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Cost-Influencing Factors on Building Security: Pilot Study

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ABSTRACT

Buildings cost more than they once had, and a significant proportion of such cost may be caused by increased expenditure on building security. To explore the cost-influencing factors of building security, this study employed sample data to examine the validity, reliability and normality of the instrument used in this study. Validation was performed by a panel of experts, and data analysis was conducted with the software package for social science (SPSS 20). The Cronbach's alpha value ranged from 0.6 to 0.8 and above, and the skewness and kurtosis were within the stipulated given ranges of ±2.0 and ±10.0, respectively. The results indicate that the instrument is reliable, and the data for preliminary study depict reasonable normality.

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INTRODUCTION

Building security is gaining importance against the backdrop of a rise in criminal activity. However, the empirical relationship between building facility (security) characteristics (both descriptor and influence characteristics) and the costs of maintaining security in buildings has yet to be derived, notwithstanding the proliferation of documented incidences of burglary, breaking and entering and armed robbery and terrorism. Although some previous researchers have attempted to address the empirical relationships of security trends in Nigeria and other countries, there are no direct links between infrastructure and building security within the built environment. For instance, the study of demographic and socio-economic determinants of crimes in Nigeria conducted by (Omotor, D.G., 2009) follows the pattern of the previous researcher by adopting panel data analysis. Thus, it differs significantly from what this research is intended to achieve. Buildings cost more currently, and a significant proportion of such cost may be caused by increased expenditure on building security. (Smith, J.L. and L.M. Bryant, 2010) affirmed that security-related costs arise from security design principles applied to newly constructed buildings and the modification of government structures. However, various factors constituting the cost of building security as well as factors influencing the cost of building security have yet to be established. This lack of knowledge has led to an investigation to discover the cost-influencing factors of building security.

Methodology:

The sequential exploratory design is a two-phase mixed methods research design. Its two-phase approach makes it simple and straightforward to describe and report. According to (Creswell, J.W., 2013), the sequential exploratory design is useful not only to the researcher who wants to explore a phenomenon but also for those who want to expand upon the qualitative findings. The tool is highly superior to other strategies used when a researcher is building up a new instrument. One of the greatest advantages of this design is that it enables researchers to generate and verify theory in the same study (Molina-Azorín, J.F., 2012). The qualitative data collection method was used in two sections: the first section of the primary data collection techniques involves the use of open-ended questionnaires, and the second section uses close-ended questionnaires to expand upon the initial primary data collected. However, these methods were suitable for this current study, as (Kabilan, M.K., 2013) also used the methods in his study to discern the teachers' voices and experiences as part of the phenomenological research process.

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Data Collection, Extraction and Analysis:

The procedures for data collection involve two pages of A4 paper. The first page contained the preambles: a brief introduction, title, objectives and qualitative research questions. The second page was divided into six (6) rows; the first row was created for the respondents' demographic information, and the remaining five rows were meant for respondents to explain and exemplify one point or factor that affects the subject matter in each of the row created. Table 1 presents the categories that were identified to sort responses to the questions.

Table 1: Categories Identified to Sort Responses to the Questions.

Questions	Categories
i) What factors constitute the cost of building security in urban environments?	(a) Access prevention (i.e. security doors, burglary proof doors and windows, mechanical locks, electronic locks) (b) Intruder detection (Burglar alarm system, glass break detection, sensor light, CCTV, complete camera with wifi application) (c) Perimeter fence (d) Perimeter protection (e) Gate-house (f) Security lighting
ii) What building factors influence the cost of building security in urban environments?	(a) Location of building (b) Height of building (c) Size of building (d) Use of building (e) External wall openings (f) Plan shape (g) Aesthetics

Relative Importance Analysis:

To determine what categories appear to be more important, the frequency, mean, and standard deviation of the data were calculated, and the severity index (SI), which is also known as the relative importance index (RII), was adopted to rank the cost factors. Analysis was conducted using Microsoft Office Excel to determine the formula given by (Shash, A.A., 1993). Ref (Cheng, Y.M., 2014) and other researchers also used the same approach in their various studies. The Severity Index (SI) Formula is presented in Equation 1 below:

$$S.I = \left\{\sum_{i=1}^{i=n} w_i f_i\right\} x \ \frac{100\%}{n} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (Eq.1)$$

where i represents the ratings 1-5, f_i is the frequency of responses, n is the total number of responses and w_i = (i/A), is the weight of each rating (in scale/number of points in a scale). 'A' is the highest score (i.e. 1-5 in this study). The ranking of the factors are presented under the qualitative results.

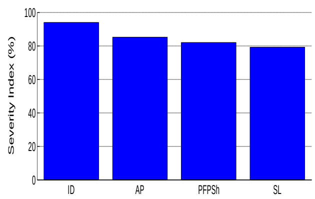

Fig 1: Security Factors

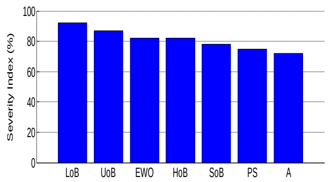

Fig 2: Building Characteristics

In terms of the rankings of each factor as shown in Figures 1 and 2, intruder detection proved to have the highest ranking with a severity index (SI) value of 94%, signifying a high degree of impact. The level of importance of this factor is thus directly correlated to building security cost. The second highest characteristic is location of building, with an SI value of 92%. This is an indication that the location of building is also an influential factor that affects building security cost. The use of building was ranked third in the group of factors affecting building security cost with a S.I value of 87%. However, these results demonstrate that there were no significant gaps separating the different factors affecting building security cost.

Reliability and Normality Test of the Instrument:

To validate the instrument used in this study, several PhD holders who were also lecturers and experts in the construction sector were contacted to verify the clarity of the instrument used in this study. Thereafter, a number of questions were rephrased to appropriately measure the constructs. However, the improved version of the instrument was administered for the pilot study test. The sample size for this pilot study test was derived based on the recommendation by (Sekaran, U. and R. Bougie, 2009) that a sample size larger than 30 and less than 500 is appropriate and effective for most research studies. Therefore, a total of 50 questionnaires were administered for the pilot study and were selectively distributed among construction professionals in five departments of the School of Environmental Technology, Federal University of Technology Minna, Nigeria. The participating professionals include architects, builders, quantity surveyors, urban and regional planners, and estate surveyors and valuers. Thus, only 39 questionnaires out of 50, a 78% return rate, were retrieved and properly completed. To produce reliable and convincing results, a typical survey requires a minimum response rate of 30% (Ali, A.S., 2010). Thus, the reliability and normality of the instrument was tested using Cronbach's alpha and skewness and kurtosis scores, respectively. The results of reliability shows that building characteristics, building security cost and two other dimension of security measure were within the range of 0.7 to 0.8 Cronbach's alpha value, and the remaining two dimensions of security measure were at 0.6 Cronbach's alpha value. As presented in Table 2.

Table 2: Pilot Study Reliability Test Results.

SN	Construct	Dimensions	Number of Items	Cronbach's alpha
1	Security measures	Access prevention	6	0.680
		Intruder detection	5	0.852
		Fence, protection and security house	6	0.775
		Security lighting	5	0.654
2	Building characteristics	Location	8	0.747
		Height of building	7	0.742
		Size of building	6	0.700
		Use of building	6	0.801
		External wall openings	8	0.829
		Plan shape	6	0.729
		Aesthetics	7	0.739
3	Building security cost	Devices	17	0.883

Subsequently, the normality test results presented in Table 3 below show the results of the research construct, dimensions, number of items in each dimension in the questionnaire, skewness and kurtosis scores. Thus, the skewness values ranged from -2.039 to 0.736, and the kurtosis scores ranged from -2.084 to 9.145, which are considered normal based on the assumption made by (Maiyaki, A.A. and S.S.M. Mokhtar, 2011) given the ranges of ±2.0 for skewness and ±10.0 for kurtosis. Therefore, these results and the established benchmark show that the entire construct is reliable. Similarly, they are considered normal based on the assumptions made.

Table 3: Pilot Study Normality Test Results.

SN	Construct	Dimensions	Number of Items	Normality			
				Skewness		Kurtosis	
				Min	Max	Min	Max
1	Security measures	Access prevention	6	-1.180	0.166	-0.818	3.507
		Intruder detection	5	-2.026	-0.053	-0.496	9.145
		Fence, protection and security-house	6	-1.621	-0.394	-1.014	3.571
		Security lighting	5	-1.847	-0.269	-2.035	4.387
2	Building characteristics	Location	8	-1.085	0.736	-1.541	1.917
		Height of building	7	-1.194	-0.295	-0.813	3.009
		Size of building	6	-1.276	-0.140	-0.617	3.357
		Use of building	6	-2.039	0.736	-2.084	8.305
		External wall openings	8	-1.401	-0.072	-0.451	1.839
		Plan shape	6	-1.390	0.251	-0.440	1.912
		Aesthetics	7	-1.094	-0.326	-0.586	1.615
3	Building security cost	Devices	17	-2.037	-0.177	-0.839	6.588

Conclusion:

The goal of this study was to pre-test the validity and reliability of the instrument used in ongoing research in preparation for the larger scale study. Therefore, the conclusion of this study is pinned to its objective, which is mainly statistical in nature at this stage. The results show that building characteristics, building security cost and two dimensions of security measures were within the range of 0.7 to 0.8 Cronbach's alpha value, signifying a very strong result, and the remaining two dimensions of security measures were at 0.6 Cronbach's alpha value, which was also acceptable. The implication of these results in terms of the inter-item reliability test is that all items were reliable, and hence no item was deleted. In addition, the normality test using skewness and kurtosis scores prove that the data as a whole is reasonably normal, especially the skewness values, which were not significantly different from zero.

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