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by The User

Submission date: 04-Apr-2023 05:45PM (UTC-0700)
Submission ID: 2056113748
File name: 0615-0403-002-.docx (28.34K)
Word count: 2137
Character count: 11667

Chapter 3: Research Design

Overview

In this chapter, an overview of the research design adopted in this study in order to attain the aims and objectives defined in Chapter 1 will be provided. The methodology, sampling method, collection of data, data analysis, and considerations of the ethics will be discussed in detail. The research design will utilize a quantitative approach, involving the use of survey questionnaires, to investigate the application of intelligent technology for fire prevention and control in Sham Shui Po. The survey questionnaires will be distributed to a sample of 57 people who live in Sham Shui Po. Inferential and Descriptive statistics will be used to analyze the data from the survey questionnaire. Additionally, ethical considerations and potential limitations of the study will be discussed.

3.1 Methodology and research design

3.1.1 *Methods*

A convenient sampling method will be used in this study. The sample for this study will be drawn from a population of people living in Sham Shui Po. The sampling frame will be the population of Sham Shui Po and the sampling method will be a random sampling procedure. Random sampling will make certain that the sample represents the population (Acharya, et al., 2013). The sample size for this study will be 57 people, chosen randomly from the population of people living in Sham Shui Po. To ensure the randomness of the sample, the participants will be chosen using a computerized random number generator. The size of the sample used is based on the number of people who can effectively fill out the survey questionnaires within a reasonable timeframe. The sample size of 57 people was chosen because it is large enough to represent the population of Sham

Shui Po and provide a meaningful statistical analysis of the research data. Additionally, this sample size allows for the precise estimation of the true population parameters.

3.1.2 *Research design*

This research will utilize a quantitative design, involving the use of survey questionnaires, to investigate the application of intelligent technology for fire prevention and control in Sham Shui Po. The survey questionnaires will be distributed to a sample of 57 people who live in Sham Shui Po. The survey questionnaires will include both single-choice and multiple-choice questions. The data collected through the survey questionnaires will then be analyzed using descriptive statistics such as frequency tables, percentages, and proportions. The data will then be used to draw conclusions regarding the application of intelligent technology for fire prevention and control in Sham Shui Po.

3.2 Participants

The participants to be used during the research will be chosen via convenience sampling, which is a non-probability sampling technique that relies on the ease of access to participants to select a sample. The participants will be selected on the basis of their availability and eagerness to participate in the research. The sample size of 57 people was chosen because it is large enough to represent the population of Sham Shui Po and provide a meaningful statistical analysis of the research data. Additionally, this sample size allows for the precise estimation of the true population parameters.

3.3 War storm

Data to be used in this study will be collected using survey questionnaires. The survey questionnaire was designed to assess the attitudes, behaviors, and opinions of the participants on this topic (Goodman, et al., 2013). The survey questionnaires will be distributed to a sample of 57

people who live in Sham Shui Po via email. The participants will be asked to respond to the survey questions within 3 days of receiving the survey link. The survey questionnaires will contain a series of questions designed to investigate the application of intelligent technology for fire prevention and control in Sham Shui Po. The survey will contain 13 questions, which will be used to collect data on respondents' ages, genders, lengths of residence in the area, number of family members living together, and past experiences with fire incidents. The survey questionnaire was designed to be self-administered, which allows for the anonymous completion of the questionnaire. This encourages participants to provide honest and accurate responses to the questions, as they do not need to feel pressured to answer in a certain way. Furthermore, the survey questionnaire is cost-effective and relatively easy to administer, and it is also convenient for participants to complete. Further, the survey will collect data on respondents' opinions on the installation of IoT intelligent fire protection equipment, the potential positive and negative effects of such equipment, and any valuable suggestions they may have. The survey questionnaires will be distributed in an online format. The survey will be hosted on an online survey platform, Google Forms (Evans & Mathur, 2018). Participants will receive a link to the survey or an email and will be asked to complete the questions within a designated period of time.

3.4 Program and Schedule

Phase	**Tasks**	**Date**
Pre-Survey	• Design the survey questionnaire • Test the survey questionnaire	• March 10th • March 15th • March 16th

	• Distribute the survey questionnaire.	
Survey	• Collect survey responses	• March 16th - March 10th
Post-Survey	• Analyze survey data • Write up survey results	• March 26th • April 3th

3.5 Data Analysis

The data collected will be analyzed using inferential and descriptive statistics. Descriptive statistics aims at summarizing the data and presenting it in a way that is easy to understand (Mertler & Vannatta, 2016). Descriptive statistics like means, standard deviations frequencies and percentages, will be used to summarize the data.

Inferential statistics will be used to analyze the data and draw conclusions from the results (Waller & Johnson, 2013). Inferential statistics such as ANOVA tests, regression analysis, chi-square tests, t-tests will be used to compare the results of the survey questions and draw conclusions about the application of intelligent technology for fire prevention and control in Sham Shui Po.

Inferential Tests

Test 1: Chi-squared Goodness-of-fit Test

This test was conducted to examine the variance between the expected and the observed frequencies for the age of participants. The null hypothesis (H0): The age of the participants is distributed according to the expected proportions. The alternative hypothesis (H1): The age of the participants is not distributed according to the expected proportions.

The Chi-squared test results indicated that the chi-square statistic was 3.44 and the p-value was 0.722. Seeing that the p-value (0.722) is greater than the significance level (0.05), we fail to reject the null hypothesis. Thus, in the end, the age of the participants is distributed according to the expected proportions.

Test 2: Chi-squared Test of Independence

This test was conducted to examine the association between the gender of participants and their eagerness to accept the installation of IoT fire protection equipment. The null hypothesis (H0): There is no association between the gender of participants and their eagerness to accept the installation of IoT fire protection equipment. The alternative hypothesis (H1): There is an association between the gender of participants and their eagerness to accept the installation of IoT fire protection equipment.

The Chi-squared test results indicated that the chi-square statistic was 5.99 and the p-value was 0.015. Seeing the p-value (0.015) is less than the significance level (0.05), we reject the null hypothesis. For that reason, we can summarize that there is an association between the gender of the participants and their willingness to accept the installation of IoT fire protection equipment.

Descriptive Statistics

The data from the survey questionnaire were analyzed using descriptive statistics. The results indicated that the majority of the participants were between 18-30 years old (35.09%), female (56.14%), and had been living in Sham Shui Po for 5-10 years (29.82%). The majority of the

participants lived in families with 1-2 members (29.82%). Of the participants, 36.84% reported that there had been a fire in the building they lived in. The majority of the participants believed that the fire hazards in their living area came from cooking stoves (33.33%), followed by debris accumulation (28.07%) and ageing/exposed wires (26.32%). Of the participants, 68.42% were willing to accept the installation of IoT fire protection equipment without having to pay, 28.07% were willing to pay for the installation and 3.51% were uncertain. The majority of the participants believed that the positive effects of IoT smart fire protection equipment were the provision of timely fire alarms (73.68%), quickly planning a reasonable escape route (66.67%), and automatically dialing the "999" alarm function to speed up the fire alarm (75.44%). The majority of the participants believed that the negative effects of IoT smart fire protection equipment were high equipment cost and maintenance costs (68.42%) and inconvenience to use (47.37%).

The results of the descriptive statistics indicate that the majority of the participants were between 18-30 years old, female, and had been living in Sham Shui Po for 5-10 years. The majority of the participants believed that the fire hazards in their living area came from cooking stoves and were willing to accept the installation of IoT fire protection equipment without having to pay. The majority of the participants also believed that the positive effects of IoT smart fire protection equipment were the provision of timely fire alarms, quickly planning a reasonable escape route, and automatically dialing the "999" alarm function to speed up the fire alarm. However, they also believed that the negative effects of the equipment were high equipment cost and maintenance costs and inconvenience to use.

The results of the two statistical tests concerning the survey questionnaire on the application of intelligent technology for fire prevention and control in Sham Shui Po indicate that the age of the participants is distributed according to the expected proportions and there is a relationship between

the gender of the participants and their willingness to accept the installation of IoT fire protection equipment.

The results of the Chi-squared Goodness-of-fit Test indicated that the chi-square statistic was 3.44 and the p-value was 0.722. Since the p-value (0.722) is greater than the significance level (0.05), we fail to reject the null hypothesis. This suggests that the age of the participants is distributed according to the expected proportions. The results of the test are consistent with the findings of the descriptive statistics which showed that the majority of the participants were between 18-30 years old.

The results of the Chi-squared Test of Independence indicated that the chi-square statistic was 5.99 and the p-value was 0.015. Since the p-value (0.015) is less than the significance level (0.05), we reject the null hypothesis. This suggests that there is a relationship between the gender of the participants and their willingness to accept the installation of IoT fire protection equipment. The results of the test are consistent with the findings of the descriptive statistics which showed that the majority of the participants were female and were willing to accept the installation of IoT fire protection equipment without having to pay.

The results from the two statistical tests provide evidence that the application of intelligent technology for fire prevention and control in Sham Shui Po is likely to be accepted by the residents. This is especially encouraging given the number of fire incidents that have occurred in the area in recent years. Intelligent technology has the potential to reduce the risk of fire and save lives.

3.6 Ethics and Limitations

This research project has taken into consideration the ethical considerations of the study research. All participants were enlightened of their rights as participants; they were enlightened that their

participation was voluntary and their responses would remain anonymous. The participants were also enlightened that they could withdraw from the research at any time without any consequences. This study has several potential limitations. One of them is the small sample size. The survey questionnaires were only distributed to a sample of 57 people, which may not be representative of the population of Sham Shui Po. Additionally, the survey questionnaires were distributed via email, which may have resulted in a lower response rate. Also, since email is an online format, therefore it is possible that the responses may be biased towards those who are more tech-savvy. Furthermore, the survey questions may have been phrased in a way that elicited biased responses from the participants. Finally, the results of this study may not be generalizable to other populations or contexts.

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