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A study on relationship between communication models and crisis management in Tehran's firefighting department

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CHRONICLE	ABSTRACT
	This research presents an empirical investigation to study the relationship between communication models and crisis management in city of Tehran municipal firefighting department. The study develops a questionnaire with 21 questions, distributes it among 400 people who worked for firefighting department associated with municipality of Tehran, Iran. Crobnach alphas for all components of the survey were well above the minimum acceptable level of 0.7. Kolmogorov–Smirnov test has indicated that all components of the survey were normally distributed. Using a t-student test, the study determined that there were meaningful relationships between communication models and crisis management (sig: 0.000), between vertical model and crisis management (sig: 0.000), between ring model and crisis management (sig: 0.000), between star model and crisis management (sig: 0.000) and between Y model and crisis management (sig: 0.000) in Tehran municipal fire department.

1. Introduction

Crisis management plays essential role for the development of any society (Griffin & Moorhead, 2011). Good management of natural events such as flood, earthquake, etc. contributes to sustainable development of economy. However, it is always important to learn about the effects of various types of crisis management (Littlejohn & Foss, 2010; Legg & Sweeny, 2012). Jia et al. (2012) presented a knowledge management model for tourism crisis management, which was as software system, and was capable of collaborate in extraction and dissemination of knowledge in all stages of crisis. They used a combination of artificial intelligence and web-based technologies to collect, sort, store, and share the necessary information throughout the organizations. The framework consisted of components with three responsibilities of knowledge extractor, knowledge server, and knowledge manager. Crisis management becomes important when we manage a supply chain and need to take necessary actions, promptly (Liu & Wang, 2011). Johansen et al. (2012) discussed some of the findings from a large survey of internal crisis management and crisis communication among public and private organizations in Denmark. Schulman and Roe (2011) proposed a metric for assessing crises, which begins in or requires the response of control rooms of major critical infrastructures.

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2. The proposed study

The proposed study of this paper consists of one question as follows,

The main question: Is there any meaningful relationship between communication models and crisis management?

There are also four sub-hypotheses associated with the study as follows,

1. There is a meaningful relationship between vertical model and crisis management.
2. There is a meaningful relationship between ring model and crisis management.
3. There is a meaningful relationship between star model and crisis management.
4. There is a meaningful relationship between Y model and crisis management.

The study was accomplished from March 2010 to February 2011. The independent variable of this survey is associated with communication models such as vertical model, ring model, star model, and Y is dependent variable, which is one whenever communication process which has no feedback and zero, otherwise. The method is two-way communication where there is one receiver and one sender of message that has relationship with each other and exchanges the information with each other. In this survey, crisis management in Tehran's municipal firefighting department is dependent variable.

Operational definitions

- Communication patterns: In the present study, communication patterns are simple performance of complicated system of Tehran municipal fire department. Control of such activities is not usually available in the nature or it takes more time and cost (Moghimi, 2011).
- Vertical pattern: There are supervisory relationships among firemen in this model. In this case, position of the leader is specified; operation speed of group members are rather good in relieving such as helping people trapped under the rubble or extinguishing the fire; accuracy is good; communication structure is stable and is going to be made; but spirit of group member is low (Stoner et al., 1995).
- Ring pattern: In this model each one of the members is linked with another two people; in this case, accuracy and communication speed is low; and position of the leader is not specified; communication structure is nearly unstable; but members have good spirit (Traci, 2011).
- Star pattern: In the star model, members cannot directly communicate with each other when crisis occurs, which means their communication is only accomplished by the leader. In star models communication speed and accuracy is appropriate. Communication structure is stable. Position of the leader is specified, but the spirit of members is low. In this model, concentration is lower than concentrated pattern.
- Y pattern: In this case, each one of the members only has connection with one person of group; communication speed is average; accuracy is nearly good; communication structure is forming; position of the leader is nearly specified; system is concentrated and spirit of the members is low.
- Crisis management: Crisis management is the process of planning and crisis performance in Tehran municipal fire department, which is seeking the tools by systematic observing of the crisis (earthquake, fire, flood, …) and analyzing them, which can prevent of crisis or can do some fast relief for reducing the losses.

According to our survey, there were 5000 people working for firefighting department of Tehran municipality. Therefore, the sample size is calculated based on Eq. (1),

$$n = \frac{N.t^2.p.q}{N.d^2 + t^2.p.q} = \frac{5000 \times 1.96^2 \times 0.5 \times 0.5}{5000 \times 0.0025 + 1.96^2 \times 0.5 \times 0.5} \tag{1}$$
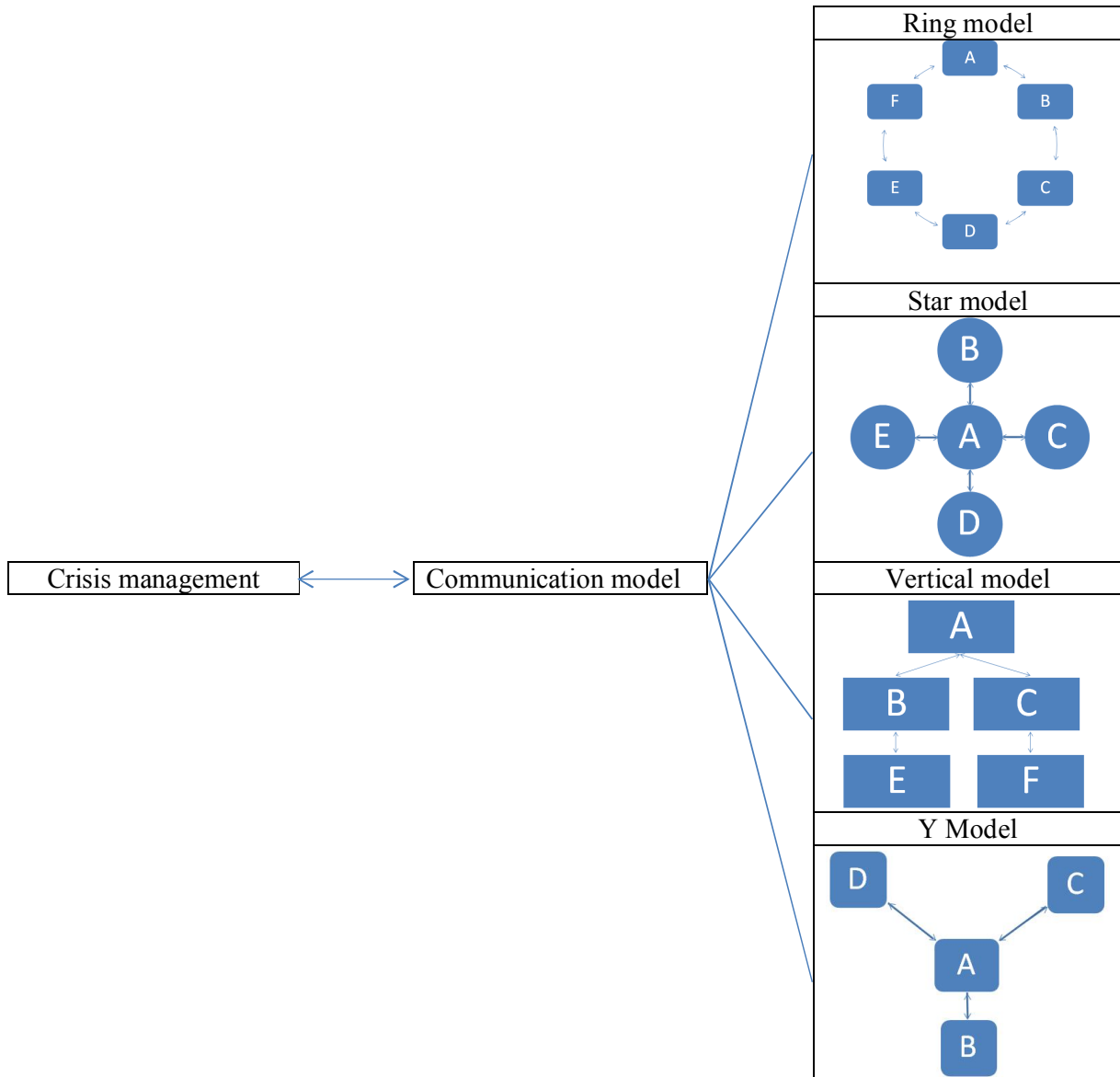
Fig. 1. Operational model of research: communicational models and crisis management.

Table 2
Communication model's component

Models	Number of questions	Description
How to make communication	1-4	4
Speed	5-8	4
Accuracy	9-11	3
Stability of communication structure	12-15	4
Resolution rate of leader position	16-18	3
Spirit of members	19-21	3
Total	21	-

The study designs a questionnaire in Likert scale consists of 21 questions and distributes it among 400 people who were randomly selected in this survey. The questionnaire consists of different questions related to how to communicate with staffs, speed, accuracy, stability of communication structure, resolution rate of leader position, and the spirit of members. Table 3 shows some of the necessary components of the survey. It is worth noting that some of the questions are overlapped in two models because of the common traits, and the information of each of them will be considered for analyzing separately. Fig. 2 demonstrates personal characteristics of the participants.

Table 3

Number of questions in the questionnaire of communication models and crisis management

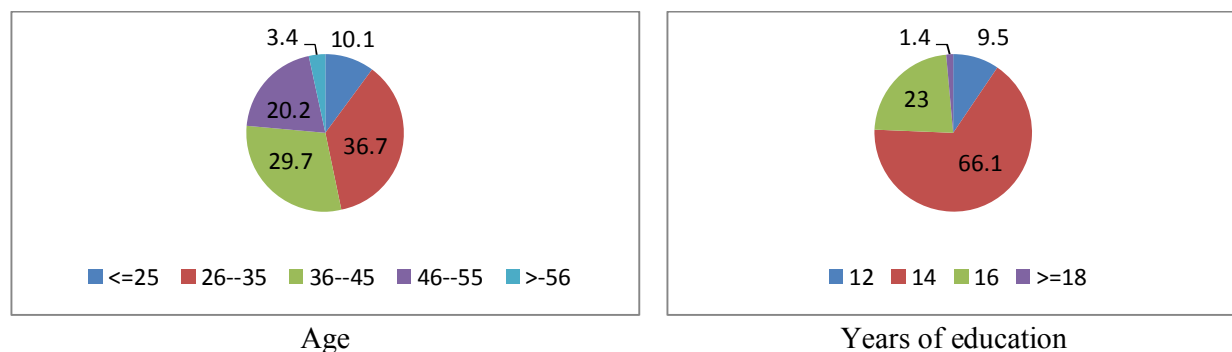| Models	Number of questions	Description
Vertical model and crisis management	6	1-5-9-12-16-19
Ring model and crisis management	6	2-6-9-13-16-19
Star model and crisis management	6	3-7-10-14-17-20
Y model and crisis management	6	4-8-11-15-18-21
Total	21	-

Age

Years of education

Fig. 2. Personal characteristics of the participants in terms of percent

As we can observe from the results of Fig. 2, most participants were middle age and have at least two years of education. In terms of job position, 24 people have chosen average option (6.7 %), 234 people have chosen high option (65.5 %), and 99 people have chosen very high option (27.7%), the highest rate is associated with high option (65.5%) and the lowest rate is related to average option (6.7%). Table 4 demonstrates the results of some basic statistics associated with Ring and Communication models. In addition, Table 5 presents details of the questions associated with each model. In addition, Table 5 demonstrates details of all questions used to collect the necessary information on each model. The proposed study of this paper uses Friedman test to rate the effects of different factors. In our survey, Chi-Square test was equal to 27.41 with P-value=0.000. According to Friedman test, star model maintains the highest rank (2.73) followed by ring model (2.53), Y model (2.38) and vertical model (2.36). Next step was to determine whether or not the data were normally distributed.

Table 4

Some basic statistics associated with two models

Criterion	Communication models and crisis management	Y model and crisis management	Vertical model and crisis management	Star model and crisis management	Ring model and crisis management
Mean	4.2101	3.7983	3.6387	3.9076	3.8571
Median	4	4	4	4	4
Mode	4	4	4	4	4
Std. deviation	0.54886	0.66931	0.96917	0.71097	0.9114
Variance	0.301	0.448	0.939	0.505	0.831
Range	2	2	3	3	3
Minimum	3	3	2	2	2
Maximum	5	5	5	5	5
Total	1503	1356	1299	1395	1377

Table 5
Details of the questions

Models	Questions
Vertical model and crisis management	To what extend lack of communication with the staffs does it influences on operation of crisis management?
	To what extend high speed of communication, does it influence on operation of crisis management?
	To what extend normal accuracy of information exchange does it influences on operation of crisis management?
	To what extend stable communication structure between employees does it influence on operation of the crisis management?
	To what extend resolution rate of leader's position does it influence on operation of crisis management?
	To what extend weak spirit of the staffs does it influences on operation of crisis management?
Ring model and crisis management	To what extend associated regulatory of staffs with each other does it influence on operation of crisis management?
	To what extend fairly fast pace of communication does it influence on operation of crisis management?
	To what extend good accuracy of information exchange does it influence on operation of crisis management?
	To what extend stable communication structure that is making between staffs does it influence on operation of crisis management?
	To what extend resolution rate of leader's position does it influence on operation of crisis management?
	To what extend weak spirit of the employees, does it influence on operation of crisis management?
Star model and crisis management	To what extend direct connection with only the operational manager does it influences on operation of crisis management?
	To what extend average speed of communication does it influence on operation of crisis management?
	To what extend good accuracy of information exchange does it influence on operation of crisis management?
	To what extend stable communication structure that is making between staffs does it influences on operation of crisis management?
	To what extend fairly resolution rate of leader's position does it influence on operation of crisis management?
	To what extend weak spirit of the staffs does it influence on operation of crisis management?
Y model and crisis management	To what extend having communication with just two people does it influence on operation of crisis management?
	To what extend low speed of communication does it influence on operation of crisis management?
	To what extend weak accuracy of information exchange does it influence on operation of crisis management?
	To what extend lack of stable communication structure among employees does it influences on operation of crisis management?
	To what extend uncertain status of leader's position does it influence on operation of crisis management?
	To what extend high spirit of the staffs does it influence on operation of crisis management?

Table 6 demonstrates the results of Kolmogorov–Smirnov test. The results of the survey indicate that all components of the survey are normally distributed when the level of significance is five percent.

Table 6
The results of Kolmogorov–Smirnov test

Research components	Kolmogorov–Smirnov test	Significant level
Ring model	3.797	0.000
Star model	7.567	0.000
Vertical model	4.096	0.000
Y model	5.175	0.000
Communication models	7.024	0.000

3. The results

In this section, we present details of our findings of the survey using t-student test. Table 7 shows details of our survey.

Table 7
The summary of t-student test (test amount = 3)

	t	Degrees of freedom	Two-way coverage level	Average difference	Confidence interval 95%	
					Minimum	Maximum
Communication models	41.657	356	0.000	1.21008	1.1530	1.2672
Ring model	17.770	356	0.000	.85714	.7623	.9520
Star model	24.119	356	0.000	.90756	.8336	.9816
Vertical model	12.451	356	0.000	.63866	.5378	.7395
Y model	22.536	356	0.000	.79832	.7287	.8680

In addition, Table 8 demonstrates the results of binomial test to examine all components of the survey. The results of Table 8 also confirm all hypotheses of the survey.

Table 8
The results of binomial test

		levels	Number	Observed probability	Statistics test	Coverage level
Ring model	First group	<= 3	129	.4	.6	.000[a,b]
	Second group	> 3	228	.6		
	Total		357	1.0		
Star model	First group	<= 3	54	.2	.6	.000[a,b]
	Second group	> 3	303	.8		
	Total		357	1.0		
Vertical model	First group	<= 3	153	.4	.6	.000[a,b]
	Second group	> 3	204	.6		
	Total		357	1.0		
Y model	First group	<= 3	123	.3	.6	.000[a,b]
	Second group	> 3	234	.7		
	Total		357	1.0		
Communication models	First group	<= 3	24	.1	.6	.000[a,b]
	Second group	> 3	333	.9		
	Total		357	1.0		

[a]Sig. <0.01, [b]Sig. < 0.05

4. Conclusion

In this paper, we have presented an empirical investigation to find out whether or not there was any meaningful relationship between communication models including ring, star, vertical and y models and crisis management. The proposed study has gathered a sample of 400 people out of nearly 5000 people who worked for firefighting department in municipality of Tehran, Iran. Using some statistical test, the study has determined that there was a meaningful relationship between vertical model and crisis management, a meaningful relationship between ring model and crisis management, a meaningful relationship between star model and crisis management and finally, there was a meaningful relationship between Y model and crisis management. Therefore, it can be concluded that all the models had meaningful relationship with management but with different effects, so we recommend the managers of the fire departments to use the star model at the moment of occurrence of big unnatural events such as city building fire, explosion of gas pipelines, and etc. In addition, we recommend the managers of fire department to use the star and the vertical models at the moment of occurrence natural events such as earthquake, flood, and etc. Different communication models are known but in this study, only four of them examined and we recommend them as future studies.

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