Modeling of Conceptual Public Building Design Factors to enhance Safety of Tourists in Thailand

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Abstract. A conceptual public building design framework was modeled using architectural and universal design concepts to enhance the safety of tourists in Thailand. The research method involved informal interviews and observations for the area case study of Koh Yo, Songkhla, Thailand. Interview results were summarized together with related theories from the literature. All factors were collected and listed. Ten experts in related fields confirmed the factors and framework through the technique of a focus group discussion. Findings indicated that tourist characteristics had a positive direct effect on requirements for the safety of public buildings and comprised three sub-factors including (1) general architectural facilities, (2) warning systems, and (3) fire safety and building regulations. Each sub-factor affected tourist safety satisfaction. This framework can be used to quantitatively analyze future policy for the design and management of public buildings to enhance the safety of tourists in Thailand.

1. Introduction
Tourism is one of the main industries that brings foreign exchange income to Thailand. The country is a popular tourist destination with a large diversity of tourism resources. According to the National Statistics Office [1], the tourism industry has a gross domestic product (GDP) of around 6.00%. The tourists mostly hail from China followed by Malaysia, Korea, Japan, India, the United Kingdom, Australia, the United States and Russia, respectively. Safety and security are important issues for the development of tourism destinations. Tourists are naturally concerned about their safety and security when traveling, and often have scant knowledge of their intended destination compared to their home country [2]. Tourists are aware that they may be at risk of physical injury due to various hazards when traveling including potential insecurity such as crime, terrorism or accidents [3]. The issue of tourist safety in Thailand must be addressed to promote tourism capability and support sustainable future growth [4]. Ko Yo is an island surrounded by Songkhla Lake that has beautiful scenery, old temples, unique local foods and many tourist attractions. The island is suitable for promoting tourism by the community. Most of the people who live on Ko Yo are engaged in fishing and trading processed fishery products. Ko Yo also has a thriving woven fabric industry producing well-known products. A conceptual research model of tourist characteristics and their requirements for safety in public buildings was formulated using the case study area as Koh Yo, Songkhla, Thailand. To achieve this objective, components of tourist requirements were first identified and then measured. A conceptual model was developed to demonstrate the relationships of factors between tourist characteristics, their safety requirements, and their attitudes toward safety. The model was proved by collecting empirical
data for quantitative analysis. Results can be used to assess the quality of design and management of public buildings to enhance the safety of tourists in Thailand.

2. Literature review
Architectural design involves creating buildings and facilities as cost-effective to meets the needs of users [5]. Architectural design must also take into account the safety of the building users such as accidents from falling on a slippery floor, walls collapsing and sufficient fire exits [5]. Safety can be defined as the protection of people against unintended consequences of an involuntary nature. For example, a case of arson is a security issue, while a spontaneous fire is a safety issue [2]. Safety in public buildings is the key issue in this study. A public building is used by many people each day. Therefore, the safety and stability of the building is the most important matter, regardless of the type or purpose of use. Facilities are tangible items as part of a property or building, especially as added extras that make people more comfortable. Facilities are basic requirements for tourists such as accommodation, buildings, parks, swimming pools, exercise rooms, signboards, communication systems, public utilities, transportation and other services. Guidelines for preventing and managing safety for foreign tourists require strong cooperation of stakeholders from all sectors including government, private sector, local communities and tourists [6]. Guidelines for tourism safety management can be stated as follows: (1) Enforcing the law and imposing penalties for serious offenders because good law enforcement will encourage tourism [7]. (2) Development of safety at tourist destinations by supporting tools and equipment to help tourists including CCTV, machine translation or signage translated into many languages, light installation in tourist attractions and basic tourist equipment [8]. (3) Promotion of hygiene in tourist destinations by improving public toilets, waste management and wastewater treatment [4]. Fire safety and building regulations require the availability of necessary protective equipment in the event of an accident. Equipment such as fire extinguishers, heat and smoke detectors and emergency lighting must pass inspection standards and be ready for use [9]. Universal design requires that any product or environment must involve the consideration of many factors including aesthetics, engineering options, environmental issues, safety concerns, industry standards, and cost [10]. The National Disability Authority [11] has defined universal design as the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people, regardless of their age, size, ability or disability. The universal design concept was considered and combined in the analysis of this study. The Center for Universal Design [12] has established seven principles of universal design to provide guidance in the design of products and environments. These principles include:

- Equitable use - the design is useful and marketable to those with diverse abilities.
- Flexibility in use - the design accommodates a wide range of individual preferences and abilities.
- Simplicity and intuition - use of the design is easy to understand, regardless of the user’s experience, knowledge, language skills, or current concentration level.
- Perceptible information - the design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities.
- Tolerance for error - the design minimizes hazards and the adverse consequences of accidental or unintended actions.
- Low physical effort - the design can be used efficiently, comfortably, and with a minimum of fatigue.
- Size and space for approach and use - appropriate size and space is provided for approach, reach, manipulation, and use, regardless of body size, posture, or mobility.

3. Research methods
The technique of focus group discussion [13] is a widely used and accepted method for achieving convergence of opinion concerning real-world knowledge solicited from a group interview within certain topic areas. The technique is designed as an expert group interview process and aims to conduct detailed examinations and discussions of a specific issue. The process is continuously iterated

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until a consensus is determined to have been achieved. This research used the focus group discussion technique to confirm the factors involved in the conceptual modeling of public building design to enhance the safety of tourists in Thailand. Steps of the focus group discussion technique were as follows:

Step 1. Identify the factors: Observations and informal interviews were conducted with tourists in the case study area (Koh Yo, Songkhla, Thailand) in terms of general management and architectural designs of safety in public buildings. Interview results were summarized along with related theories from the literature such as textbooks, research articles (ISI, SCOPUS and ScienceDirect databases) and related annual reports in Thailand. All factors were collated and listed before proceeding to the next step.

Step 2. Confirm the factors: The listed factors were confirmed by ten experts [13] in related fields using the focus group discussion technique. The experts were selected based on their professional experience as follows: Five experts from tourists in the case study, three experts in architectural design aspects of public buildings employed by private design companies, and two experts from local tourism government officers in Koh Yo, Songkhla, Thailand. The listed factors were confirmed by a consensus of opinions starting from expert 1, 2, 3..., 10 and returning to expert 1 again. All experts carefully considered the listed factors. Results were aggregated and shared with the group after each round until a consensus was saturated. Once the listed factors were confirmed and categorized by the ten experts, they were constructed as the conceptual model in the next section.

Step 3. Draft the conceptual model: According to the expert opinions, confirmed factors were categorized and arrows were drawn between the factors as a draft conceptual model. This was then reconfirmed by the ten experts by repeating Step 2. The final model was considered as the conceptual research model.

4. Results
From the focus group discussion, the opinions of the ten experts as confirmed factors and items as indicators of the study are listed in Table 1.

Table 1 shows the factors of tourist characteristics comprising age and health as TC1 and TC2. Tourist requirements comprised three sub-factors as (1) general architectural facilities; 10 items (Q1 to Q10), (2) warning systems; 4 items (Q11 to Q14), and (3) fire safety and building regulations; 9 items (Q15 to Q23), while tourist safety satisfaction comprised 3 items (TS1 to TS3). All factors for tourist requirements and their measurement items were used to construct the conceptual model shown as Figure 1. This model was extended to include more detail of the items, variables and their indicators as shown in Figure 2.

![Figure 1](image-url)
Figure 2. Detailed conceptual model

Table 1. Factors for tourist’s requirements and their measurement items

| Factor                      | Item                                                                 |
|-----------------------------|----------------------------------------------------------------------|
| Tourist characteristics     | TC1 Age                                                               |
|                             | TC2 Health                                                            |
|                             | Q1 Floor/different level floor                                        |
|                             | Q2 Stair                                                              |
|                             | Q3 Ramp                                                               |
|                             | Q4 Fall protection wall / hand rail                                  |
|                             | Q5 Door / window                                                     |
|                             | Q6 Elevator                                                          |
|                             | Q7 Escalator                                                          |
|                             | Q8 Lighting                                                           |
|                             | Q9 Car park                                                          |
|                             | Q10 Toilet                                                           |
| General architectural       | Q11 Warning sign board / symbol                                       |
| facilities                  | Q12 Notification sound                                                |
|                             | Q13 CCTV                                                             |
|                             | Q14 Safety officer                                                   |
| Tourist requirements        | Q15 Fire extinguisher                                                |
|                             | Q16 Heat and smoke detector                                          |
|                             | Q17 Emergency lighting                                               |
|                             | Q18 Fire sprinkler                                                   |
|                             | Q19 Fire alarm                                                       |
|                             | Q20 Fire cabinet                                                     |
|                             | Q21 Fire exit                                                        |
|                             | Q22 Assembly area                                                    |
|                             | Q23 Local regulation                                                 |
| Warning systems             | TS1 Confident in the safety                                          |
|                             | TS2 Reliable in the safety                                           |
|                             | TS3 Satisfying in the safety                                         |
5. Conclusions
This research studied factors related to enhancing the safety of tourists in public buildings by modeling a conceptual framework. The case study area (Koh Yo, Songkhla, Thailand) was observed, and interviews were conducted to assess the general management and architectural design for safety in public buildings. Factors were identified from the case study and confirmed by ten experts using the focus group discussion technique. Results indicated that requirements of tourist characteristics included age and health as TC1 and TC2, general architectural facilities Q1-Q10, warning systems Q11-Q14, fire safety and building regulations Q15-Q23, and tourist safety satisfaction TS1-TS3 as shown in Table 1. A conceptual model as the outcome from the study (Figure 2) showed that factors of tourist characteristics had a positive direct effect on their safety requirements. These requirements comprised three sub-factors including (1) general architectural facilities, (2) warning systems, and (3) fire safety and building regulations. All factors impacted on tourist safety satisfaction in public buildings in the case study area. The model in Figure 1 was extended to include more details of the items, variables and indicators as shown in Figure 2. This model can be used to quantitatively analyze future policy for the design and management of public buildings to enhance the safety of tourists in Thailand.

6. References
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