The Identification of the Elements Effective on the Resilient Design of Emergency Evacuation Ways Against Fire

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Abstract

Identifying the factors affecting the emergency evacuation process of the occupants at critical times in the burning building and how to exit them to a safe place from fire hazards can play a critical role in the rescue management. An important prerequisite for emergency evacuation of a burning architectural building is the assumption that safety measures designed for the building's architecture against a potential fire are capable of providing appropriate behavioral conditions for effective emergency evacuation at the time of the fire by building occupants. The emergency evacuation process will play an important role in the sustainable design of a building against fire. Review literature on the factors affecting emergency evacuation performance in a burning architecture showed that the architectural environment around them influenced the occupants' behavior and the burning framework of its own cinemorph building creates its own, which can be quite different to the cinemorph designed by the architect of a different building but also opposed. According to building the evacuation model, requires collecting data from the three components of structural, fire and human characters. This article aims to rank the factors affecting emergency evacuation in a burning building by investigating the impact of each of these characters and identifying their subset criterion characters by extracting data from the questionnaires based on Lisrel's structural equation method and software analysis, and the impact of each criterion. Finally, a conceptual model of the factors influencing successful emergency evacuation in a burning architecture framework is proposed.

Keywords: Fire, Burning architecture framework, Architecture, Way founding

1. Introduction

Fire, as one of the worst psychological conditions for human beings during their lifetimes, occurs at the time of natural or human disasters. Not only fire, but also other conditions such as earthquake create a process of emergency evacuation in the building hence, the term "critical environment" refers to the body of The building is on fire in a special space and time that the nature of the use of the building body changes rapidly and it will have other physical features and requirements. (Golledge, R.1999)

The phenomenon of fire will cause serious damage to the structure of buildings leading to loss of life to those present in a building. Fire resistance has attracted remarkable attention in the world in recent decades. Fire resistance and the consequences of a large fire is concerned itself as an infrastructure in the architecture of durable buildings that has been proposed since 2015 and presented and agreed as on the scale of durable metropolitan index. The stability and resistance of buildings against the risk of fire have two basic objectives:

Ensuring the safety of lives of those present in a building and the stability of the building against the risk of fire in such a way that the minimum possible damage occurs to the future use of the building after the fire, the architecture, structure and internal facilities of a building. According to the third issue of Iranian National Building Regulations, today all buildings in the country should be examined in terms of safety and stability against fire hazards, while the country's architectural research knowledge as the main field of building engineering on fire modeling in a building during a new fire is on its primary stages. The third section of the National Building Code is now compiled sporadically from European and American fire standards. Kopeck gives an example in this regard: "Suppose a man is working in his office in an office building. The building catches fire. According to the alarm and smell of smoke, he understands he should go towards the door (technical features of the building, including emergency evacuation of the building) and as you see, given the smell of the smoke, his body reacts chemically to counteract it. (Characteristics of the nature of the fire, including emergency evacuation of the building) When escaping and descending stairs, he fears, a fear that remembers from childhood (building architectural design, including emergency evacuation of the building) When escaping, he remembers to help women and children (human behavior, including emergency evacuation of the building), Kopeck's example actually shows the way founding phenomenon in the body of The building is on fire while it has the tangible and known nature and it has a more complex mechanism, too. (Carpman J. R., Grant M. A, 2002)

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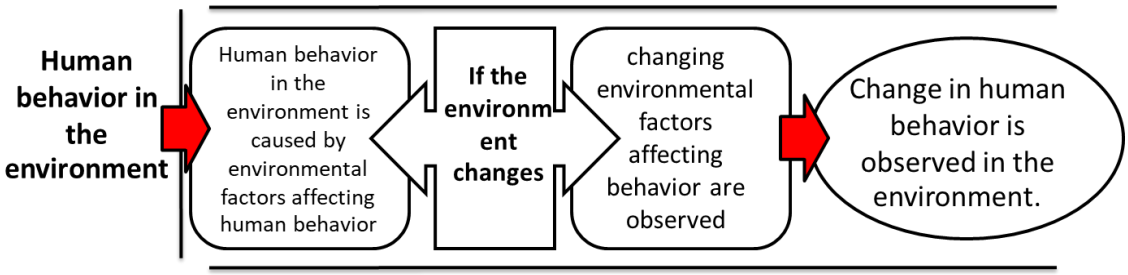

Fig.1. Barker's behavioral change model in architectural space

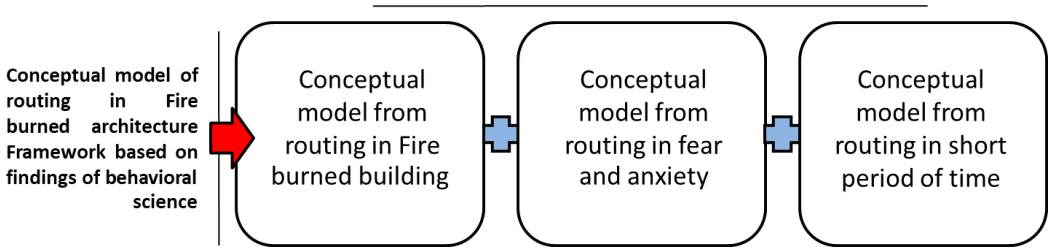

Fig. 2. Three micro-factors constituting the conceptual model of way founding in the building is on fire

1.1 Research Questions: What model does a human's

way founding behavior follow in the physical environment of the building is on fire based on the findings of the behavioral sciences?-Why is way founding in the building is on fire different from way founding in everyday architecture?-What is the relationship between architectural environment and way founding behavior?-How can predict the way founding model in the building is on fire based on the findings of the behavioral sciences when designing architecture?

2. Background of Studies

Arthur and Passini consider the way founding term as a description of practice without anxiety and successful a route or space from one point to another point using information about determining the current location, destination and route to that destination. He considers the term "way founding" as "orienting with the spatial behavior of an individual in an environment that has a particular relationship to the stability of the space or environment and is related to the formation of the users' mental image." (Passini, 1984)

Table 1
3 Way- founding Stages from Passini and Paul Arthur's point of view

Routing phases from Passini and Paul Ardors point of view		
Stage	**Suggested name**	**Descriptions**
1	Decision making	Stage is the begging that the individual at decision points in the environment before taking action chooses which side would reach him to the destination better.
2	Decision implementation	The implementing of the decision is a dynamic nature ,the individual processes the information provided and executes the decision plan when moving at the appropriated time and place along
3	Information processing	It's done through decision making and implementation of decision and action based on information. It is at this stage that mental role playing leads the directing of individual in next

In another view, Gibson considers that "successful and efficient way founding systems, by employing obvious signs and information, are accompanied by implicit signals and symbols that work correctly and immediately."

People need to know where they are, they should know the different situations in the environment, and how to reach their destination, and how to get out. John Lang describes the way founding process as a set of decisions and policies on key issues affecting the people searching for a site (Golledge, R.1999)

In the following, John Lang talks about the formation of the mental image in a two-way process between the person and the environment. He talks about the different Mental plans in the mind of individuals from an environment unit by physiologic differences dominating different humans and he introduces the human factor in two-way process with the variable environment (Mileti, Dennis et.1977, 24-26).

He considers mental process in the meaning of recognition of the location of the supervisor between different locations and the ability to choose the route. In other words, it means knowing where we are in the surroundings.

Table 2
Physiological differences from John Lang's view

		Routing phases from Passini and Paul Ardors point of view
1	**differences**	These differences reflect in mental images, physiological individual differenced, organ characteristics ,gender, duration of residence, personal experience, types of urban transportation
2	**Shapes**	Different people pays attention to different elements and patterns of environment shapes with certain patterns are not appealing to all people
3	**surroundings**	Organ differences and features of the human cause some people with mental disabilities to have difficulty in specifying their position and orientation in buildings, districts and cities, other whose mental disorders have physiological basis have incomplete and sometimes distorted images of

Table 3
Comment of various experts on the routing in architecture

		The routing in architecture
1	**Gibson**	Successful and efficient way founding systems, by employing obvious signs and information, are accompanied by implicit signals and symbols that work correctly and immediately.
2	**Passini**	Enhancing the image of a particular place is achieved by optimally marking of routes and locations or by changing the physical organization of a city, neighborhood or buildings
3	**Miller**	Organ differences and features of the human cause some people with mental disabilities to have difficulty in specifying their position and orientation in buildings, districts and cities, other whose mental disorders have physiological basis have incomplete and sometimes distorted images of
4	**Lang**	The way founding term as a description of practice without anxiety and successful a route or space from one point to another point using information about determining the current location, destination and route to that destination.
5	**Tolman**	Gaining knowledge of designing an effective way founding requires having a thorough knowledge from the architecture of buildings and understanding of the fire factor and how it moves and smoke during an accident in buildings.
6	**Paul Ardors**	Different people pays attention to different elements and patterns of environment shapes with certain patterns are not appealing to all people

Various researchers have conducted various researches on mental way founding tools. Miller considers the problem-solving way founding including three parts and introduces its own unique way-founding tool for each of these parts. People, environment and information. In the following table, a comprehensive list of mental way founding tools known by various researchers is described. (Arthur, P. And Passini, 1992)

"If way founding is difficult, nervous pressure increases, especially when one is in danger," Passini says. Enhancing the image of a particular place is achieved by optimally marking of routes and locations or by changing the physical organization of a city, neighborhood or buildings. "(Arthur, P. And Passini, 1992)

Table 4
Comment of various experts on the way founding tool in architecture

		The routing in architecture
1	**Hardman**	When selecting the route, the supervisor through the use of environmental and spatial information chooses the optimal route through the network of passages.
2	**Carpman**	Difficult way-founding leads to problem and confusing
3	**Miller**	Diversification of getting environmental information leads to different behavior in way-founding, as a result, the decision to choose the path is related to the information received from the environments.
4	**Golledge**	There are various tools as guidance of making a decision and choosing a path to reach the goal, all of which lead to information transfer and ultimately follows the ease of routing based on general division.
5	**Kozolwski**	The method using maps and verbal tools is more commonly used by people unfamiliar with the environment. Newcomers to the environments are more confidents in choosing the right rout using these techniques
6	**Lowton**	There may be no information available many times along the route, in this condition, the supervisor can make decision by using trail and error method and searching the environments or by following the guiding signs follow the best way to reach the destination.

Therefore, Golledge chooses three questions to be answered in order to properly design the route process. Where did I come from? Where am I? And. Where am I going? In the following, Chinese researcher, Wang, introduces several important components for designing an effective model (Moore & A. H. Golledge 59, 2000)

Table 5
Components of successful way founding systems from John Wang's view

		successful way founding systems
Row	**Component**	**Distribution**
1	**Effectiveness**	An Effective routing systems is a useful systems that provide sufficient information
2	**Efficiency**	Productivity is actually helping people to find the correct way
3	**Enjoyment**	Means enjoying different sense during way founding
4	**Satisfactio**	Related to people values

Researches began two decades late in the early 1970s with scholars such as Braxma, Milenisky, and Pauless. They tried to observe the exact behavior of the possessors of a building at the time of the fire. (The information collected by him is often about the movement of dense populations as well as the speed of movement of people across different demographics resulting from observing and interviewing possessors rescued of the building is on fire or specialists in helping fire accidents) (Carpman J. R., Grant M. A, 2002)

2.1 Statement of problem: all human beings have experienced different environments throughout their lives and are surrounded by them, but some temporal and spatial conditions create conditions that human being may have never experienced before (Mileti, Dennis et.1977, 24-26).

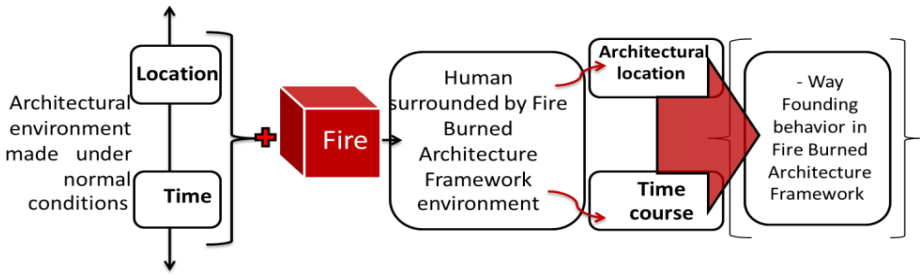

Fig. 3. Synomorphy transfer model of normal location and time to fiery location and time
(Source: Authors)

Location of The building is on fire are considered to be of these types of environments. Therefore, the name of the emergency to these environmental conditions seems to be a correct issue, from the perspective of an emergency research, it creates unique features. Based on the data extraction and the research in the SFPE world standard, any modeling from human way founding behavior in fire situations should be considered for the accuracy of prediction of various factors and the interaction of these factors together accurately estimate the human behavior studied by the researcher. Findings from the background of studies of human way founding behavior during a fire can be divided into two main factors (Zimring, 1981, 149).

The first factor relates to the individual's mental and psychological characteristics. This component will examine the individual behavior of a person separately from others and subsequently the individual's way founding behavior will be resulting from his or her perception of the social behavior observed by the individual and subconsciously imitates the person. It should be noted that at this stage, after observing the patterned behavior that is taken place from the terrified human populations, the individual examines the outcome of his or her external observations from the behavior of the populations in the final decision for choosing the appropriate exit route. Nevertheless, the third component introduced by the International Standard Codes of Human Understanding Factor examines the extent and manner of human risk perception and the effects of its impact on successful way founding in the body of architecture. Table 8 introduces the factors affecting the prediction of one's behavior when way founding in fiery architecture (Golledge, R.1999).

Table 8
Factors affecting predicting individual behavior when way founding in Fire burning architecture framework

		Factors affecting predicting individual behavior when routing in fire burned architecture framework(Based on standard (SFPE),factors affecting phases of routing in fire burned architecture framework by attendees in building need identification of indicators of population appraisal
1	**Occupation density**	Considering the per capita spatial occupation by building occupants, one of the most important factors influencing population routing during fires is locating the focal points of population masses in building.it should be noted that the concentration of people in each building are also covers the phenomenon of collective panic when firing
2	**Evacuation**	Individual and group action when fear is directly influenced by firing decision making and routing ,it should be noted that this factor derives directly from the concept of social motor efficacy
3	**Placement**	Placement of sequencing different activities with different population flow as well as different times in fire hazard awareness alone have their own effect on the emergency evacuation process
4	**Occupiers placement**	The occupiers placement in the architectural space of building relative to the area where the fire was declared and the persons mental retrieval
5	**Familiarity factor**	Time of use –Evacuation sign
6	**Response time Mental problems**	Critical response time among patients has different types of mental problems ad with more delay than other construction occupiers who have normal psychological behavioral characteristic
7	**Response time physical problems**	Critical response time for evacuation of fire space in a building for patients with a variety of motor ,visual ,auditory and olfactory disabilities are significantly different from other occupants with normal physical characteristics in a building

8	**Responsibility**	Defining the term social dependency is the feeling of responsibility of person for other people in the fire burned space to inform them or to help them evacuate the building.
10	**Social**	The social and occupational responsibilities of those present in the building affect their behavior during the emergency evacuation of the building alone
11	**Sexual and age condition**	There is a tremendous behavioral difference between two genders
12	**Culture**	The behavioral response in time of crisis is a function of the prevailing ecosystem and culture on occupiers within the architecture
13	**Perception**	Childhood ,adolescence ,middle aged, old aged
14	**ETC.**	The presence of rainy weather, cold or hot ,and the decision on the type of cover by religion when leaving and… all are the factors affecting emergency exit evacuation

Gaining knowledge of designing an effective way founding requires having a thorough knowledge from the architecture of buildings and understanding of the fire factor and how it moves and smoke during an accident in buildings. Horizontal and vertical collision factors in the alignment of building floors, such as stairs, elevators and corridors, play the most important role in the architecture of a building to plan the emergency evacuation process of a damaged building and to provide safe conditions for relief organizations.

The model presented in Fig. 4 is derived from the findings from previous studies regarding factors affecting the successful emergency evacuation.

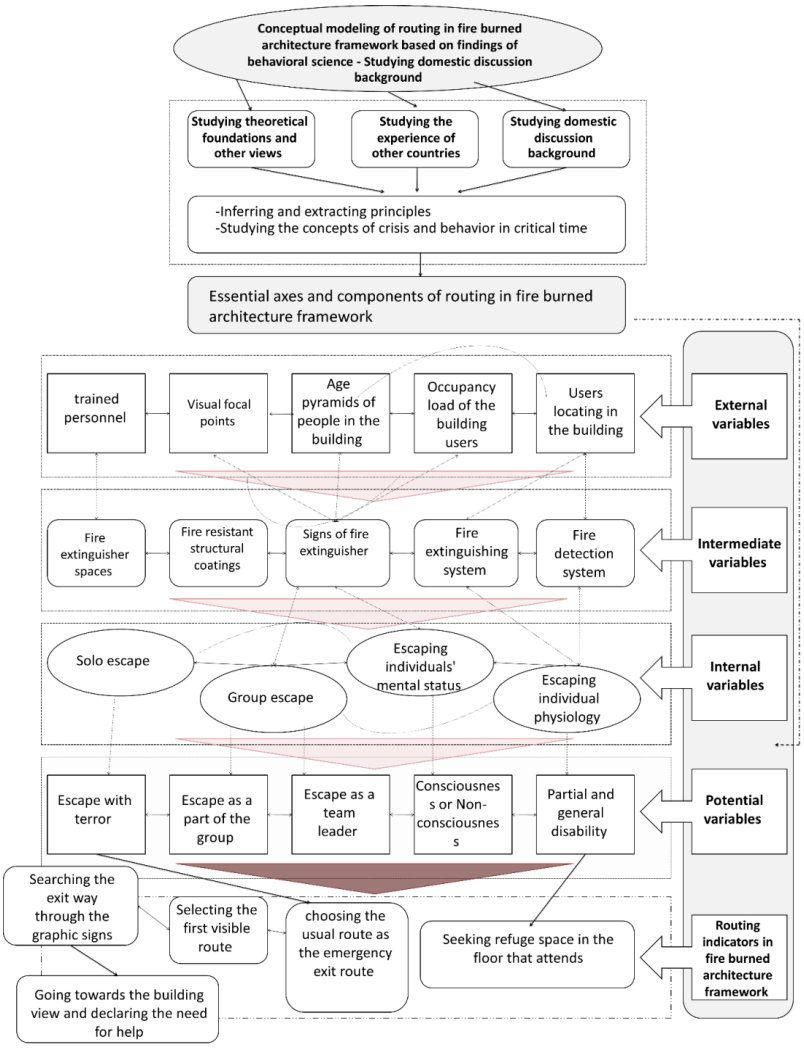

Fig. 4. Conceptual way founding model in the building is on firebase on research findings

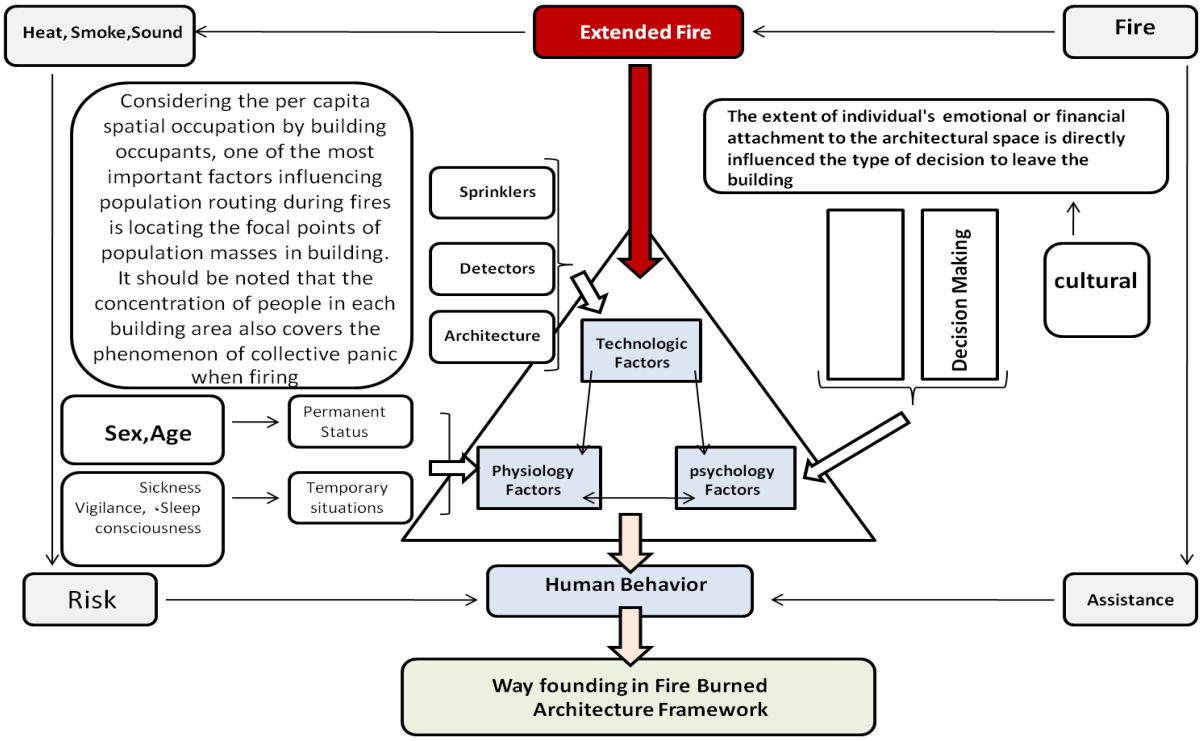

Fig. 4. Conceptual Routing model

3. Research Method

3.1 First steps: Interview with experts at the highest level of the fire and municipal organization in Tehran to provide qualitative research on the principles is provided during calculations. For this purpose, a thorough background of the outline will be provided before the formulation of the questionnaire questions through expert interviews as well as studies about the research background.

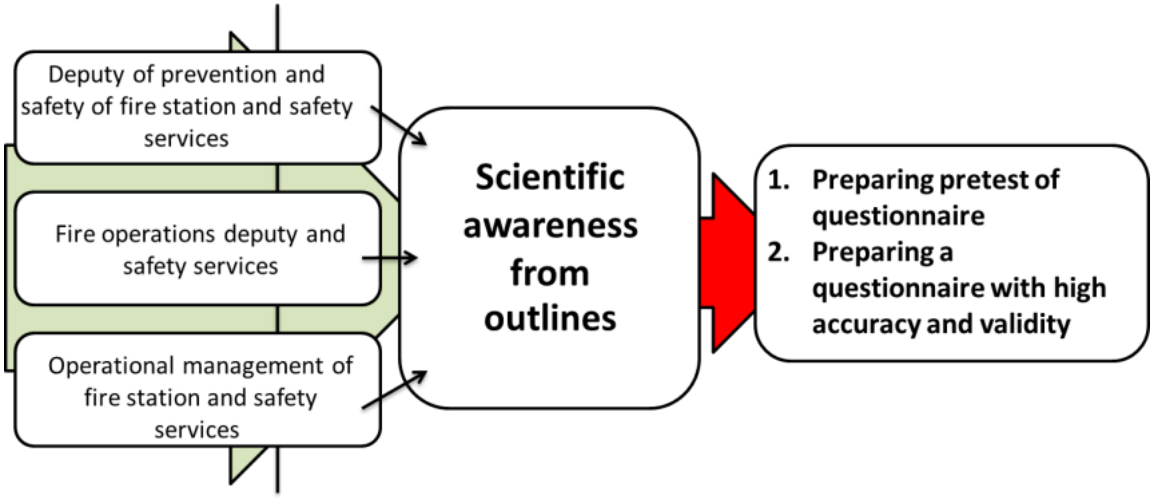

Fig .5. The prognosis model from the importance issues of experts

Measuring the influential components on way founding in the body of The building is on fire according to the purpose of this study that is to explain the way founding model in the body of fire burning architecture: Based on the studies and statements of the experts in this area, important and influential indicators are extracted according to components of individual human behavior, group behavior among humans, and the risk perception and introduced in the theoretical model of effective factors and emergency evacuation . In the next step, based on the knowledge gained from the opinions of fire experts, a research questionnaire was prepared

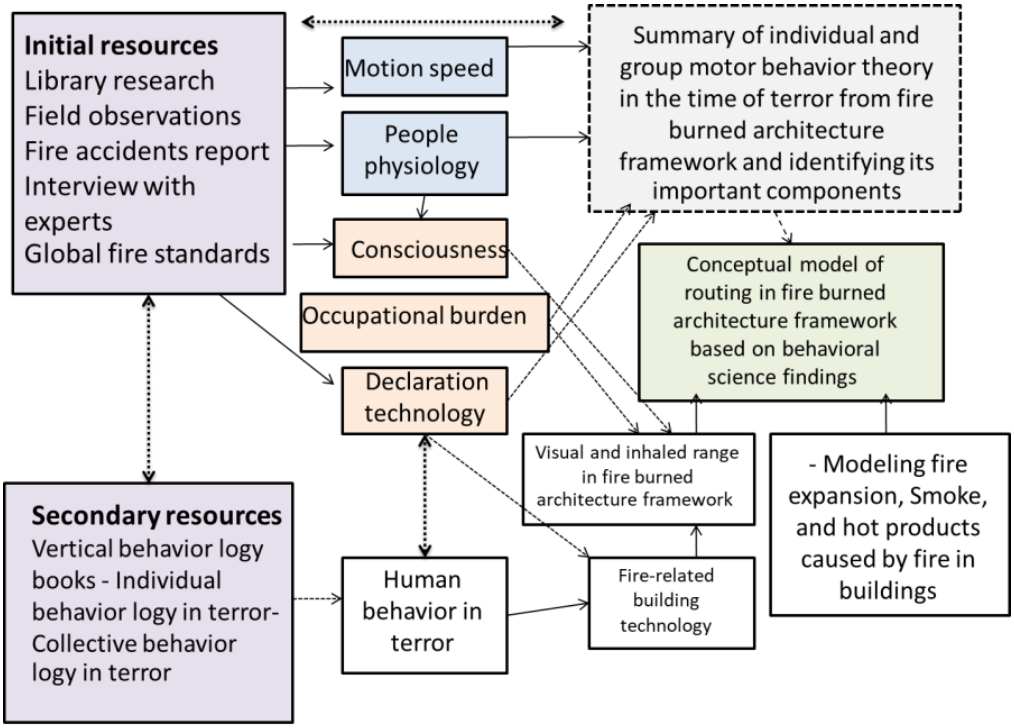

Fig . 6. Initial model of identification and factors affecting emergency evacuation

3.2 Second Step: According to the quantitative-qualitative nature of the present study, a random sampling method using Cochran's formula for the questionnaire of "Measuring the Priority of Influential Factors in Way founding in Fire Architecture" is used and people as a statistical population (sample) are selected that have one of the following conditions: People with experience in the body of a fire burning architecture framework, experts of Tehran Municipality Fire and Safety Organization, PhD students in Architecture of Shahid Beheshti University, MA student in Architecture of Azad University of Science and Research, MA student of urban planning of Azad University of Science and Research, on this basis, among nearly 800 specialists, 250 people according to the Cochran formula were selected as the sample size of the study and a questionnaire was distributed among them.

3.3 Third Step: (Forming the Primary Information Matrix): The first step in explaining, extracting information and effective way founding criteria in the building is on fire body is based on the findings of the research background. This model in initial explanation has considered by experts and operational experts in the field of firefighting. In explaining and formulating the quality of way founding in fire burning architecture framework, the variables used were restricted to the three components of fire indices, building indices and human indices.

Table 9
Factors influencing way founding behavior in the building is on fire

Affecting routing behavior in fire burned architecture framework				
1	**Component**	**Index**	**Measurements**	**Impact Factor of Measure**
2	Group	Mass formation	Individual escape	Individual and group action
3	Group	Mental routing	Use of buildings	Placement of sequencing different activities
4	Solo motion	Physiologic	Perception ability	The occupiers placement in the architectural space
5	Solo motion	Physiologic	Motor ability	Critical response time for evacuating of fire burned space in a building for patients with a variety of motor, visual , auditory and olfactory disabilities are different

6	Solo motion	Attachment	Social dependencies	Defining the term social dependency is the feeling responsibility of person for others
7	Solo motion	Attachment	Social role	The social and occupational responsibility
8	Solo motion	Attachment	Capital	The extent of individual emotional responsibility of those present in the building affect their
9	Solo motion	Sex-Age	Gender	There is a tremendous behavioral difference
10	Solo motion	Sex-Age	Behavioral culture	The behavioral response in time of crisis is a function of the prevailing ecosystem and culture on occupiers within the architecture
11	Solo motion	Sex-Age	Age	Childhood ,adolescence ,middle aged, old aged
12	Solo motion	Routing	Familiarity	Time of use –Evacuation sign
13	perception	Mental perception	Natural consciousness	The ability of awareness from potential danger
14	perception	Mental perception	Non-Natural consciousness	The ability of awareness from potential danger
15	perception	Mental perception	Interior design	circulation
16	perception	Mental perception	Interior Furnishing	Furnishes
17	perception	Mental perception	Visual focal point	If there are focal point such as spaces in cinema
18	perception	External perception	Other issues	The presence of rainy weather, cold or hot ,and the decision on the type of cover by religion when leaving and… all are the factors affecting emergency exit evacuation

Identifying the correlation between the variables, examining the values related to the shares of each variable with the other relevant variables, based on the Structural Equation Method is the goal of conducting this stage. The first output is based on the Structural Equation Method of the share table for each variable, which shows how much is the common variance of a variable with the other variables used in the research.

3.3 Fourth Stage **(**Extracting factor load and variable of investigating explained variance of subject): This step calculates the preliminary computation matrix in which the explained variance is determined by each factor In other words, the corresponding matrix that is showed in the form of the model explained, the estimate of factor analysis or factor loading of the indicators or path coefficient and the coefficient of comparative relationship of the effective way founding measures is specified in body of The building is on fire, and more importantly, how much has been the share of each of the relevant factor in explaining and determining the effective way founding

Table 10
Multiples of components affecting emergency way founding from the body of the building is on fire

Affecting routing behavior in fire burned architecture framework				
1	**Component**	**Index**	**Measurements**	**Impact Factor of Measure**
2	Group motion	Mass formation	Individual escape	72%
3	Group motion	Mental routing	Use of buildings	60%
4	Solo motion	Physiologic	Perception ability	78%
5	Solo motion	Physiologic	Motor ability	85%
6	Solo motion	Attachment	Social dependencies	45%
7	Solo motion	Attachment	Social role	35%
8	Solo motion	Attachment	Capital	94%
9	Solo motion	Sex-Age	Gender	60%
10	Solo motion	Sex-Age	Behavioral culture	80%
11	Solo motion	Sex-Age	Age	77%
12	Solo motion	Routing	Familiarity	60%
13	perception	Mental perception	Natural consciousness	67%
14	perception	Mental perception	Non-Natural consciousness	67%
15	perception	Mental perception	Interior design	45%
16	perception	Mental perception	Interior Furnishing	64%
17	perception	Mental perception	Visual focal point	25%
18	perception	External perception	Other issues	15%

3.4 Step Five: (Confirming model validation): At this stage and after determining the factor load of each of the factors explaining the emergency discharge, by assigning points to each of the factor indices, compared to standard scores, evaluation and test of fitness and significance of the relationship between variables are done.

Table 11
Factors of emergency exit components from body of the building is on fire

Factors Affecting Effective Components			
Error rate	**Critical Levels**	**practical**	Effective component
0/00	**4/32**	**1/31**	Group movement
0/00	**4/61**	**1/04**	Solo movements
0/00	**0/62**	**0/85**	Risk perception

3.5 Sixth step: (Modification of the model): At this stage, based on the fitness of the model of factors affecting the way founding of the body of the building is on fire by estimating the amount of explanation of each factor, the tested hypothesis and questions are answered: In other words, this study is going to identify the explanatory factors and their effect on the studied emergency evacuation. The method of data analysis in this study is quantitative which is tested through the structural equation method and path analysis of the logical answer to the question and hypothesis.

The purpose of path analysis is to obtain quantitative estimates of the causal relationships between the set of way founding variables in body of the building is on fire. In this study, 8 factors affecting emergency way founding of buildings are summarized by factor analysis method and reduced to three factors and presented as a combination of significant factors. Then, the impact of each of the factors in explaining the impact on the effective emergency way founding process by using the LISREL output model as a multi-criteria decision making method, the empirical model tested and finally the effective way founding model from body of the building is on fire in amount of indicators of explaining emergency evacuation are specified.

3.6 Research Findings**:** As it is evident from the software output models in the path analysis model (Fig. 7), the relationship between the components and indices has been evaluated individually. Individual dependency index from the components of individual behavior has the highest impact factor and the external perception component has the lowest impact factor. Since the indicators were able to explain each component well or in other words, a significant relationship to be established between them.

In the structural model (Figure 8) that measures the relationship between way founding and the components simultaneously with the indicators, two indicators, i.e. collective behavior and perception from fire conditions have the most impact.

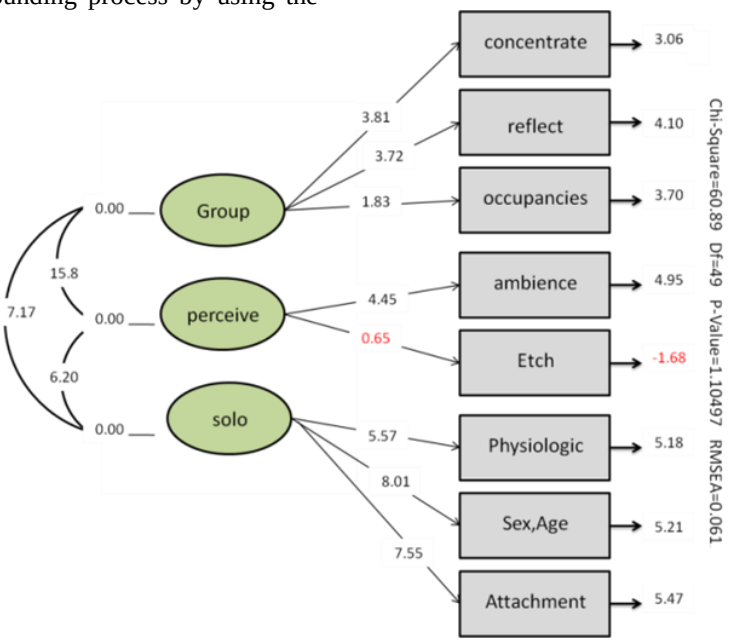

Fig .7. Way founding process analysis model and explanatory indicators

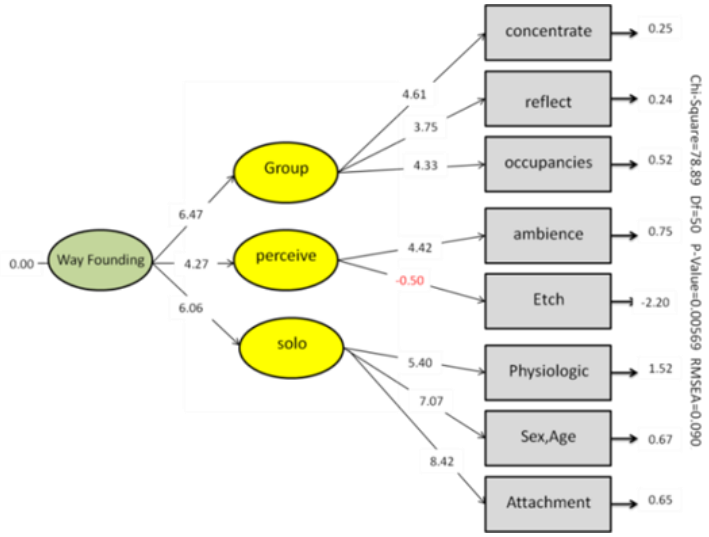

Fig .8. Structural model of the components affecting emergency evacuation of the building is on fire

While in the relationship between way founding and the components, the individual behavior component has less explanatory power than the other components of emergency evacuation. According to the structural model (Fig. 9), the component of collective behavior then, the individual behavior component, respectively, have the highest impact on explaining the way founding in the building is on fire.

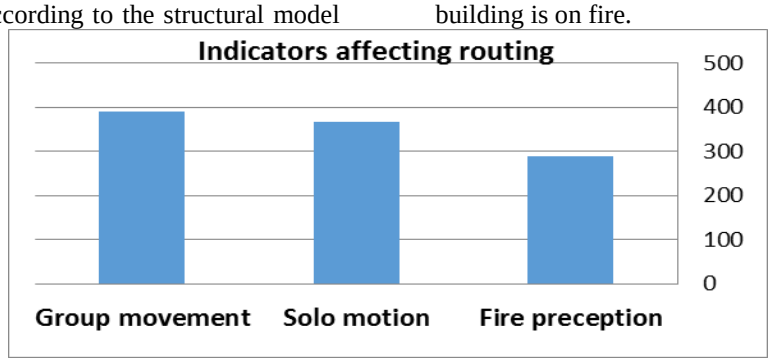

Fig .9. The Impact of components affecting emergency evacuation in buildings

After processing both the path analysis (Fig. 10) and the structural (Fig. 11) models, it became clear that the index of presence of focal points and external perceptions could not well explain the component of fire perception and should be excluded from the model.

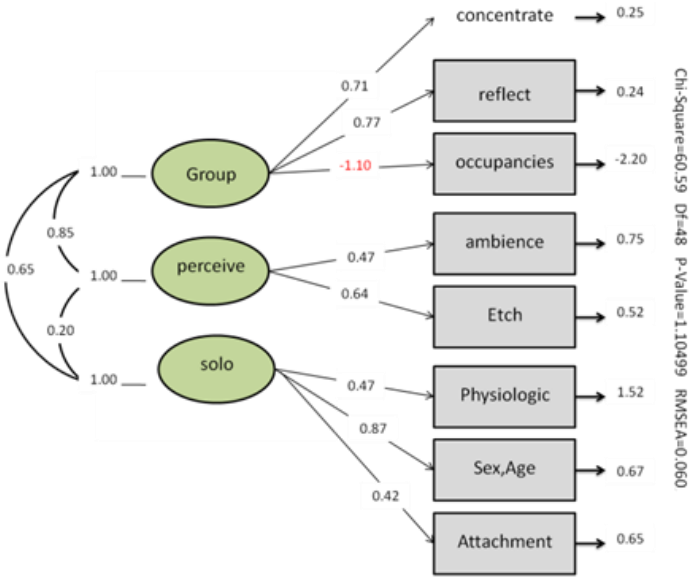

Fig .10. Fitting the model of factors affecting way founding

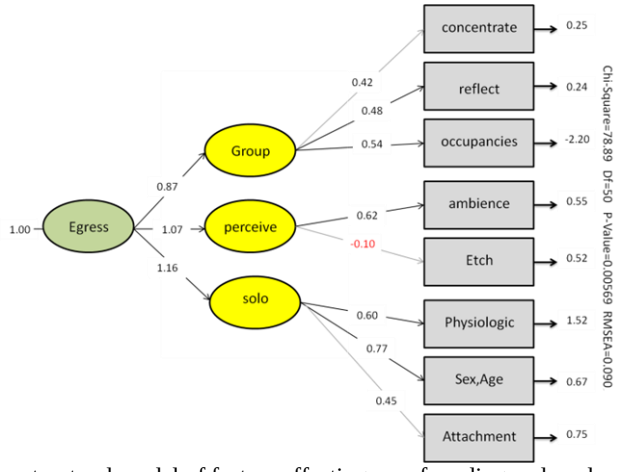

Fig . 11. Fitting the structural model of factors affecting way founding and explanatory components

According to the data extracted from the LISREL analytical model and the analytical fit, it is found that the measure of one's familiarity with the building from the path mental readability index, which is a commonality between the two components of group behavior and individual behavior, is considered one of the most important factors affecting way founding. It can be predicted that a person who is presence in the body of the building is on fire before thinking to find any emergency exit route inside the building will immediately act to evacuate the building through his or her usual familiar path.

After this factor, age and year measures from individual behavior index, as well as measures related to individual consciousness present in the body of The building is on fire from the index of perceiving risk have the highest impact factor on way founding in The building is on fire.

So that research data shows that firstly, many age groups, such as children, are not able to understand the danger of fire or, in any case, they are not evacuating their place and space to an adult to order them, so it can be concluded that the emergency evacuation process of children will never begin without the presence of adults. It should also be acknowledged that the lack of consciousness of possessors, whether due to sleep and normal conditions or due to the use of drugs and alcohol, will all prevent proper way founding in order to evacuate the building.

Subsequently, people with less alertness usually tend to move in the direction that is in the direction of moving their eyes, even they continue deadlocks, and then at the end of the route, they realize their mistake and even they will have sensory disorder. Other people refuge to graphic signs showing exit routes only after disability to exit the route from their usual route, if they disappointed to cross the escape routes; they refuge towards the building view in the hope of seeking help.

The data extracted from the study show that mediating variables and internal variables affect way founding markers in The building is on fire due to the speed, ease and increasing safe time for evacuation of emergency exit of building, but in formulation of way founding style in The building is on fire, potential variables identified has the greatest impact.

4. Conclusion

According to the main question of the research on identification of the variables affecting the stability of a building against fire hazard, effective elements, based on the consensus of experts of the Tehran Municipality Fire and Safety Services Department by screening several elements derived from the theoretical foundations of the research together with the help of Delphi-fuzzy method in 3 stages, all the dimensions considered by the experts were classified into three sub-variables: "nature of fire", "building design" and "firefighting technologies". Then, by preparing a final questionnaire based on the Likert scale and after obtaining statistical validations, in the LISREL Software, structural equation analysis software, the weights of the effect of each variable on the dependent variable (building resistance against fire) were determined. According to the information obtained from the analysis of structural equations in LISREL Software, it was determined that among the experts of the fire department and the elite students in postgraduate studies in construction and Civil Development sciences, the variable of independent zoning of building uses against fire spread is one of the resilient design element of building architecture. Fire is considered as of the utmost importance in stabilizing a port against the risk of widespread fire. In the next rank we consider the element of intelligent or smart fire extinguishing by rainfall systems of fire alarm and extinguishing technologies, and in the third rank is the element of mineral and gypsum coatings of the same variable. The findings of this study showed that the priority of resilient architectural design of a building against fire from the perspective of Iranian elites and researchers is superior to automatic fire extinguishing and other extinguishing technologies and structural coating. In this way, Iranian experts consider the issue of fire resistance of a building to be potentially dependent on the potentially resilient and correct architectural design of a building in phases one and two of the building architecture, and then the supplement of resilient design, fire extinguishing technologies used in the building. They are known to affect the stability of a building in the event of occurrence of wider fire.

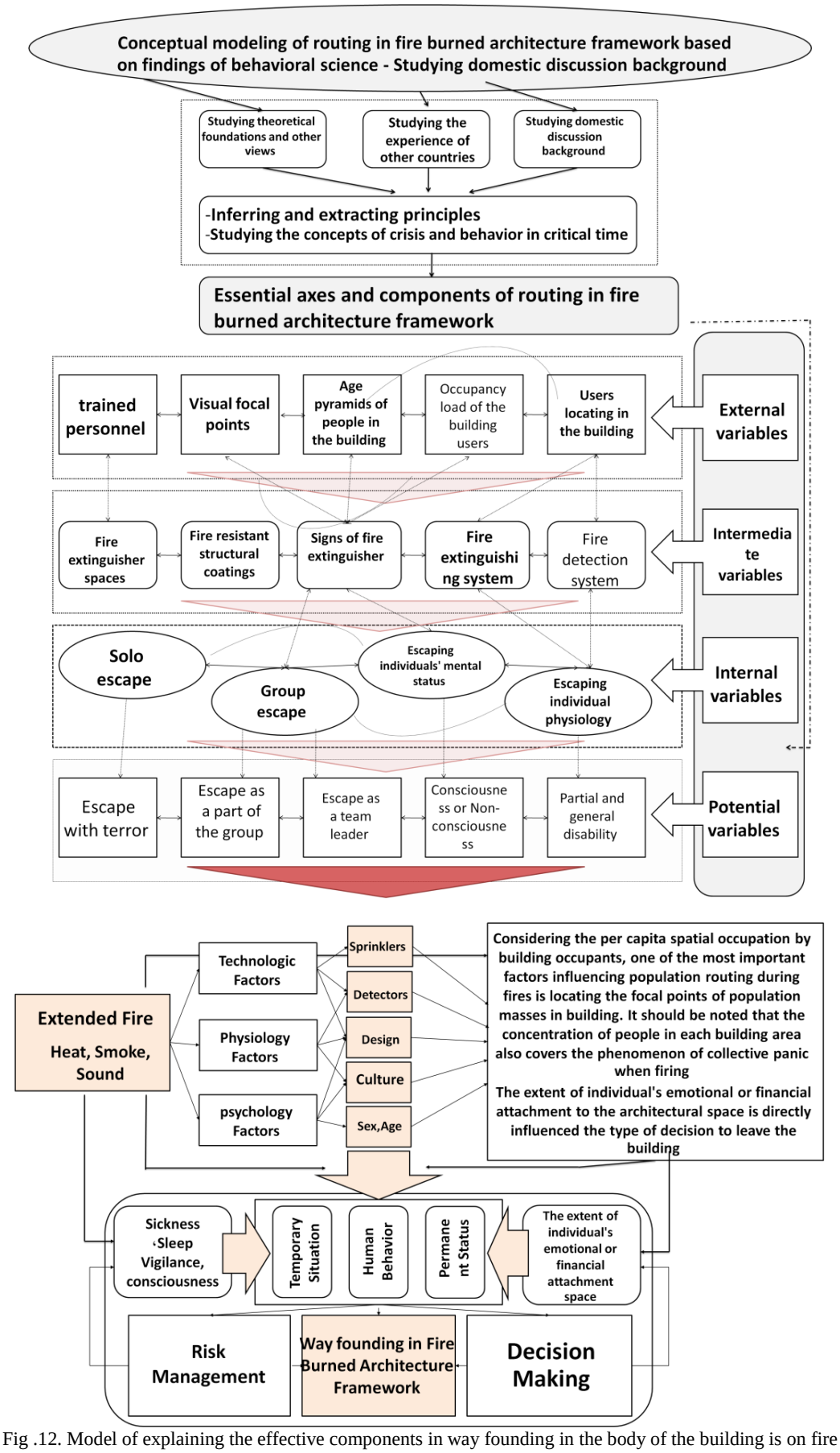

Fig .12. Model of explaining the effective components in way founding in the body of the building is on fire

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