Evaluation the Key Success Factors in Emergency Management using Neutrosophic DEMATEL Method

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Abstract

Critical to protecting people, property, and communities from the devastating effects of catastrophes and other crises is the field of emergency management. Effective emergency management relies on several aspects that must be identified and prioritized if positive results are to be achieved. Preparedness, planning, leadership, governance, information management, resource management, community participation, resilience, and a culture of continuous improvement are all discussed in this article as crucial elements of emergency management. Professionals in emergency management may strengthen their talents, boost response coordination, and instill resilience by learning about and using these elements. This paper used multi-criteria decision-making (MCDM) to deal with the various factors of emergency management. The decision-making trial and evaluation laboratory (DEMATEL) method is used to compute the weights of criteria and relationships between factors in emergency management. The DEMATEL method is integrated with the neutrosophic set to deal with uncertain data. There are six main factors and nineteen sub-factors are used in this paper. We obtained the Preparedness and Planning is the best factor.

Keywords: Neutrosophic Set; MCDM; DEMATEL; Emergency Management; Success Factors.

1. Introduction

Protecting lives, limiting property loss, and facilitating a speedy recovery are all vital functions of emergency management. The success of response operations in the face of threats including natural disasters, public health crises, and man-made calamities often hinges on the quality of emergency management. Despite the many variables at play, there are a few that seem to have the most impact on whether or not emergency management is successful[1], [2].

These critical components include a wide variety of characteristics that strengthen readiness, coordination of responses, and overall resilience. Professionals and organizations in emergency management may improve their skills, response operations, and mitigation of crises by better understanding and prioritizing these elements. While the particular parts of a good emergency management framework may change depending on the specifics of the situation itself, there are a few core components that always seem to be necessary[3], [4].

Some of the most important aspects of emergency management are discussed in this article, along with their relevance and effect on response operations. A strong and efficient emergency management system is built on a foundation of readiness, planning, leadership, communication, resource management, community participation, and a culture of continuous improvement.

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The capacity of emergency management teams to recognize, react to, and recover from crises may be improved by addressing these variables and executing suitable techniques. Also crucial to building resilient emergency management practices is being aware of and prepared to deal with the obstacles and problems that may arise[5], [6].

Life, vital infrastructure, and the welfare of impacted populations may all be safeguarded via the identification and integration of crucial success elements in disaster management. Professionals in emergency management may help build more resilient communities by concentrating on these aspects, which will lead to more effective, efficient, and coordinated response activities in the event of an emergency or catastrophe[7], [8].

One of the various approaches to MCDM that can be found in the literature is the decision-making trial and evaluation laboratory (DEMATEL) technique. The DEMATEL was created by the Battelle Memorial Institute at Geneva's Science and Human Affairs Programmed between 1972 and 1976 to tackle these knotty issues[9], [10].

This approach is one of the structural modelling strategies that may discover the interdependencies of criteria using causality diagram and unidirectional analysis, as opposed to other MCDM methods like the analytic hierarchy process (AHP), where evaluation criteria are independent. To illustrate causality and the relative weights of various factors and criteria, the causal diagram use digraphs rather than directionless graphs[11], [12].

Despite these benefits, DEMATEL's linguistic words have a few drawbacks. Because information is sometimes prohibitively expensive and, more significantly, many language scales are ambiguous and incomplete, real-number-based ones are inadequate to offer a competent assessment or judgement. It's also possible that the limited or inadequate information provided by these language measures can lead to misunderstandings when used to solicit the views of decision-makers. Decisions may be difficult if decision-makers' perspectives are unclear or they lack appropriate information.

Neutrosophic sets were developed as a solution to the problem of working with sparse data[13]. Single-valued neutrosophic sets (SVNSs) were introduced a year later to simplify the use of neutrosophic sets in the actual world of science and engineering. SVNSs' ease of use has allowed for the incorporation of various areas of scientific knowledge[14], [15], including aggregation operators, correlation studies[16], scoring functions, distance, and similarity metrics, into these collections[17], [18].

2. Emergency Management

Management of unexpected events, including their prevention, response, and aftermath, is referred to as emergency management. Taking this strategy means utilizing a wide range of methods, tools, and materials to lessen the destruction of people and their surroundings in times of crisis[19], [20].

Protecting and preserving human life and well-being, maintaining essential infrastructure, and facilitating a rapid and efficient response to crises are the fundamental objectives of emergency management. Coordination and cooperation among many parties, including government agencies, emergency responders, NGOs, community groups, and the general public, are essential in this field[21], [22].

Among the most important aspects of emergency management are:

Risk assessment, planning, training, and exercises are all examples of preparedness activities that improve the readiness and skills of emergency management professionals and organizations. The goals of preparedness are to foresee and plan for probable risks, create reaction strategies, and guarantee the availability of resources and infrastructure[23].

The term "mitigation" refers to the process of taking precautions and putting plans in place to lessen the severity of potential disasters. Enhancing resilience and decreasing susceptibility to catastrophes may be achieved by measures including land-use planning, building rules, hazard mapping, and infrastructural enhancements.

When an emergency situation arises, the first line of defense is the response. Provide emergency services such as medical treatment, search and rescue, and evacuation through activating emergency operations centers, mobilizing and deploying emergency personnel and resources, coordinating response activities, and so on[24], [25].

Rebuilding and restoring communities and infrastructure after a disaster is what is meant by "recovery." Assessment of damage, removal of debris, rebuilding, economic recovery, and provision of support services to impacted persons and communities are all part of this process.

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Maintaining open lines of communication, coordinating efforts, and working together are all essential during any disaster management process. This includes reaching out to impacted populations, providing them with up-to-date information, and coordinating response activities across different agencies and organizations.

New threats, technology, and problems are always posing new questions and opportunities for emergency managers. Public administration, engineering, public health, the social sciences, and risk management are just a few of the areas where expertise from other disciplines must be integrated.

The loss of life, the extent of property damage, and the promotion of resilience in the face of adversity may all be reduced by adopting good emergency management practices, which can increase a society's capacity to prepare for, react to, and recover from catastrophes[26], [27].

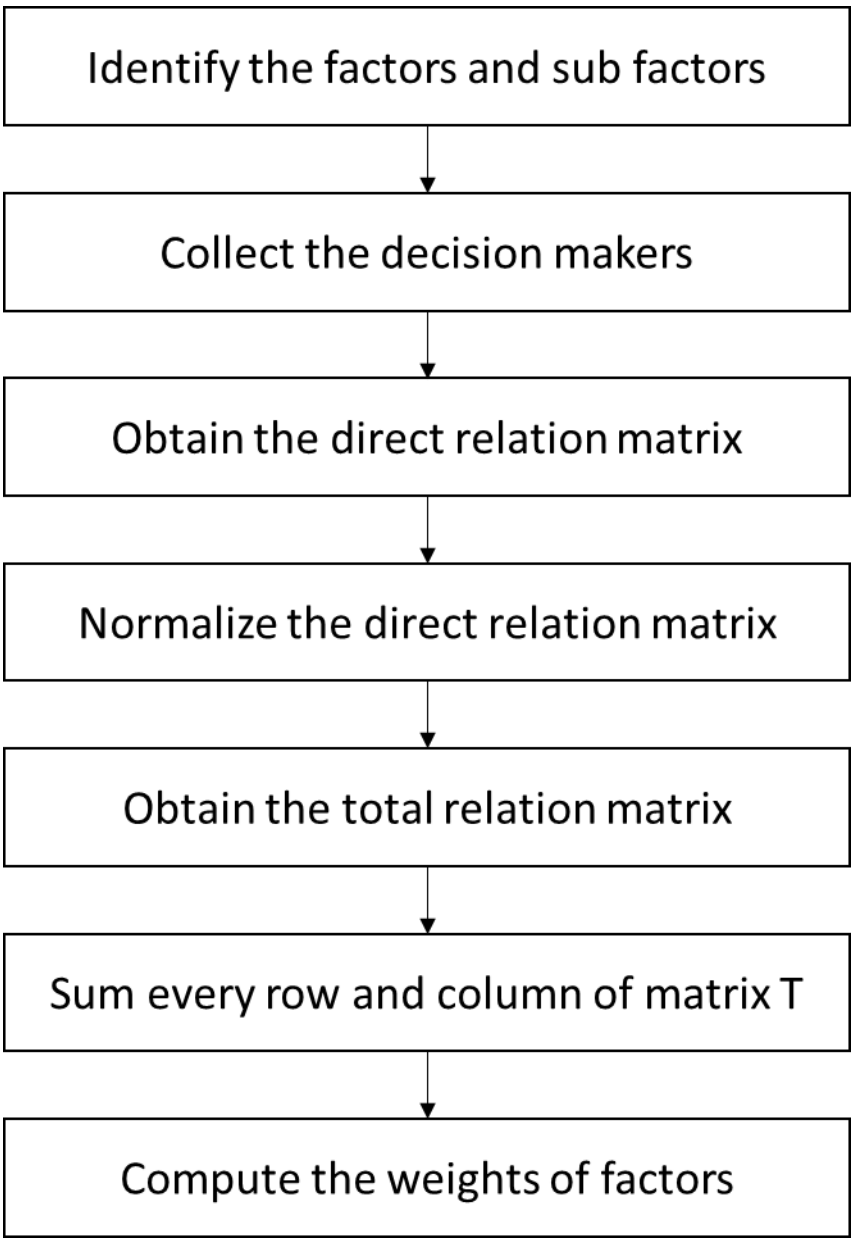

Figure 1: The flowchart of the single valued neutrosophic DEMATEL method.

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3. Neutrosophic DEMATEL Method

This section introduces some definitions on the single valued neutrosophic numbers and the steps of the single valued neutrosophic DEMATEL method [15], [28] as shown in Figure 1.

Definition 1. The arithmetic operation between single valued neutrosophic numbers can be computed as:

$$x \oplus y = (T_1 + T_2 - T_1, T_2, I_1, I_2, F_1, F_2) \quad (1)$$

$$x \otimes y = (T_1 T_2, I_1 + I_2 - I_1 I_2, F_1 + F_2 - F_1 F_2) \quad (2)$$

$$\prec x = ((1 - (1 - T_1)^{\wedge}, I_1^{\wedge}, F_1^{\wedge})) \quad (3)$$

$$x^{\prec} = (T_1^{\prec}, 1 - (1 - I_1)^{\prec}, 1 - (1 - F_1)^{\prec}) \quad (4)$$

Definition 2. We can compute the cumulative, idempotent, absorption, and de Morgan's law as:

$$x \cup y = (T_1, I_1, F_1) \cup (T_2, I_2, F_2) = (T_2, I_2, F_2) \cup (T_1, I_1, F_1) = y \cup x \quad (5)$$

$$x \cup x = (T_1, I_1, F_1) \cup (T_1, I_1, F_1) = (T_1, I_1, F_1) = x, y \cap y = (T_1, I_1, F_1) \cap (T_1, I_1, F_1) = (T_1, I_1, F_1) = y \quad (6)$$

$$x \cup x \cap y = (T_1, I_1, F_1) \cup (T_1, I_1, F_1) \cap (T_2, I_2, F_2) = (T_1, I_1, F_1) = x \quad (7)$$

$$k(x \cup y) = k(T_1, I_1, F_1) \cap k(T_2, I_2, F_2); \quad (9)$$

Step 1. Obtain the direct relation matrix

The decision makers evaluate the direct relation matrix.

Step 2. Normalize the direct relation matrix

$$S = \frac{1}{max_{1 \le i \le n} \sum_{j=1}^{n} x_{ij}} \quad (10)$$

$$D = \left(d_{ij}\right)_{n \times n} \quad (11)$$

Step 3. Obtain the total relation matrix

$$T = \left(t_{ij}\right)_{n \times n} = D(I - D)^{-1} \quad (12)$$

Step 4. Sum every row and column of matrix T

$$r_i = \sum_{j=1}^{n} t_{ij} \quad (13)$$

$$c_j = \sum_{i=1}^{n} t_{ij} \quad (14)$$

Step 5. Compute the weights of factors

$$w_j = \frac{r_i + c_i}{\sum_{i=1}^{n} (r_i + c_i)} \quad (15)$$

4. Application

Emergency management's efficiency and efficacy may be greatly affected by a few key aspects. Improved readiness, response coordination, and recovery are all the result of these elements. While the specifics of what will make an emergency situation successful might change based on the specifics of the disaster itself, the following are certain characteristics that are always crucial:

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Planning & Preparation: Being ready for an emergency is the first step in managing one successfully. Important elements for success are:

Comprehensive risk assessments are performed to identify threats, weaknesses, and probable situations so that resources may be allocated proactively.

Plans for dealing with emergencies require drawing up specific instructions for how to handle a crisis, including who should do what and how to do it.

Regular training and emergency simulations are conducted to improve readiness, put response skills to the test, and foster teamwork among responders.

The establishment of reliable lines of communication and established standards for exchanging and coordinating information in the event of an emergency.

Effective emergency management requires both strong leadership and solid governance systems. Important elements for success are:

Capable leaders who can make sound judgements, lay out a path forward, and instill faith in the response efforts constitute strong leadership.

To support coordinated and unified response operations, it is necessary to establish multi-agency governance structures that bring together various agencies, organizations, and stakeholders.

Efficient decision-making, resource allocation, and coordinated action during emergency operations are all dependent on clear command and control structures being in place.

Effective communication and information management are critical to the safe and effective handling of any emergency situation. Among the most important factors are:

Information that is both timely and accurate is essential for effective decision-making, timely response, and the well-being of impacted people.

To improve public safety and enable educated decision-making, it is important to develop tactics for public communication, such as providing timely warnings, instructions, and updates.

Interagency communication: facilitating open lines of communication and sharing of relevant information amongst emergency response agencies, organizations, and affected parties.

Effective emergency management requires careful use of available resources. Important elements for success are:

Comprehensive evaluations of employees, equipment, supplies, and infrastructure are conducted in order to identify shortfalls and establish allocation priorities.

Establishing reliable logistical systems to guarantee rapid and effective resource acquisition, distribution, and tracking in support of response activities.

In order to maximize resource sharing and prevent duplication, it is important to facilitate coordination and collaboration across various response agencies and organizations.

Resilience and Community Involvement Community involvement and engagement is crucial to effective disaster management. Important elements for success are:

Members of the community are encouraged to take part in all phases of disaster preparation, response, and recovery to build a stronger, more resilient community.

Facilitating educated decision-making at the individual and community levels by the dissemination of accurate and easily available information on risks, preparatory measures, and response activities.

By developing partnerships, boosting community cohesiveness, and capitalizing on preexisting community resources, social support systems aim to strengthen social support networks and community resilience.

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Enhancing emergency management skills requires a commitment to a culture of continual development and learning. Important elements for success are:

Following major incidents, thorough analyses are conducted to determine what went well and what may be done differently in terms of emergency response.

In order to better prepare for emergencies, it is important for experts in the field of emergency management to share and collaborate on information and ideas.

To better prepare for future emergencies, it is important to actively seek and incorporate input from all stakeholders engaged in emergency management.

Emergency management activities may be more effective, efficient, and resilient by taking into account and executing these critical success elements, which in turn saves lives, reduces damage, and expedites recovery from crises and disasters.

We applied the single valued neutrosophic DEMATEL method in six factors and 19 sub factors.

Step 1. Obtain the direct relation matrix

The decision makers evaluate the direct relation matrix by using single valued neutrosophic numbers. The direct relation matrix is built between factors and sub factors. We put the 19 sub factors with each other to compute the relationships between others.

Step 2. Normalize the direct relation matrix

Then normalize the direct relation matrix by using Eqs. (10 and 11) as shown in Table 1 and Table 2.

Table 1: The normalize the success factors of emergency management

	FEM1	FEM2	FEM3	FEM4	FEM5	FEM6
FEM1	0.362	0.085432	0.211354	0.090405	0.124136	0.632
FEM2	1	0.236	0.060416	0.08869	0.09204	0.5269
FEM3	0.438469	1	0.256	0.090405	0.06254	0.256
FEM4	0.98103	0.651934	0.693767	0.245	0.05782	0.256
FEM5	0.688213	0.605128	0.966038	1	0.236	0.236
FEM6	0.572785	0.447903	1	0.957031	1	1

Table 2: The normalize the success sub factors of emergency management

	SFEM1	SFEM2	SFEM3	SFEM4	SFEM5	SFEM6	SFEM7	SFEM8	SFEM9	SFEM10	SFEM11	SFEM12	SFEM13	SFEM14	SFEM15	SFEM16	SFEM17	SFEM18	SFEM19
SFEM1	0.236	0.085432	0.194842	0.087084	0.124136	0.149721	0.055908	0.057889	0.123806	0.087084	0.060416	0.201072	0.227315	0.094464	0.060416	0.067456	0.134656	0.060416	0.2563
SFEM2	0.651934	0.236	0.055696	0.085432	0.092404	0.124823	0.060416	0.082499	0.060487	0.086187	0.087084	0.060416	0.087084	0.134656	0.201214	0.178688	0.276676	0.134656	0.236
SFEM3	0.285853	1	0.236	0.087084	0.062546	0.060646	0.055696	0.053312	0.055696	0.060416	0.079508	0.124136	0.124136	0.176764	0.147028	0.134656	0.134656	0.094464	0.236

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SFEM4	0.639566	0.651934	0.639566	0.236	0.05782	0.060646	0.13924	0.090134	0.227032	0.202016	0.227268	0.202016	0.164728	0.09216	0.055908	0.11689	0.276676	0.143872	0.236
SFEM5	0.448669	0.605128	0.890566	0.963265	0.236	0.055908	0.140656	0.13554	0.235528	0.150804	0.055908	0.124136	0.227268	0.09216	0.062068	0.192666	0.277149	0.134656	0.236
SFEM6	0.373418	0.447903	0.921875	0.921875	1	0.2369	0.055908	0.081324	0.060416	0.087084	0.062611	0.08496	0.086187	0.094464	0.085432	0.21929	0.276676	0.134656	0.256
SFEM7	0.996201	0.921875	1	0.4	0.395973	1	0.236	0.05783	0.08614	0.087084	0.124136	0.06254	0.055696	0.094464	0.055696	0.24704	0.194094	0.060416	0.362
SFEM8	0.920796	0.646221	1	0.591479	0.393333	0.658056	0.921875	0.2259	0.055908	0.053312	0.227268	0.06254	0.060463	0.134656	0.061124	0.065766	0.134656	0.161792	0.236
SFEM9	0.449867	0.920796	1	0.245322	0.236473	0.925391	0.646575	0.953567	0.236	0.06136	0.055696	0.06254	0.055908	0.145664	0.185472	0.065536	0.134656	0.134656	0.236
SFEM10	0.639566	0.646221	0.921875	0.275701	0.369327	0.642005	0.639566	1	0.907692	0.236	0.124136	0.087084	0.055814	0.094464	0.124348	0.060416	0.124136	0.065536	0.546
SFEM11	0.921875	0.639566	0.700505	0.245067	0.996201	0.892951	0.448669	0.234579	1	0.448669	0.236	0.132632	0.060487	0.145664	0.132844	0.065536	0.124136	0.246579	0.362
SFEM12	0.276995	0.921875	0.448669	0.275701	0.448669	0.658056	0.890566	0.852453	0.890566	0.639566	0.419929	0.236	0.164728	0.100659	0.227268	0.065536	0.134814	0.115712	0.236
SFEM13	0.245017	0.639566	0.447903	0.338109	0.245067	0.648686	1	0.881733	0.996201	0.997886	0.920796	0.338109	0.236	0.145664	0.164775	0.060416	0.124136	0.065536	0.236
SFEM14	0.639566	0.448669	0.342029	0.655556	0.655556	0.642005	0.639566	0.429468	0.414763	0.639566	0.414763	0.600203	0.414763	0.256	0.16284	0.065536	0.134656	0.246272	0.259
SFEM15	0.921875	0.2768	0.378812	0.996201	0.897338	0.65442	1	0.872201	0.300293	0.447903	0.419257	0.245067	0.338012	0.371014	0.236	0.060416	0.124136	0.211456	0.859
SFEM16	0.895636	0.338109	0.448669	0.516864	0.31358	0.276558	0.24456	0.87933	0.921875	1	0.921875	0.921875	1	1	1	0.256	0.134656	0.159488	0.965
SFE	0.921	0.448	0.921	0.448	0.447	0.45038	0.639	0.882	0.921	1	1	0.920	1	1	1	1	0.526	0.134	0.856

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M17	875	669	875	669	903		566	422	875			796						656	
SFEM18	1	0.448669	0.639566	0.419929	0.448669	0.450381	1	0.357437	0.448669	0.921875	0.245017	0.522124	0.921875	0.266112	0.285744	0.410915	1	0.2256	0.2256
SFEM19	0.920796	1	1	1	1	0.925391	0.651934	0.957203	1	0.432344	0.651934	1	1	0.988417	0.274738	0.265285	0.614864	1	1

Step 3. Obtain the total relation matrix

Then we obtained the total relation matrix by using Eq. (12) as shown in Table 3 and 4.

Table 3: The total relation the success factors of emergency management

	FEM1	FEM2	FEM3	FEM4	FEM5	FEM6
FEM1	-0.51569	-0.39131	-0.18194	-0.15279	-0.06023	-0.0499
FEM2	-0.0832	-0.54772	-0.4127	-0.22221	-0.09825	-0.06771
FEM3	-0.17689	0.189273	-0.44071	-0.3495	-0.17643	-0.14503
FEM4	0.044828	-0.11513	-0.17798	-0.41797	-0.30129	-0.24767
FEM5	-0.10615	-0.05753	-0.09989	-0.02048	-0.45672	-0.55903
FEM6	-1.00853	-0.4917	-0.26983	-0.08655	-0.05212	-0.84749

Table 4: The total relation the success sub factors of emergency management

	SFEM1	SFEM2	SFEM3	SFEM4	SFEM5	SFEM6	SFEM7	SFEM8	SFEM9	SFEM10	SFEM11	SFEM12	SFEM13	SFEM14	SFEM15	SFEM16	SFEM17	SFEM18	SFEM19
SFEM1	-0.1	-0.1	-0.0	-0.1	-0.0	0.010	-0.0	-0.0	0.023	-0.0	-0.0	0.053	0.055	-0.0	-0.0	-0.0	-0.0	-0.0	0.010
	9866	3846	5611	0846	3586	321	4025	1686	391	2606	2903	983	111	4221	573	3886	1518	2104	692
SFEM2	0.059	-0.4	-0.3	-0.1	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.006	0.046	0.003	0.016	-0.0	0.000
	268	9652	5305	3389	641	6895	4959	2136	4808	3806	0629	2431	0391	792	843	736	0701	0214	993
SFEM3	-0.0	0.188	-0.4	-0.2	-0.1	-0.1	-0.0	-0.0	-0.0	-0.0	-0.0	0.007	0.005	0.053	0.048	-0.0	-0.0	0.014	0.013
	8472	706	3307	2843	2507	2387	5784	5934	8198	1241	1809	859	006	847	891	1334	2763	356	639
SFEM4	0.075	0.011	-0.0	-0.3	-0.2	-0.1	-0.0	-0.0	0.033	0.001	0.035	-0.0	-0.0	-0.0	-0.0	-0.0	0.025	-0.0	-0.0
	266	9111	7753	5871	4872	3868	2779	5371	303	135	352	1215	3383	6345	2045	2573	354	3448	
SFEM5	-0.0	0.051	0.018	0.122	-0.3	-0.3	-0.1	-0.0	0.005	-0.0	-0.0	-0.0	0.020	-0.0	-0.0	0.009	0.010	-0.0	-0.0
	6256	8885	387	877	9413	285	2148	2763	214	6134	2434	3413	109	4059	0854	1	488	3873	5294
SFEM6	-0.2	-0.1	0.049	0.298	0.152	-0.5	-0.3	-0.1	0.080	0.013	0.030	0.027	0.024	0.029	0.027	0.030	0.057	0.037	0.066
	6959	0534	037	694	847	3969	206	4696	2	1764	5757	8623	2	9	4	29	36		

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SF	0.0	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	0.0	-	-	0.0
E	18	0.0	0.0	0.0	0.0	60	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	62	0.0	0.0	27
M	97	11	55	31	09	92	52	12	56	83	53	10	22	10	32	16	29	53	22
7	4	71	3	09	66	3	73	24	52	01	9	64	58	44	53	9	89	14	3
SF	0.2	0.0	0.0	0.0	-	-	0.0	-	-	-	0.0	-	-	-	-	0.0	-	-	-
E	69	00	84	32	0.0	0.0	65	0.4	0.2	0.1	00	0.0	0.0	0.0	0.0	04	0.0	0.0	0.0
M	67	21	76	12	50	48	71	49	81	36	18	41	35	30	62	35	06	15	45
8	2	9	1	3	87	04	2	49	21	71	9	01	74	8	56	9	61	39	25
SF	0.0	0.1	0.1	-	-	0.0	-	0.0	-	-	-	-	-	0.0	0.0	0.0	-	-	-
E	04	51	05	0.0	0.1	95	0.0	57	0.4	0.2	0.1	0.1	0.0	04	51	10	0.0	0.0	0.0
M	62	42	43	15	00	79	20	33	80	47	47	01	81	89	22	36	06	22	66
9	5	3	7	45	68	2	66	2	08	27	08	22	34	7	8	4	69	99	17
SF	-	0.0	0.1	-	-	-1.4	-	0.1	-	-	-	-	-	-	-	-	-	-	0.0
E	0.0	43	51	0.1	0.1	4E	0.0	80	0.0	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	87
M	06	20	99	56	67	-	02	80	61	69	52	38	38	49	98	52	36	13	09
10	73	7	5	61	38	05	82	3	6	33	31	61	62	52	46	69	19	06	8
SF	0.0	-	0.0	-	0.2	-	-	-	0.2	-	-	-	-	-	-	-	-	0.0	-
E	27	0.0	69	0.0	90	0.0	0.2	0.2	26	0.0	0.2	0.1	0.1	0.1	0.0	0.0	0.0	28	0.0
M	83	18	01	83	22	07	82	18	83	95	76	81	45	05	38	37	10	35	88
11	1	39	8	22	6	35	67	56	5	11	92	26	02	48	12	63	96	4	92
SF	-	0.2	-	-	0.0	0.0	0.1	0.0	-	-	-	-	-	-	0.0	-	-	-	-
E	0.0	98	0.0	0.0	02	68	08	65	0.0	0.1	0.1	0.2	0.2	0.1	13	0.0	0.0	0.0	0.0
M	52	11	43	51	23	85	79	23	38	03	25	27	44	72	07	23	49	85	95
12	6	2	34	96	4	3	1	8	57	57	81	94	06	88	9	46	96	08	46
SF	-	0.3	0.1	-	-	0.1	0.0	0.0	0.1	0.0	0.1	-	-	-	-	-	-	-	-
E	0.0	01	82	0.1	0.0	88	59	36	20	30	37	0.2	0.3	0.2	0.1	0.0	0.0	0.1	0.1
M	31	07	24	04	38	97	67	09	67	14	93	91	71	22	08	63	94	25	23
13	44	2	1	59	05	4	2	1	7	5	2	6	26	66	77	33	46	76	19
SF	0.0	0.0	-	0.1	0.0	0.0	0.0	-	-	0.1	-	0.0	-	-	-	-	-	-	-
E	47	69	0.0	58	93	35	04	0.1	0.0	13	0.0	76	0.1	0.2	0.1	0.0	0.0	0.0	0.2
M	64	49	47	78	25	56	12	13	60	41	80	47	03	25	25	89	72	65	00
14	2	2	29	7	4	4	7	82	82	2	95	7	02	78	88	08	73	82	19
SF	-	-	-	0.3	0.1	-	0.1	-	-	-	-		-	-	-	-	-	0.0	0.1
E	0.0	0.5	0.2	52	17	0.1	07	0.1	0.2	0.1	0.0	-	0.0	0.1	0.3	0.1	0.0	37	00
M	87	04	77	18	05	74	83	41	79	12	64	0.1	25	13	23	80	81	71	57
15	75	43	77	4	8	16	3	77	84	44	37	07	86	23	59	55	41	2	6
SF	-	-	-	-	-	-	-	0.1	0.0	0.0	0.0	0.0	-	0.0		-	-	-	
E	0.2	0.3	0.2	0.0	0.0	0.0	0.0	42	60	22	33	02	0.0	31	0.0	0.4	0.4	0.0	-
M	30	81	61	25	83	50	71	65	79	68	70	03	38	03	24	37	02	62	0.0
16	19	21	95	12	75	69	28	1	7	5	5	2	17	4	96	81	68	96	18
SF	-	-	-	-	-	-	-	0.0	0.0	-	0.1	-	-	0.1	0.1	0.0	-	-	-
E	0.5	0.7	0.2	0.2	0.0	0.1	0.0	92	05	0.0	37	0.0	0.1	08	46	32	0.5	0.2	0.1
M	95	70	98	02	78	27	57	91	65	13	42	41	49	01	44	20	43	81	39
17	49	55	15	57	27	47	27	6	3	26	9	22	56	7	6	6	26	6	75
SF	-	-	-	-	-	-	0.2		-	0.2	-	-		-	0.0	0.0	0.0	-	-
E	0.2	0.6	0.1	0.4	0.2	0.0	80	-	0.0	81	0.1	0.1	0.0	0.2	06	73	83	0.3	0.2
M	77	36	72	17	55	13	34	0.0	90	45	09	62	95	01	82	38	37	91	86
18	96	35	81	48	45	54	6	24	6	2	78	15	91	15	4	9	3	45	74
SF	-	-	-	-	-	-	-	-	0.0	-	-	0.0	0.0	-	-	-	-	0.2	-
E	0.8	0.5	0.3	0.2	0.1	0.0	0.0	0.0	08	0.1	0.0	51	55	0.0	0.2	0.1	0.0	10	0.4
M	66	25	96	73	44	71	25	51	94	02	83	15	55	11	94	50	18	82	96
19	45	06	1	66	36	89	51	46	6	29	99	4	4	63	44	57	55	4	04

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Step 4. Sum every row and column of matrix T

Then compute the sum of each row and columns by suing Eqs. (13 and 14) as shown in Figures 2 and 3

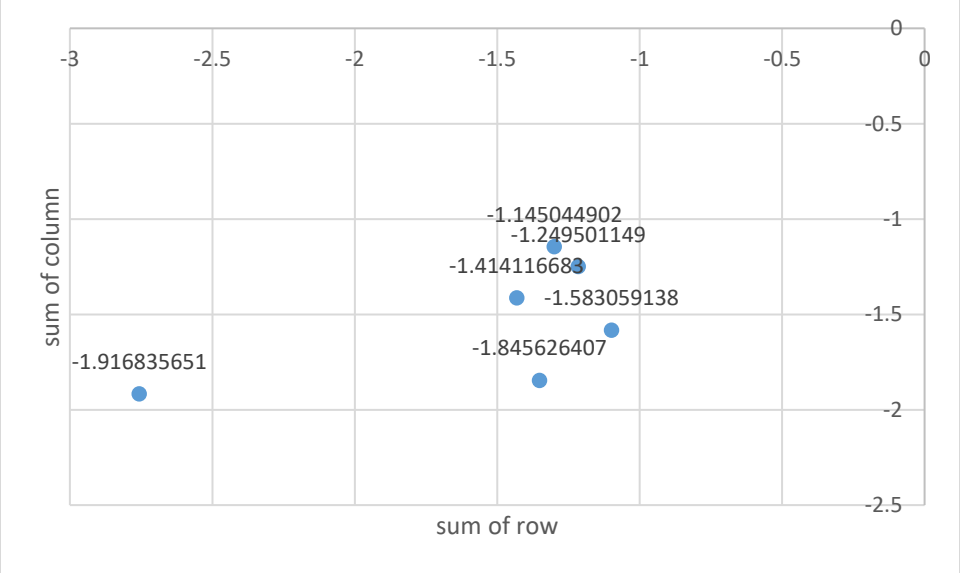

Figure 2: The relationships between success factors.

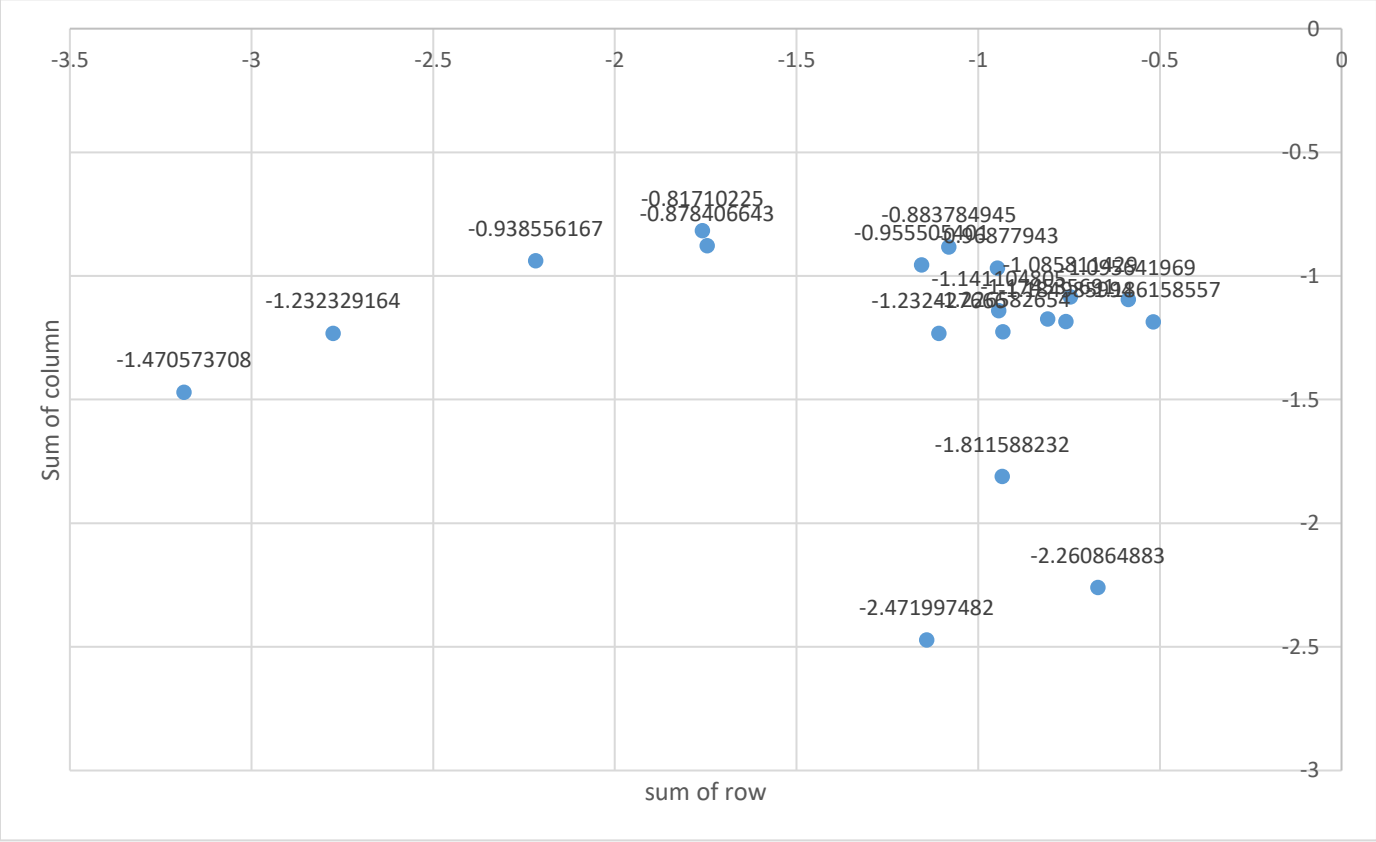

Figure 3: The relationships between success sub factors.

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Step 5. Compute the weights of factors

Then compute the weights of criteria by using Eq. (15) as shown in Figure 4 and 5.

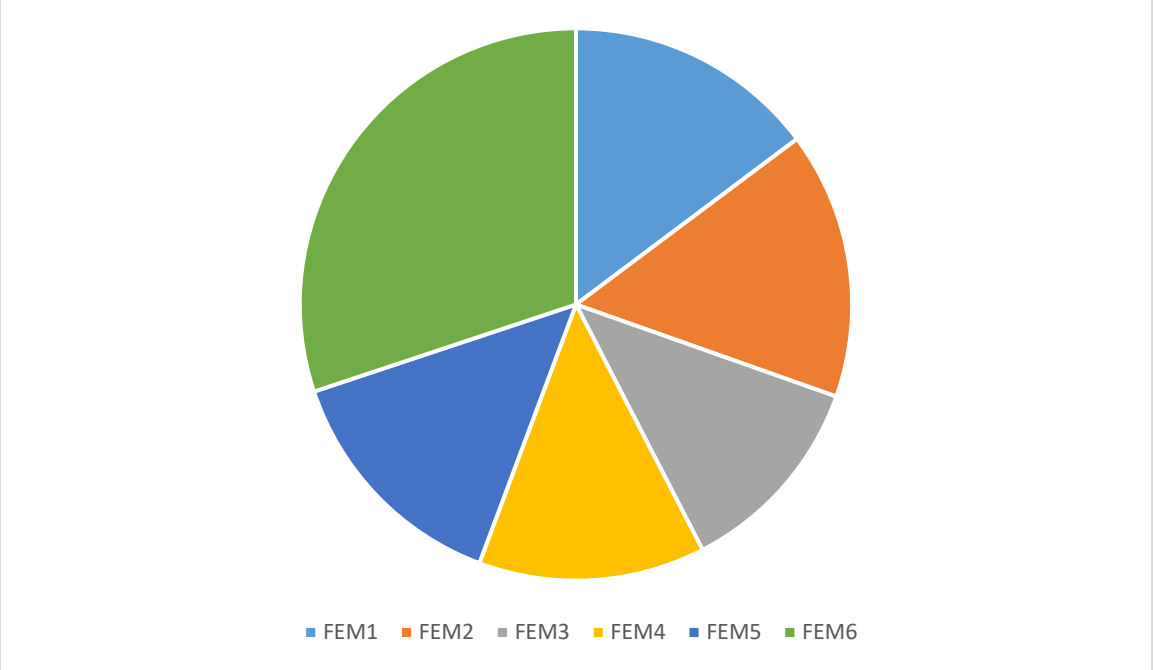

Figure 4: The weights of success factors.

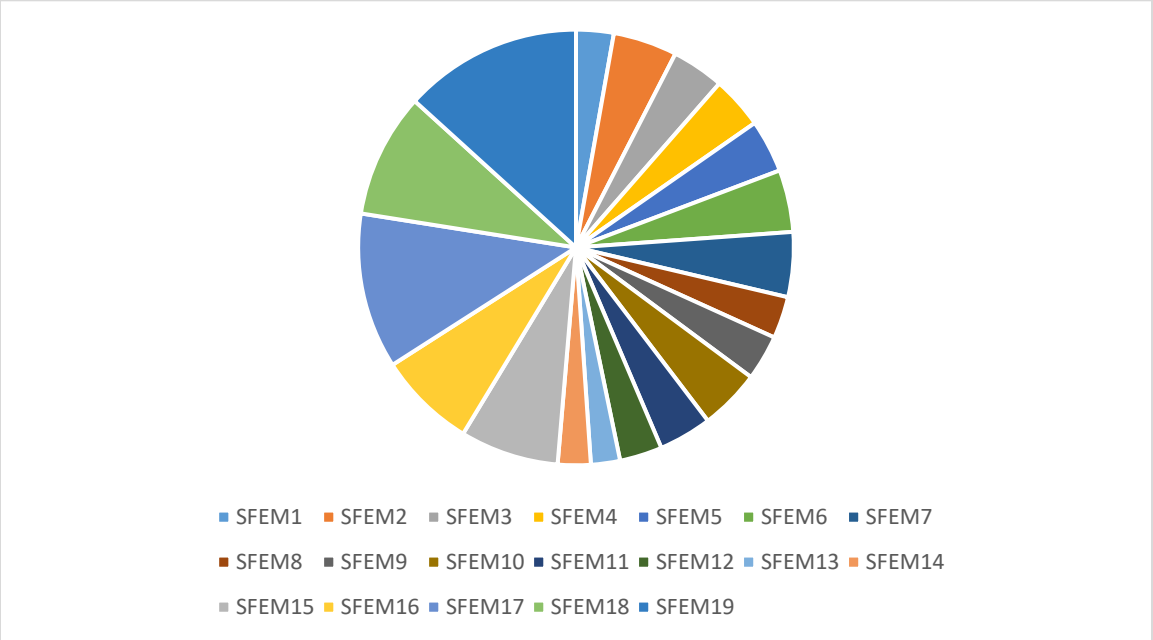

Figure 5: The weights of success sub factors.

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5. Conclusions

The three phases of emergency management—preparation, response, and recovery—each rely on their own unique set of crucial success elements. Strong emergency management systems can be constructed with the help of a comprehensive framework that includes the identified factors of preparedness and planning, leadership and governance, communication and information management, resource management, community engagement and resilience, and a culture of continuous improvement.

To better respond to emergencies, make better decisions, and promote efficient coordination among stakeholders, emergency management professionals and organizations should priorities these criteria. Further, creating resilient emergency management practices requires attending to possible problems and traps such inadequate preparation, broken lines of communication, and mismanaged resources. Emergency management teams may better recognize, react to, and recover from crises if they adopt five critical success characteristics. Professionals may boost public security, lessen casualties, and improve the lives of those living in impacted areas by incorporating these considerations into their work. Recognizing the significance of these success characteristics and tailoring them to unique settings and developing issues is becoming more important as the profession of emergency management continues to develop. This paper used the DEMATEL method to show the weights of criteria and show the relationships between the factors. The DEMATEL method is integrated with the neutrosophic set to deal with the uncertain data.

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