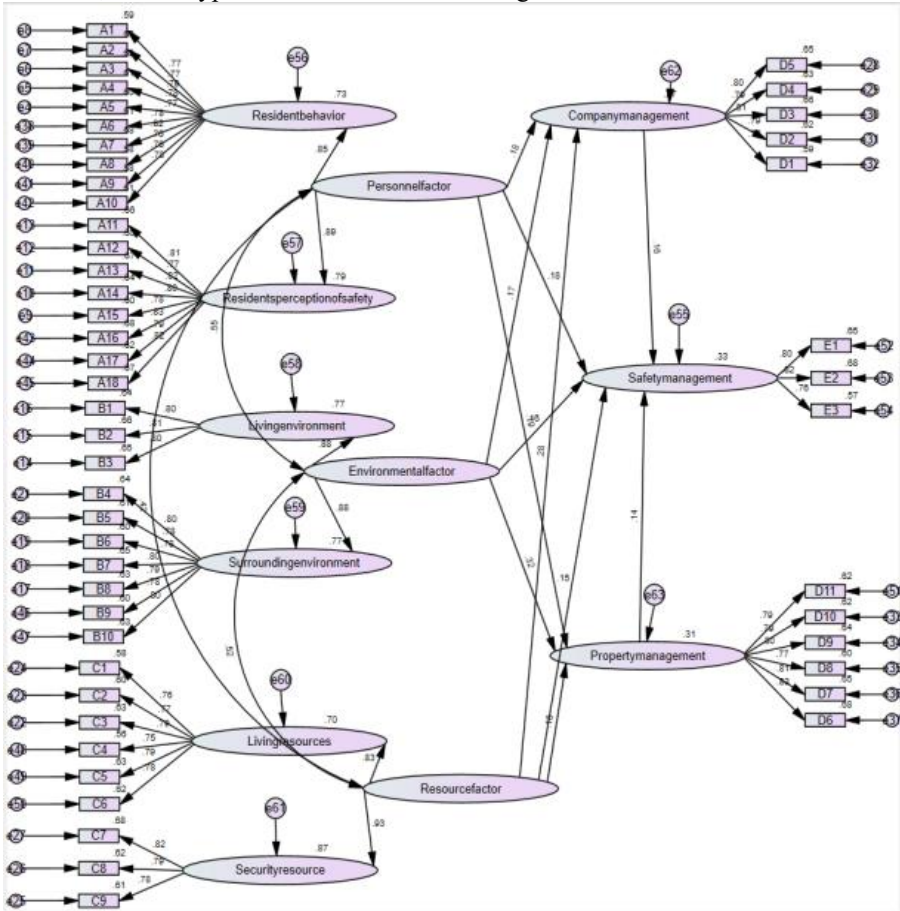


Fig. 3. Path diagram.

Table 3. Path analysis result

Hypothesis	Path		Estimate	S.E.	C.R.	P	S.TD
H1a1	Safety management	<--- Personnel factor	0.205	0.081	2.544	0.011	0.176
H1a2	Property management	<--- Personnel factor	0.222	0.077	2.902	0.004	0.189

H1a3	Safety management	<---	Personnel factor	0.217	0.083	2.634	0.008	0.177
H2a1	Safety management	<---	Resource factor	0.153	0.072	2.108	0.035	0.146
H2a2	Property management	<---	Resource factor	0.17	0.067	2.539	0.011	0.162
H2a3	Company management	<---	Resource factor	0.312	0.075	4.154	**	0.284
H3a1	Safety management	<---	Environmental factor	0.178	0.088	2.031	0.042	0.159
H3a2	Property management	<---	Environmental factor	0.364	0.084	4.348	**	0.323
H3a3	Company management	<---	Environmental factor	0.199	0.087	2.283	0.022	0.169
H4a1	Safety management	<---	Property management	0.138	0.061	2.264	0.024	0.139
H4a2	Safety management	<---	Company management	0.147	0.057	2.597	0.009	0.155

**3.5 Mediation effect test**

This study used AMOS 24.0 to test the hypothesis of possible mediating effect between property management and corporate management. The samples were randomly repeated for several times, and the upper and lower limits of Bootstrap 95% confidence interval did not include 0, and c.R. Value greater than or equal to 1.96, as the criterion of significance test. The results of intermediate test are shown in the TableIV.As can be seen from the table, the upper and lower limits of 95% confidence intervals for direct effects do not include 0, and direct effects are significant. Indirect effect is significant because the upper and lower limits of 95% confidence intervals do not include 0. The standardized path coefficients were 0.032, 0.031, 0.029, 0.05, 0.046 and 0.023, accounting for 12%, 11%, 11%, 20%, 23% and 23% of the total effect, respectively. It can be seen that enterprise management and property management play a certain intermediary role between human factors, environmental factors and resource factors.

**Table 4.** Path analysis result

Parameter		Estimate	Lower	Upper	P	Effect ratio
Indirect effect	Personnel factor→Company management→Safety management	0.032	0.005	0.082	0.012	12%
	Personnel factor→Property management	0.031	0.005	0.057	0.009	11%

	management→Safety management	1	004	09	014	
	Environmental factor→Company management	0.02	0.	0.	0.	11%
	management→Safety management	9	003	089	023	
	Environmental factor→Property management	0.05	0.	0.	0.	20%
	management→Safety management		009	123	009	
	Resource factor→Company management	0.04	0.	0.	0.	23%
	management→Safety management	6	014	101	004	
	Resource factor→Property management	0.02	0.	0.	0.	23%
	management→Safety management	3	002	075	027	
	Personnel factor→Safety management	0.20	0.	0.	0.	
	management	5	045	405	013	
Direct effect	Environmental factor→Safety management	0.17	0.	0.	0.	
	management	8	004	366	046	
	Resource factor→Safety management	0.15	0.	0.	0.	
	management	3	023	314	024	
	Personnel factor→Safety management	0.26	0.	0.	0.	
	management	8	092	476	002	
Total effect	Environmental factor→Safety management	0.25	0.	0.	0.	
	management	7	071	458	005	
	Resource factor→Safety management	0.22	0.	0.	0.	
	management	2	076	393	003	

It can be seen from the table that the upper and lower limits of 95% confidence interval of direct effect do not include 0, and the direct effect is significant. The upper and lower limits of 95% confidence intervals for indirect effects do not include 0, and the indirect effects are significant. The standardized path coefficients are: 0.032, 0.031, 0.029, 0.05, 0.046, 0.023, respectively accounted for 12%, 11%, 11%, 20%, 23%, 23% of the total effect. It can be seen that corporate management and property management play a part of the intermediary role between human factors, environmental factors and resource factors.

#### 4 Comparative analysis of variable correlation

According to the empirical test data and results, among the direct effects on community safety management, the value of personnel factor (0.176) is the highest, indicating that the influence of personnel factor is the greatest. In the future, it is necessary to focus on the adjustment of related items with low scores. The environmental factor (0.159) is in the medium level, so the environmental factor should be adjusted for the items with low scores, and some resources should be allocated. The resource factor (0.146) is the smallest, in contrast, there is no need to carry out major improvement activities, just adjust the current management measures; Property management (0.139) has the smallest path coefficient value on community safety management, indicating that among all variables, it has a relatively small impact on community safety management. There is no need to invest a lot of effort to improve the score of relatively low items, while the company management (0.155) only needs to adjust the score of items with low scores.



Among the influences on property management, the personnel factor (0.189) is higher. Appropriate adjustment of the personnel factor can also have a good impact on property management. Among the influences on company management, personnel factor (0.177). In summary, the factors that have a great influence on property management and company management all include personnel factor. Therefore, it can be seen that management based on personnel factor can improve both property management and company management, and company investment and management income can achieve good results. Resource factor (0.284) has the greatest impact on corporate management, indicating that the reform and change of resource factor will greatly affect the internal management of the company.

From the perspective of intermediary effect, the intermediary effect of property management in personnel factors and community safety management accounts for 11%, and that of corporate management in personnel factors and community safety management accounts for 12%, playing a relatively limited intermediary role. Therefore, in terms of personnel factors, it is more important to improve the company's own management. The mediating effect of property management in environmental factors and community safety management accounts for 20%, and that of corporate management in environmental factors and community safety management accounts for 11%. Therefore, compared with corporate management, the improvement of property management can have a better effect on the direct impact of environmental factors on community safety management. The mediating effect of property management and company management in resource factors and community safety management is both 23%, which is the highest value. Therefore, property management and company management play a more prominent mediating role in resource factors to community safety management, indicating that the management improvement for property and company can achieve the best effect on the direct impact of resource factors on community safety management.

## **5 Countermeasures and Suggestions**

### **5.1 Build smart communities with big data applications**

Existing smart community products such as the registration and appointment APP for outsiders in the community can strictly control related activities of visitors from outside of the community, and access can be obtained after the consent of the owner. At the door of the community and the apartment building, an access control card or password is set to unlock the elevator operation and ensure the personal and property safety of community residents. Community security personnel can connect the mobile phone to the camera in real-time and set the alarm situation. When there is dangerous behavior in the community, the mobile phone automatically sends a screenshot to alarm and record the time, location, and other data. The application of community care is to register and record the portraits of the elderly or people with mobility difficulties in the community and send reminders to their families when they travel alone to ensure the safety of travel. The implementation of unmanned cabinets facilitates the convenience of shopping activities for community residents and also reduces the cost of personnel. With

surveillance cameras, community residents need to consciously scan the code to purchase goods, and at the same time, to a certain extent, crowdedness in supermarkets is avoided<sup>[5]</sup>.

The contemporary intellectual community needs to benefit from the community's way of life and improve happiness in the established system and volunteer service activities. These are important for community safety management and the construction of safe communities. With the rapid development of science and technology, a smart community is a social project that the country pays more attention to in the future. The construction of a smart community under financial support can guarantee community security and reduce the incidence of security risks from human factors.

## **5.2 Awareness, education, and accident and injury management capabilities**

Property management companies need to guide residents to participate in community construction and refine a participation procedure. Then, residents actively participate in the "decision-making, implementation, and supervision". The establishment of community consultation ensures that the residents' opinions on a safe community can be timely reflected in feedback and solutions to problems. Through visits, discussions, and on-site inspections, a comprehensive understanding of safety and other aspects of the problem and timely feedback to the relevant departments are realized<sup>[6]</sup>. The internal functions of the property company must be in place, responding to the requirements of each unit in the community, and consciously and actively participating in the security construction of the community to ensure the staffing and related equipment according to the needs. At the same time, property companies need to cooperate with professional companies for security and consider outsourcing at the operation level. Property service companies need to send special management personnel, and then, they do not need their workers which reduces the cost of human resources<sup>[7]</sup>.

## **6 Conclusions**

In this paper, community safety management index system is established based on accident causation theory, accidental energy release theory and seamless organization theory, and community safety management index system of property management company is established based on analysis of the current situation of Shijiazhuang property management and responsibility scope. Data are collected through questionnaire distribution and descriptive statistical analysis. After obtaining the existing problems in community safety management of Shijiazhuang Property Management Company, the reliability and validity test is carried out to test the rationality of questionnaire data, and independent variables, dependent variables and intermediate variables are established through index elements. The research hypothesis is established after qualitative analysis, the structural equation model is used to test the research hypothesis, the correlation conclusions of variables are compared and analyzed, and the improvement suggestions are put forward. In summary, the conclusions are as follows:

Human factors, resource factors, environmental factors, property management and company management all have significant positive effects on community safety management, and property management and company management play a partial mediating role in the impact of the other three factors on community safety management. According to the test results, it can be seen that personnel factors have the greatest significant impact on community safety management, environmental factors have the greatest positive impact on property management, resource factors have the greatest positive impact on corporate management, and property management and corporate management play the highest mediating role in the positive impact of resource factors on community safety management<sup>[8]</sup>. Comprehensive empirical research and analysis show that in community safety management, property management companies need to make the biggest changes in resource factors, direct safety guidance in personnel rather than indirect management through property management companies, and maximize the improvement of property management for the environment.

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