Effective Components on Cash-based Intervention to Affected People by Natural Disasters Using Information and Communication Technology in Iran

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Original Article

Abstract

INTRODUCTION: Rescue and relief organizations start their operations from the first moments after the occurrence of a disaster. Moreover, they set up emergency accommodation camps after the emergency period to deliver aid and health packages with standard content based on the general needs of the affected people. However, if a family has infants, children, elderly, or sick members, these packages will not be able to meet their needs. Cash donations instead of goods respect the human dignity of the affected people after the emergency period and result in the recovery of the families and the economy of the region. Usage of information technology for this purpose leads to speed, accuracy, and transparency in the implementation of the above-mentioned method. Given the differences between the situation in Iran and the international community, the present study aimed to find localized components that affect the provision of cash-based interventions to the affected people by natural disasters using information and communications technology.

METHODS: This mixed method research was performed in two stages; meta-synthesis was used in the first stage and Fuzzy Delphi was used in the second stage to extract the domestic components of the cash-based interventions. The statistical population in the meta-synthesis stage was the local and international journals as well as the performance reports of international aid agencies published during 2004-2019. Finally, through sample selection and systematic selection based on the defined keywords, 71 out of 388 studies were selected for the purposes of the research. In the second stage, the statistical population consisted of executive directors of local aid agencies and crisis management instructors at universities and international workshops. Eventually, 14 experts were selected judgmentally who participated in three Delphi rounds.

FINDINGS: In the first stage, 18 components in four categories were determined using the seven-step model of Sandelowski and Barroso. In the first round of Delphi, one component was omitted and six other components were added according to the opinions of the experts. However, in the second and third rounds, all the components were approved by them without any further changes. According to the obtained Kendall's rank correlation coefficient which was about 0.703, the local components were agreed upon by the selected experts.

CONCLUSION: The determined local components that affect the process of transferring cash-based interventions to the affected people by natural disasters using information and communications technology consisted of 23 components that were screened and confirmed by the experts. These components can be used as a basis for the development of a process model for the systematic electronic transfer of money to the affected people by natural disasters in Iran after the emergency response period.

Keywords: Cash-Based Intervention; Information and Communications Technology; Natural Disasters.

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Introduction

In total, 315 natural disasters occurred in 2018 with 11,804 deaths, more than 68 million people affected, and 131.7 billion dollars in economic losses worldwide. Therefore, Asia has suffered the most since 45% of accidents, 80% of deaths, and 76% of injuries occurred in this continent. Almost half of global deaths from natural disasters (47%) happened in Indonesia and the highest number of affected people was observed in India (35%). Earthquakes and floods are among the deadliest natural disasters with mortality rates of 45% and 24%, respectively. Flood is the most destructive disaster and accounts for 50% of the total affected people based on 2018 Review of Disasters Evevents prepared by EM-DAT (1). Therefore, it is essential to develop plans for the prevention, response, and most importantly management of the crisis. In such situations, the usual reactions cannot be helpful. Disaster management requires experience, skill, speed, intelligence, creativity, and time management skills more than anything else in order to evaluate the situation based on the available information and take the necessary measures as soon as possible (2).

In Iran, according to the provisions of the crisis management law declared by the government on 26/8/2019 and approved by the Iranian Parliament, the Red Crescent Society, as the specialized rescue and relief organization of the country has responsibilities towards the affected people of natural disasters. These responsibilities include rescuing affected people from disasters, transferring them to medical centers, providing emergency shelters for them, supplying their needs, and storing relief items (3). These aids are delivered through the Red Crescent Society according to the Sphere standards (4) in the form of 24-hour, three-day and one-month aid and health packages to the affected people, which consist of the same items for all the affected people. However, they usually cannot meet the needs of infants, children, the elderly, and the sick in the disaster area.

Therefore, the need for cash-based interventions in the development programs around the world has become more prominent. Moreover, such interventions are gaining more credibility among other forms of humanitarian aid for various reasons, such as the consideration of self-esteem and choice, speed of delivery, value of money, proper protection of supply chain for recovery and development, support of livelihood, and access to opportunities (5).

The cash-based interventions can be in the form of financial assistance provided for those affected by disasters and crises. It can include small and regular contributions or large cash payments that enable people to meet most of their basic needs by investing in jobs that lead to more development and recover their lives after the disasters (6).

In the traditional forms of aid, non-governmental organizations (NGOs) are involved in the market as consumers to purchase goods/services and distribute them among the affected people who are effectively eliminated their interaction with the market as buyers. However, if the donations are in cash, the NGOs give the cash to the individuals and they choose how to spend it in their local market to buy goods or services that meet their needs (7).

The donations are divided into two main categories of cash and In-kind. In recent years, the methods of transferring cash donations have developed and received more attention. In other words, cash-based intervention is the key to rapid, efficient, and effective development of crisis response. The use of cash along with In-kind donations is a relatively new approach and the aid workers are in the early stages of developing guidelines, policies, and organizational capacities to implement cash donations programs.

This type of donation, if used properly, can be more efficient, effective, and valuable than In-kind donations, and also promote livelihood faster which gives more dignity to the affected people, compared to other types of aid (8). Moreover, according to previous studies, people spend money more carefully for things they or their families need and spend it mostly on food, clothes, transportation, and similar items (9).

This type of donation was used in Iran during the Bam earthquake with the cooperation of the British Red Cross. However, no Persian document could be found on the subject of the present research in the reviewed reports, articles, and studies. Given the association with crisis management and according to the keywords of the research, the reviewed studies were mainly articles and reports about supply chain systems in times of crisis.

The present study aimed to determine the components that affect the cash-based donations to the affected people by natural disasters in Iran

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by using information and communications technology. The components were collected through a systematic review of the related literature and reports of international aid agencies on this issue which was modified according to the opinion of the Iranian rescue and relief management experts.

Methods

The present mixed method research was performed in two stages using meta-synthesis and Fuzzy Delphi methods. The meta-synthesis was used in the first stage which included the collection of qualitative research data with the aim of performing a systematic review of the related literature. In order to achieve the goal of the research, the seven-step model of Sandelowski and Barroso (10) was used which consists of the formulation of the research question, systematic review of the literature, search and selection of appropriate studies, information extraction, analysis and composition of the findings, quality control, and presentation of the results.

In this research, various databases, journals, and search engines were examined in order to identify and collect the required studies performed during 2004-2019.

The focus of the present study was on the databases of Emerald, Science Direct, CIVILICA, Magiran, SID, Web of Science. The keywords in Table 1 were used to search the required studies and a total of 388 related articles were found.

According to the pattern shown in Figure 1, various parameters, such as title, abstract, full text, and research method of each study were evaluated and 71 articles were included in the final selection.

Table 1. Searched Keywords

English	Persian
Cash-Based Intervention Cash-Based Assistance Cash Transfer Program e-Cash in CBI, CBA, CTP m-Cash in CBA, CBI, CTP IT Applications in CTP, CBI, CBA	Crisis management Assistance in Crisis Natural disaster management Cash donations to affected people by natural disasters Cash-based interventions in humanitarian aids In-kind donations to affected people by natural disasters

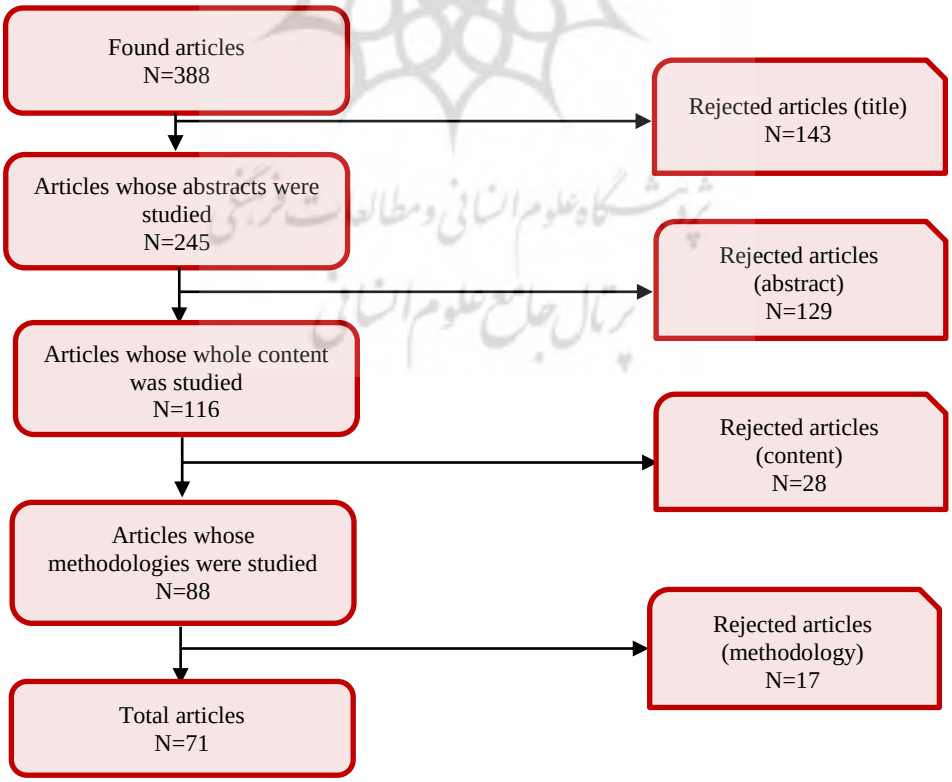

Figure 1. Article selection pattern

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All the articles included in the final selection were categorized based on their references or their formal report, including the author's first and last name, along with the year of publication of the article, and related keywords in each article to be analyzed in the next step. All the extracted data in the previous step were considered as codes and entered in the form of a scale matrix. Subsequently, these codes were categorized based on their concepts.

Based on the results of the qualitative analysis of the 71 finally selected resources, 18 components that affected the process of cash donations to the affected people by natural disasters according to the information and communications technology were recognized and divided into four categories, namely the Main factors, Secondary factors, Crisis management, and Operational plans. These components include Regional Need Assessment and Prioritization, Regional Market Assessment, Regional Risk Assessment, Role of Government and Governmental Organizations, role of NGOs, Cross-Sectorial Coordination and Single-Platform, Appropriate Money Transfer Methods, Electronic Payment Infrastructure, Financial Services Infrastructure, Policies, Continuous Monitoring and Evaluation/assessment, Availability of Necessary Devices at the Target Region, Liquidity Management, Demographic Characteristics of the Affected People, Education on How to Give and Receive Cash Donations, Recovery and Rehabilitation, Prevention and Preparedness, and Response.

No foundations have been established in Iran regarding the delivery of cash donations to the affected people based on the information and communications technology since this subject is new and requires accurate components based on the conditions of the country. Therefore, the fuzzy analysis method was used in this study which provides a higher degree of accuracy, compared to the simple Delphi method. In this regard, at this stage of the research, a preliminary questionnaire was prepared and distributed among the experts to obtain their opinions with the aim of adaptation to the conditions of the country according to their experience and knowledge.

In the second stage, the identified components from the previous stage were provided for the available experts in the form of a questionnaire which was scored based on a seven-point Likert scale. They reviewed the questionnaire and confirmed it which indicates the validity of the questionnaire structure. Moreover, Cronbach's alpha was used to measure the reliability of the questionnaire and was obtained at 0.721 in the first round which confirms the reliability of the questionnaire since it is more than 0.7.

The Delphi panel consisted of a group of experts, including executive managers in the field of rescue and disaster management and crisis management as well as professors in the field of the present research subject. Their opinions were applied to improve or complete the components during three fuzzy Delphi rounds. In order to conduct Delphi and collect the opinions of experts based on Table 2, questionnaires were filled and interviews were conducted during face-to-face and specialized meetings.

Various methods have been proposed to aggregate the opinions of n respondents. In fact, these aggregation methods are experimental methods that have been proposed by various researchers. The fuzzy mean method was used in the present study.

$$F_{AVE} = \left(\left\{\frac{\sum l}{n}\right\}, \left\{\frac{\sum m}{n}\right\}, \left\{\frac{\sum u}{n}\right\}\right)$$

Equation 1. Calculation of the mean value of triangular fuzzy numbers

Usually, the sum of the mean of triangular and trapezoidal fuzzy numbers can be summarized by a definite value which is the best corresponding mean value and this process is called defuzzification. The center of area defuzzification method presented by Tzeng and Teng (11) was used in this study as presented below:

$$DF_{ij} = \frac{[(u_{ij} - l_{ij}) + (m_{ij} - l_{ij})]}{3} + l_{ij}$$

Table 2. Seven-point fuzzy scale for evaluation of the components

Fuzzy number scale	Fuzzy value	Linguistic variable
(0, 0, 0.1)	$\tilde{1}$	Totally unimportant
(0, 0.1, 0.3)	$\tilde{2}$	Very unimportant
(0.1, 0.3, 0.5)	$\tilde{3}$	Unimportant
(0.3, 0.5, 0.75)	$\tilde{4}$	Moderately important
(0.5, 0.75, 0.9)	$\tilde{5}$	Important
(0.75, 0.9, 1)	$\tilde{6}$	Very important
(0.9, 1, 1)	$\tilde{7}$	Totally important

Equation 2. Defuzzification of triangular fuzzy numbers

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The defuzzification values greater than 0.7 are acceptable; hence, any component with a score of less than 0.7 is rejected (11-13).

Findings

Results of the first round are summarized in Table 3. It should be noted that if any of the items was ambiguous for the experts, they were explained in detail form them during the interviews. Moreover, the challenges they faced were resolved to help them clearly understand the questionnaires and effectively complete them based on their valuable experiences. According to the considered defuzzification limit, the "Response" component with a value of 0.602 was omitted from the questionnaires in the second round.

During the discussions with the experts in order to explain the components, they suggested some other factors according to their experiences and research. Therefore, six components that were most commonly mentioned by them were added to the questionnaire. These components included "Budget Management", "Mobile Payment Infrastructure", "Identification of the Aid Recipients", "Responsibility (for complaint)", "International Aid Organizations", and "Management and Tracking of the Donations".

Furthermore, after the addition of the mentioned factors and given the importance of all the items, the experts did not consider categorization necessary; therefore, in the second and third rounds, all the components were placed in the questionnaire without categorization. Moreover, they also strongly suggested that the word "Charities" should be added to the "NGOs" component due to their spontaneous presence and the need to manage and control the cash donations collected by them. For this reason, it was added to the questionnaires of the second round. The second round of fuzzy Delphi was performed after the addition and modification of the finalized components of the first round. The results are summarized in Table 4.

The six components proposed by the experts were questioned for the first time in the second round and none of the items were omitted. However, according to the recommendations of the literature and in order to confirm the validity of the results, the third round of the Delphi was performed and none of the items were omitted which meant that the Delphi rounds were over. In general, the Delphi rounds stop if the difference between the mean scores of the last two rounds is smaller than the threshold (i.e., 0.2) (14, 15). According to Table 4 and the difference between the main values of the second and third rounds, it was concluded that the Delphi rounds should stop.

According to the results of the three performed rounds and in order to confirm all the components and verify the general agreement of experts, the Kendall rank coefficient was used which was

Table 3. Results of the first round of Delphi (and the omitted component)

Components	Definite value
Role of Government and Governmental Organizations	0.896
Role of Non-Governmental Organizations	0.890
Policies	0.884
Cross-Sectorial Coordination and Single-Platform	0.881
Electronic Payment Infrastructure	0.877
Recovery and Rehabilitation	0.864
Continuous Monitoring and Evaluation	0.864
Prevention and Preparedness	0.862
Regional Need Assessment and Prioritization	0.858
Regional Market Assessment	0.855
Regional Risk Assessment	0.855
Demographic Characteristics of the Affected People	0.830
Availability of Necessary Devices at the Target Region	0.819
Liquidity Management	0.816
Appropriate Money Transfer Methods	0.797
Education on How to Give and Receive Cash Donations	0.791
Financial Services Infrastructure	0.791
Response	0.602

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Table 4. Definitive values of the second and third rounds of fuzzy Delphi
(Suggested components by experts are highlighted)

Component	Definite value of the second round	Definite value of the third round	Difference of the values
Role of Government and Governmental Organizations	0.937	0.937	0.000
Policies	0.925	0.925	0.000
Continuous Monitoring and evaluation	0.889	0.919	0.030
Cross-Sectorial Coordination and Single-Platform	0.907	0.913	0.006
Management and tracking of the donation	0.821	0.895	0.074
Feedback management and responsibility	0.877	0.887	0.010
Budget management	0.889	0.854	0.035
Identification of the Aid Recipients	0.862	0.851	0.011
Mobile payment infrastructure	0.807	0.848	0.041
Recovery and Rehabilitation	0.786	0.839	0.053
Prevention and Preparedness	0.777	0.839	0.062
Electronic Payment Infrastructure	0.854	0.839	0.015
Regional Need Assessment and Prioritization	0.771	0.831	0.060
Regional Risk Assessment	0.756	0.821	0.065
Regional Market Assessment	0.767	0.815	0.048
Financial Services Infrastructure	0.732	0.815	0.083
Availability of Necessary Devices at the Target Region	0.705	0.801	0.096
Appropriate Money Transfer Methods	0.778	0.787	0.009
Liquidity Management	0.719	0.763	0.044
Demographic Characteristics of the Affected People	0.736	0.757	0.021
Role of Non-Governmental Organizations and Charities	0.735	0.748	0.013
International Organizations	0.741	0.733	0.008
Education on How to Give and Receive Cash Donations	0.706	0.721	0.015

obtained at 0.664, 0.689, and 0.703 for the first, second, and third rounds, respectively. Given that the acquired values were within the range of 0.7, according to the Delphi rules, the general consensus of experts on the components was confirmed and this supports the reason for ending the Delphi rounds (16).

Discussion and Conclusion

Various factors and components influence the process of cash-based interventions to affected people by natural disasters. Due to the special conditions of Iran and specifically the various imposed sanctions, the present research aimed to determine the effective components that are adapted to the local situations based on the opinion of experts in the field of rescue & relief and crisis management.

According to the findings of the first round of Delphi, the component of "Response" was omitted which could be due to the nature of the "Response" stage in crisis management. This stage includes the provision of emergency measures and services after a crisis, including announcement, notification, search, rescue, healthcare, treatment, security, transportation, communication, medical emergencies, burial, waste management, fire control, hazardous materials control, fuel supply, and reestablishment of lifelines (17). In this regard, since at this stage only In-kind donations can be helpful, it was not considered an effective component by the experts.

Two components of "the Role of Government and Governmental Organizations" and "Policies" governing the country achieved the highest mean values and level of agreement. Therefore, these two components were identified as the most influential factors on the ICT-based cash donations. Accordingly, such donations should be given after making the necessary agreements with the government regarding the adopted policies (18, 19).

Three components of "Continuous Monitoring and Evaluation/Assessment", "Management and Tracking of the Donations" and "Feedback Management and Responsibility", which have a supervisory nature, underwent a shift during the three Delphi rounds. Accordingly, by the third round, their importance had increased which could be due to the emphasis of experts on the transparency of the information provided by the government and the judicial system. Regarding

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the international aspect of these components, 61 of the largest donors and humanitarian organizations in 2016 (24 states, 11 UN agencies, 5 international organizations, the International Red Cross and Red Crescent Movement, and 21 NGOs) have signed the "Grand Bargain" agreement; therefore, they are committed to improving the efficiency of their humanitarian efforts (20).

Moreover, international aid agencies consider continuous Monitoring and evaluation as one of the principles of cash-based interventions (18, 21, 22, 23, 24). This component of the cash donation program is related to the collected cash and its expenditure which should be constantly reviewed after the implementation in order to be improved if necessary. Given the advancement of the payment system technologies in the country and in accordance with the law on dissemination and free access to information (approved by the Iranian Parliament on 1/9/2008), it is necessary to track the donations to observe the process of their collection and expenditure through electronic systems and report to donors

Furthermore, an increase in the transparency of the procedure will enhance the public trust in cash donations. Responsibility and accountability towards aid recipients and donors after transferring the donations through customer relationship management system which was embedded in the component of feedback management and responsibility was also considered very important by the experts.

The component of "Cross-Sectorial Coordination and Single-Platform" was emphasized in the reports of the aid agencies since the lack of this systematic integration led to an increase in the costs of aid, rework, and fraud (25). In this regard, Steets and Ruppert have also discussed that payment platforms in the aid delivery process require coordination among the crisis management section. Usage of a single platform for cash payments with different purposes will improve cost-effectiveness, enhance coordination of assistance, and also prevent fraud or abuse (26). This systematic integration can easily become practical through the use of ICT.

"Budget Management" was one of the components that the experts added in the first round. During the interviews, it became clear that the experts considered this component as dependence on the government budget to build the infrastructure and the allocation of budget for aid, regardless of the public assistance. In the third round, its importance was revealed in the consensus among the experts.

Given the rate of mobile phone penetration in Iran (139.71% by 22/9/2019) and the mobile payment services, the experts considered the "Mobile Payment Infrastructure" to be a more important component than "Electronic Payment Infrastructure". It is true that the electronic payment infrastructure is the basis of the mobile payment infrastructure; however, the experts found it more practical to identify the affected people by natural disasters by their previous identification through SIM card ownership.

These two factors are somehow connected to the component of "Availability of Necessary Devices at the Target Region" which means the provision of the proper hardware, software, and communication infrastructure for a transaction among the affected people, suppliers, and retailers. Despite the fact that the experts approved of this component, they considered it not very important. They explained in the interviews that the process is costly and it is impossible to have the equipment there according to the conditions of the disaster area; nevertheless, they approved its provision and considered it necessary.

The component of "Financial Services Infrastructure" also attracted more attention during the three rounds of Delphi, compared to other components. Moreover, it was even more emphasized during the third round since if the financial services infrastructure is not predicted and organized using ICT specifically for cash donations, all the systems will lose their integration. This leads to the independent operation of each system which, in turn, results in errors and a lack of transparency in the entire disaster assistance process. Based on the 20-year experience of the author regarding the use of information technology in various fields, this problem applies to all the systems that are related to finance.

The "Recovery and Rehabilitation" component, based on the conditions of the disaster area, determines which methods of cash-based interventions should be used, such as conditional or unconditional assistance, coupon, or cash for work. This component was also approved by the experts. It is important and necessary for the authorities to

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consider the priority of economic rehabilitation over physical reconstruction or at least their simultaneity, which is especially important in rural areas (27).

In fact, prioritizing economic rehabilitation also contributes to the acceleration of physical reconstruction. This was confirmed by the results of the research performed in Lebanon, Ethiopia, the Philippines (28), and Uganda (29). According to the results of the aforementioned studies, the affected people experienced the highest level of marginal utility and a 40%-increase in the next four years which resulted in more income for the affected people and economic prosperity of the disaster area due to the cash donations (30). The ICT can optimize the management of this process and make it cost-effective.

The "Appropriate Money Transfer Method" component is also proportional to the evaluation result and determines that money or coupons be delivered to the affected people in the form of paper, electronic, or mobile coupon based on the conditions of the region (31, 32). This component is strongly connected to the three factors of "Regional Need Assessment and Prioritization" (18, 33). The practical view of the experts also confirmed the efficiency of these components regarding the methods of money transfer to the affected area.

It should be noted that risk assessment includes gender-based risk assessment, fraud, personal security, and electronic transactions. According to the studies conducted in central and southern Somalia (8), cash donations are more secure than food and goods. Moreover, based on the results of a study carried out in the Democratic Republic of the Congo, money and coupons had similar effects on food security, family resilience or property ownership strategies, better usage and long-term durability, access to markets to purchase goods and services were the prerequisites of cash-based interventions (34). Assessment of the regional market is also the basis of any cash-based intervention program since it determines the ability to provide goods and services with appropriate quality and quantity in the region (35).

"Education on How to Give and Receive Cash Donations" is also an important component from an international perspective on the effectiveness of the money transfer program in disasters since the education of manual or digital procedures can accelerate and facilitate the transfer of money or coupons (paper, electronic, mobile). However, in the third round of Delphi, experts considered it as the least important component. During the interviews, it became clear that some experts considered this factor to be strongly related to the type of electronic or mobile money transfer method; nevertheless, it obtained the least level of agreement.

Tee mmmmnnnnt of tee RRll e ff Itt rr aatinnll Orgiii ztt inn"" add the eeeee ef NGOs ddd Crrr itiss" in tee preeess ff ICT-based cash donations were confirmed by the experts; however, they were considered unimportant. In the interviews, the experts mainly referred to security problems regarding the practical role of international aid organizations. Moreover, regarding non-private and charity organizations, the experts believed there is a lack of laws or systems to monitor their responsibility. However, in the international aid system, both of the above-mentioned components are mentioned as the main pillars of the ICT-based cash donations (18, 21, 22, 23, 24).

"Identification of the Aid Recipients" was also considered important due to the total number of abuses according to the operational experiences of the experts. They emphasized on the usage of the identification services of the Civil Registration System or the database of the Organization of Targeted Subsidies. However, according to the author's personal experience, the Organization of Targeted Subsidies practically avoids providing this information for various reasons. The component related to this factor, which was relegated to less important levels despite the approval of experts, was the "Demographic Characteristics of the Affected People". The experts practically considered this factor important while the inquiry about these details was more important for them since unfortunately identity theft during the distribution of In-kind donations was also commonly observed by them. According to the results of a study conducted on the disaster assistance to Nepal, Iraq, Mozambique, and Ukraine also considered this component as important from an international perspective (36).

Component of "Liquidity Management" helps determine the amount of needed money to the affected people by disasters, the time interval of payments, and their amount and frequency. Due to the detailed explanation of this factor in the

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interviews, the experts expressed their agreement, however, it was not prioritized. Nevertheless, this was also considered very important by international aid agencies.

According to the raised issues, 23 local components affecting the ICT-based cash donations to the affected people by disasters, were approved based on the experiences of the interviewed experts. Moreover, these components can provide a basis for the development of an indigenous process model for ICT-based cash donations to the affected people by disasters that can be used in future research.

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Conflict of Interests

The authors declare that they have no conflict of interest regarding the publication of the current study.

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