A New Disaster Aid Information System Model for Indonesia Red Cross: A Case Study in East Java Province

Djoni Haryadi Setiabudi[1], I Gede A. Widyadana[2], Vivi Harsono[3], Randy Christian Wongso[4]

[#1]*Informatics Department, Petra Christian University*
Jl. Siwalankerto 121-131, Surabaya, Indonesia
[1]djonihs@petra.ac.id
[3]m26414097@john.petra.ac.id

[2]*Industrial Engineering Department, Petra Christian University*
Jl. Siwalankerto 121-131, Surabaya, Indonesia
[2]gede@petra.ac.id
[4]randycw2793@gmail.com

***Abstract*— Humanitarian logistics is a complex system since there are many individuals and institutions should collaborate when a disaster happen. Therefore in this research we develop a new information system that collaborate donor information system, funding system and collaboration between a humanitarian organization and some retail chain stores. Only few researchers give focus in this information system. The model is developed based on a survey to 101 individuals in Surabaya, East Java, Indonesia to know their perception about humanitarian aids. The information model is developed for Indonesia Red Cross since this institution is the most trustworthy institution but only few respondents have donated their donation through this organisation. The model is developed by incorporating convenience store chain since they are good in distribution channel and networking. The system model result in more efficient and effective distribution process.**

Keywords *information system; humanitarian logistic; funding, convenience store chain*

1. Introduction

Indonesia is one of high risk countries. There was 19,877 disasters from 1815 until August 2015 according to the Indonesian National Board for Disaster Management (BNPB). Among of all disaster, flood is the most often disaster in Indonesia which 31% of disaster in Indonesia is flood. Therefore humanitarian logistic is important to be handled seriously in Indonesia.

Globally humanitarian logistic has many attention by some researchers recently. There are some important issues in humanitarian logistics and one of them is effectiveness of managing supply and demand of the recipients. Some problems that occurs in this issues are unbalance in supply and demand.

There some goods that are not needed by the recipients but the supply are very huge. In the other side, some goods that are needed by the recipients are not available in enough quantity. Even though there are many number and variety actors in humanitarian relief, they have their own logistic expertise, capacity, interest and missions. Coordination is a key factor for effectiveness of humanitarian relief by increasing collaboration among relief organization [1]. Distribution centre has very importance role in humanitarian relief [9]. They should not only serve and replenish goods for the recipients but also showing the recipient's direction to find intermediate station closer to affected area. A humanitarian supply chain framework for funding allocation is developed by [3]. They set some funding categories such as nature, cash and in-kind also categories of funding resources such as institutional and private. They use efficiency, effectiveness and equity as criteria of humanitarian supply chain performance. They made the framework and identified some research related to humanitarian supply chain funding. They concluded that one important research topic is how to get funding system that can react efficient and effectively to a disaster. The topic is important since funding and logistics are related and funding models have important role for humanitarian aids efficiency and effectiveness [5]. The other problem is many donors' finds challenging to understand the implication their donations. Many donor are not

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well-informed about their donations and this issue become donation constraint therefore donors should be educates and informed that the system of humanitarian supply chains are dynamic and complex [7]. It is important to have clear information to the donors. A lack of donor information is one important factor for increasing funding systems' complexity [3]

Due to our literature review, there are few research in humanitarian logistic consider integrated system of donors, funding system, and collaboration of humanitarian organizations and businesses sectors, and collaboration between. This paper contribute to propose integrated system of fast and reliable information to the donor about the recipient's needs, funding system and supply from business sectors. In this paper we develop a new efficient and effective information system. The research start for identification of donor perception and then based on donor perception, an information system model is developed. This research support the finding of [3] that one important research focus is to find an efficient and effective funding system to react di disaster. The research is conducted in East Java, Indonesia since some disaster such as flood often happened in this area. An efficient and effective humanitarian system can be support by using technology to gather, aggregate and analyse data and effectively communicate two-way communication between humanitarians such as donors and volunteers and people in need [2].

2. Donor's Survey

An effective humanitarian information systems can be developed based on the need and perception of donors, therefore an intensive survey is conducted. The survey is distributed in 5 districts in Surabaya. Using significance criteria = 0.1, and the effect size=0.15 to attain power of 0.80, the minimum sample size is 87 respondents are derived from table in [4]. The survey is distributed to 101 respondents in Surabaya City, the biggest city in East Java province where 60% of respondents are male and the rest are female. The age distribution of the respondents are 31% are less than 31 years old, 37% are from age 30 to 50 and the rest are above 50 years old. From 101 respondents, 57% ever have participation as a donor and most of them which is around 82% choose to donate cash and 18% give goods as their donation. Most of the donor think to give cash better than goods since cash is more flexible and can be used to buy any goods that are needed by the recipient. It is also more convenient for the donors to give cash than goods.

There are some reasons for participants who have not given donation. The biggest reason (31%) is they don't have extra fund to be donated. The second biggest reason (26%) is they do not believe with the institution who collect the donation. The rest respondents think that donation process is not clear and complicated (20%), lack of information about a location where donation can be given (13%) and their donation will not have significant contribution (10%). Respondents get information about donation needed for disaster aid mostly from television (46%) since this media is used frequently and up to date, 18% get information from radio, 9% get information from any organization and 27% get information from any other media or directly from disaster location. The interesting result is from institution that donation is given. Most of respondents donate their donation to religion organization (57%), donate through social organization 12%, TV station 9%, working place 11%, donation through some volunteer who take donation at some streets, and Indonesia Red Cross 2%.However most respondents (47%) think Indonesia Red Cross is the most trustworthy institution, 25% trust with BPBD (official humanitarian institution), 18% trust with NGO and the rest trust with other institutions. Recently convenience stores chain are quite popular in Indonesia and the survey shows that 45% respondent's visit convenience stores chain 2-3 times in a week, 41% at least visit one times and 14% respondents visit more than three times in a week. When they asked, they have interest if they can donate their donation in convenience stores chain or not, 50% of them said that they are interested.

There some interesting finding from our survey. There are many opportunities to attract new donor for humanitarian aids. Around 59% of respondents still want to give donation however they don't trust some institutions, lack of information and they think that donation is a complicated process and not clear. At the other side 47% respondents state that Indonesia Red Cross (IRC) is the most trustworthy institution. However the IRC official state that there are small portion of donation comes from individuals. This statement support our finding that only 2% of respondents give their donation to IRC

and most of them give donation through religion institution. Actually donation that are distributed by IRC is more efficient and effective than religion institution due to their ability and experience to handle disaster. Most respondent give donation through religion institution since most of Indonesia people are religious people and they get information about an opportunity to give donation from this institution. Most of respondents get information from television, however in last few years, information from social media, internet and many application dominate channel for sharing important information in convenience, fast and cheap way. Therefore there are many opportunities to improve the ability of IRC to collect donation and distribute donation to the recipients. In this paper we develop IRC information system model to improve number of individual to give donors through IRC by making information distribute fast and accurate and an easy process to give funds. The other IRC drawback is ability to keep some needed goods, especially some deteriorated goods since IRC is not allowed to keep this kind of goods. If they do not keep the goods, it take longer time to get the goods and distribute to disaster area. In the other side, many convenience stores chain has ability to keep a big number of stocks and distribute the goods in a short period. In this paper, we try to incorporate convenience stores chain and other distribution players in logistic to support disaster aids.

3. Proposed IRC Information System

3.1 System Analysis

Indonesia Red Cross have branches in every city to handle limited disaster effect. The disaster scope and effect become larger and cannot be handled by IRC branch in the city then the control is handled by IRC in the province. The IRC centre in East Java province is located in Surabaya. Some volunteers are sent to disaster location when a disaster happens, by bringing some goods needed in limited volume. Some shelters are provided near some potential disaster locations. The shelter has coordination function for the volunteers and a centre to stock some goods for IRC in the province or in the city. The shelter also has a function to receive some donation from donors and then to send their aid to the recipients. Any institutions or individuals can be a donor. Up to now they do not have good administration system to handle the cash properly so it is prone to misuse the cash. Therefore IRC prefer to receive aids in the form of goods than cash. This is the weakness of IRC that can be an opportunity to be improved since from our survey, the respondents are prefer to donate cash than goods.

Currently, there is no good administration system for the donors. They are registered manually, therefore it is difficult to have a historical data of the donor's aids. The other problem, the information about recipients need only known by IRC volunteers and it is not informed the potential donor. Therefore donors usually send aids according to their opinions, mostly are food such as rice and instant noodle. As the result in many cases, foods become overstock and shortage for some needed goods such as diapers. IRC does not have any accurate information about a number of goods stock in their warehouse. Communication between IRC centre with donors, and volunteers in disaster location mostly use smartphones and applications such as SMS, BBM, and Whatsapp. Even though these tools are efficient, many information is not accurate.

3.2. Proposed System

Based on the problem analysis, this research proposes an integrated system that can overcome the communication problem between IRC, donors, and volunteers. The system considers some set decisions of logistics preparedness such as facility location, stock propositioning, resource allocation, and relief distribution [8]. In this research, we propose involvement of goods and logistic providers to simplify and accelerate distribution system to the disaster location. The system is developed using web-based that can be accessed using a computer and mobile technologies. A mobile application is developed so volunteers can access the data easily and accurately. The system framework is shown in Figure 1.

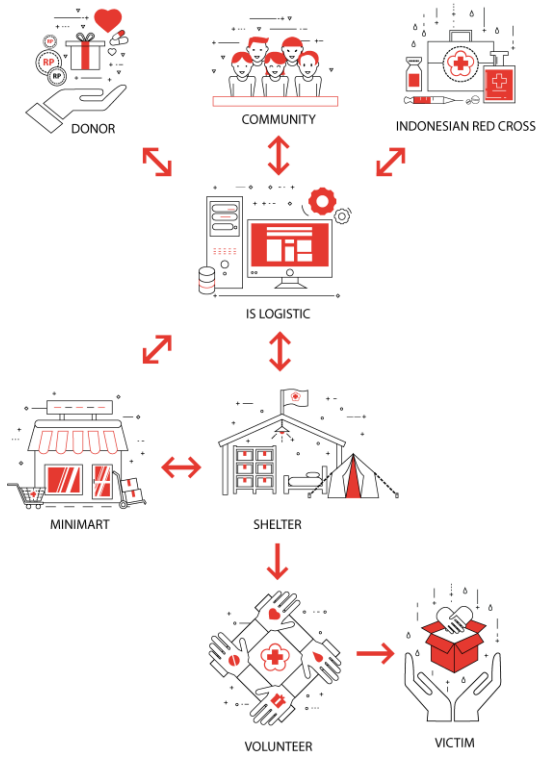

Figure 1: Humanitarian Integrated Logistics Information Systems Framework

Location of database processing centre is in the S1 Logistic server, where all data and information boils down to the server. The server can be owned by IRC or it can be host in a hosting service provider. The operator can input information of logistic needs for every disaster location or monitors the availability of logistic in every location using web based application. The public can monitor IRC logistic distribution activities and needs, therefore, potential donors can register as a donor. Donors can see the logistic needs in every disaster event through the web and the application and can give donations via money transfer to IRC account. IRC will accumulate all donations and allocate the donations to every disaster location according to the need in every location.

Logistic aids distribute to disaster location by setting an order to the supermarket or mini market that have online collaboration in the system. When minimarket gets an order through the system, they can use their distribution network to deliver the aid through the closest store or warehouse, therefore, the goods can be received quickly. This system considers partnerships between humanitarian organizations and business sector since the partnership have been examined and illuminated by many researchers and some of them concluded that this partnerships affect performance of humanitarian logistics [6]. Some volunteers in disaster locations receive the goods and they will give confirmation through the system when the goods have been received correctly. This confirmation can be known by the donors and IRC administration centre. This system guarantees the donations are used properly and the need of the recipient can be updated on time and fast.

3.3. Modelling Process

The modeling process based on data flow diagram as shown in Figure 2. Figure 2 shows level 0 DFD that consists of six processes which are Master Data Management, Donations Reception, Orders Making and Items Reception, Items Distribution, Demands Request, and Reporting.The information is started from demands request and then demand request will be checked in master data management to know the goods availability. When the goods needed is not available, then some request demands will be announced to public in Demand Request. Reporting process is used to make report for the donors if the donation goods or cash have been accepted by the recipients. The details of the Donation Reception process can be seen inFigure 3.There are two processes in the Donations Reception process which are Upload Transfer Receipts and Verifications from IRC processes. In the first step, the donor uploads her transfer receipt to the system and then the IRC verify the donor and save the donation data to the database. Order Making by IRC, Items Received, and Payments processes are all of the process in the Orders Making and Items Reception process as shown in Figure 4. The order is made by IRC to a convenience store. Later the convenience store check and approves the orders. When the order is approved, goods will be sent to the desired locations or shelters. The shelter officers send a verification to the convenience store and update the stocks of the goods when the goods have been delivered to the designated shelters. The convenience store delivery will be verified by IRC and then invoice can be made and sent to the IRC to get the payment.

The Items Distribution process, consists of Volunteers See Shelters, Items Data and Volunteers Distribute Items processes as shown in Figure 5. In this process, the volunteers can see the goods availability to be distributed in the system and then they can choose which goods should be distributed.

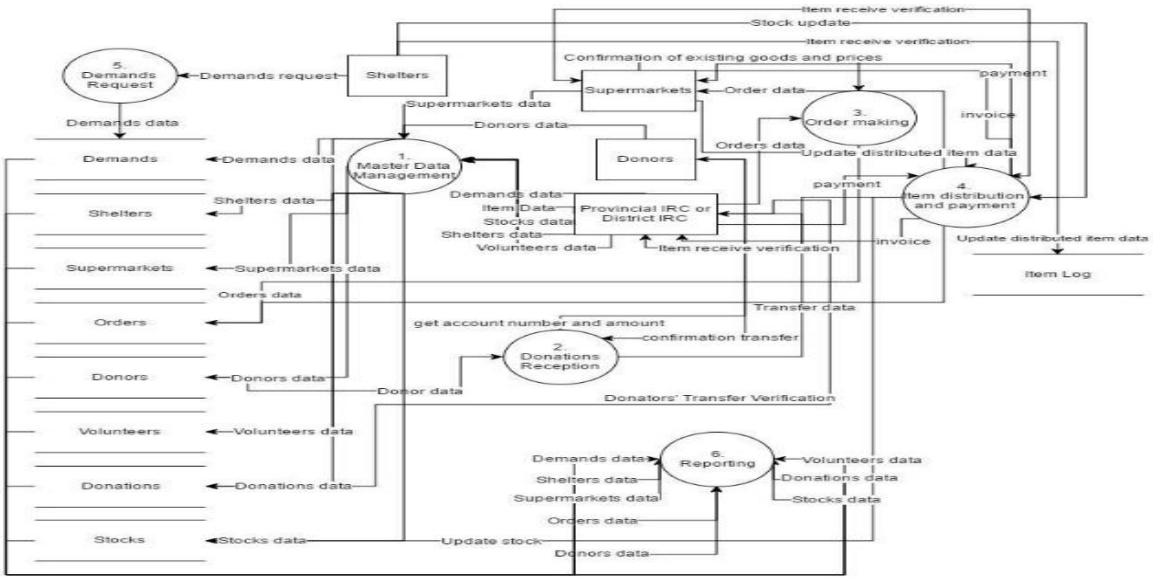

Figure 2. Data Flow Diagram Level 0

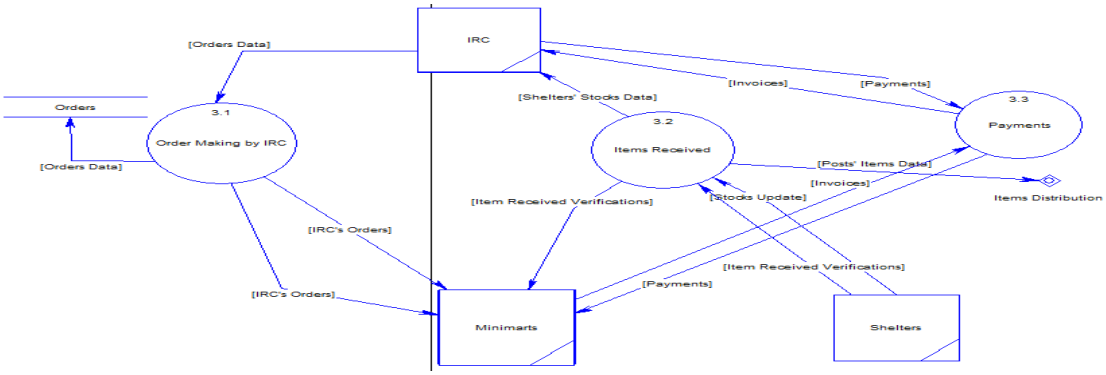

Figure 3. DFD Level 1 of Reception Process

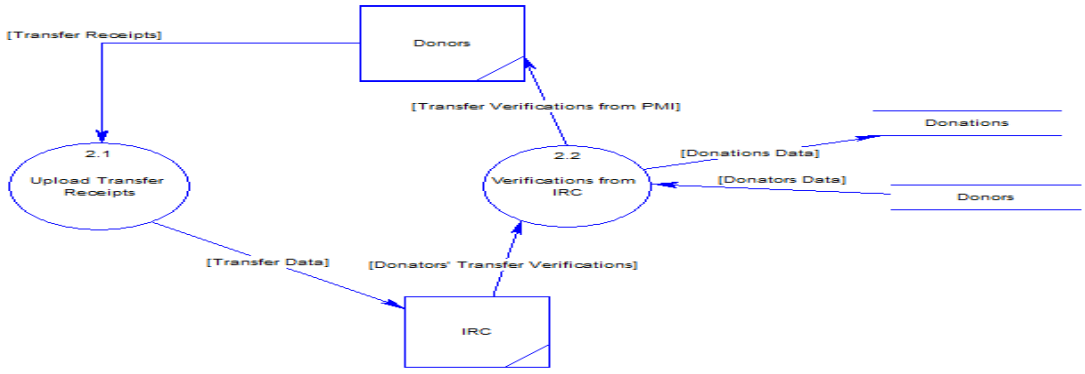

Figure 4. DFD Level 1 of Order making

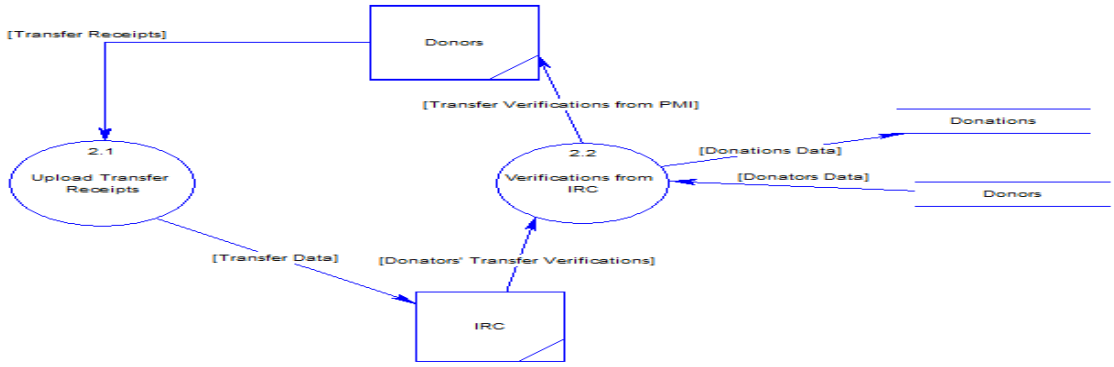

Figure 5. DFD Level 1 of Items Distribution Process

4. Conclusion

In this paper a management information system model for Indonesia Red Cross (IRC) has been developed. The information systems collaborate donor information system, funding system and collaboration between a humanitarian organization and some retail chain stores. There are few researchers focus in this topic, and this is topic is new in Indonesia. The system development process is started with a survey to conduct some important information for developing the system. The system is developed to IRC since IRC is the most trustworthy institution to collect and distribute disaster aids in Indonesia. However only small percentage of respondents distribute their donation through IRC since they do not have enough information about the way to make donation and the need of recipients through IRC. The system is developed for IRC who serve East Java province.

In the system, we also collaborate convenience stores chain to contribute to prepare and deliver some goods since they have good networking, available in wide are in East Java up to rural areas and can stock some deteriorated goods that cannot be stocked by IRC. Collaboration with convenience stores chain can increase efficiency and effectiveness of humanitarian aids distribution. In the other side this collaboration is part of convenience stores chain social responsibility.

For the donor, this model help them to know the needs of the recipients and can donate any goods that are needed by the recipients. This improve the willingness to donate, reduce number of excessive unneeded goods and reduce shortages. In the future research, the model is not only used to fulfil goods that are needed by the recipient but also some goods or service that are needed for recovery phase and number of player in the system can be added by incorporate some logistics

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