

Assessment of Emergency Communication Number Used in Nepal

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ABSTRACT

Natural disaster is inevitable in any parts of the world irrespective of any level of development and status. The casualties and the fatalities, however, also depend upon the precautions, and communication is most vital for preparedness. The overall objective of the study was to access emergency communication number used in Nepal. Literature review followed by key informant interviews was conducted in order to collect and analyze the information and their previous experiences. The information thus collected was documented. Standard communication framework followed in developed countries has been examined. Multiple emergency numbers create difficulty to identify the right support. Integrated single emergency number is needed for effective communication. This number shall be accessible to all the mobile network operators in the country. Then only all the public who have the mobile connectivity can reach to the responding authority irrespective of customer of any mobile network operator.

Keywords: communication, emergency, mobile phone

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INTRODUCTION

It is important for public safety to be able to provide and maintain communications before, during, and after a disaster or emergency. Communication is an important component before, during, and immediately after a disaster situation to reduce, response, and recovery from the disaster. Timely communication is important to prevent the loss from disaster. Before disasters strike, mobile communications can be used as a conduit for disseminating information about the impending danger, thus making it possible for people to take the necessary precautions to mitigate the impact of these hazards.

Similarly, communication helps to rescue operation after disaster and connects affected people, families, and communities with first responders, support systems, and other family members. The role of communication technology has been

recognized as integral to disaster management for a long time. Communication technology plays a vital role in all the four distinct phases of disaster, mitigation, preparedness, response, and recovery.

The interoperability of various communication systems like mobile phones, Internet, radio, and television complement each other to disseminate the hazard information before disaster to mitigate or prevent the effect of disaster to human society. Communication can be any one or combination in person, cell phone, land line, email, social media (like Facebook, Twitter), etc. Two-way communication is possible for these means. One-way communication means, like FM radio, television, siren, megaphone, public address system, can be applicable to disseminate the hazard information to vulnerable community.

Nepal Doorsanchar Company Limited (NDCL) is the biggest telecommunication service provider in the country. Similarly, other private mobile network operators (MNOs) providing the service are Ncell, Smart telecom, United Telecom Limited, Nepal Satellite Telecom, STM Telecom Sanchar, etc. Some of the Internet service providers in the country are World link, Subishu, Vianet, etc.

Mainly mobile communication services are useful for various aspects including risk reduction purpose, and numerous people get advantage from the service during disaster. Mobile communication system, thus developed, will be useful to provide early warning system and thereby reducing the chances of casualties and the hazards from natural disaster. Integrated emergency number will also be useful for the rescue operation as the real-time data of the cell phone users are available. The real-time data collected from network can be beneficial for the evacuation planning. This adds speed and accuracy to respond to emergency. Public will be benefited from the better communication from warning message till the rescue operation. It will be helpful to update the safety information during the emergency. It will be a mean to get informed; the better you have information; the better one can respond the situation. So, the objective of the research is to assess the emergency communication numbers used in Nepal.

Emergency Service

Emergency can be described as a situation that causes instant risk over health, life, property, or environment. Emergency requires instant intervention from becoming worst. Service that provides immediate and rapid assistance in situations where there is a direct risk to:

- Life
- Individual or public health or safety
- Private or public property or the environment

Emergency Number

Special short code(s) or number(s) used by the emergency caller requesting assistance from the emergency services.

Based on the guidelines from International Telecommunication Union (ITU), mobile equipment (ME) in a GSM and user equipment (UE) supporting voice in an UMTS system, therefore, have a built-in recognition of 112 and 911 as an emergency number and facilitates an emergency call wherein:

- Device is locked, protected by password.
- Device is in the coverage of any GSM/UMTS network, not necessarily in the subscribed network.
- Device is with or without a SIM/USIM/ISIM.

Apart from a single initial emergency number, 3GPP also defines a provision of specifying preferred emergency numbers in terminals and identity modules (b-3GPP TS 22.101). An emergency number is associated with emergency type in the identity modules allowing terminals to initiate an emergency call (e.g. 100 Police, 101 Fire brigade, 102 Ambulance). Following are the types of emergency:

- Police
- Ambulance
- Fire Brigade
- Marine Guard
- Mountain Rescue
- Manually Initiated eCall (MIeC)
- Automatically Initiated eCall (AIeC)

INTERNATIONAL TRENDS AND PRACTICES ON INTEGRATED EMERGENCY COMMUNICATION AND RESPONSE SYSTEM (IECRS)

Most developed countries have adopted single three-digit emergency number to contact emergency services in situation of distress. Single emergency numbers implemented in some of the countries are listed in Table 1.

Table 1. Single emergency number used in various countries.

Country	Single emergency number(s) in use
United States	911
United Kingdom	999 (primary), 112 (secondary)
France	112
Germany	112
Turkey	112
Italy	112
Spain	112
Canada	911
Australia	0
Austria	112
Norway	112
Romania	112
Belgium	112
Finland	112
Bulgaria	112
Czech Republic	112
Sweden	112

Source: Official Document NTA, 2017 [7].

A single three-digit number 112 is widely used in Europe and 911 mostly in North America to communicate for emergency services. European Emergency Number Association (EENA), Brussels-based NGO, provides a platform for emergency services, public authorities, decision-makers, researchers, associations, and solution providers in implementing 112 for IECRS within European Union and around the globe. Similarly, National Emergency Number Association (NENA), a US-based organization, works on developing policy, technology, and operations for 911 and promotes the implementation across North America. Many countries around the globe today are members of this organization and are gradually reshaping their emergency communication and response system architecture to an integrated model with a single emergency number. In most countries today, the IECRS is operated by Ministry of Interior or its equivalent.

STRUCTURE OF AN INTEGRATED EMERGENCY COMMUNICATION AND RESPONSE SYSTEM

In an IECRS, Public Safety Answering Point (PSAP) is the core component for

communication, coordination, and mobilization of emergency responders. Figure 1 illustrates the functional architecture of an IECRS (b-ETSI SR 002 180).

A PSAP is a centralized authority responsible for call taking and dispatch of emergency services. Following areas of an IECRS must be determined before the introduction of PSAP(s):

- Connection model between TSPs and PSAP.
- Model between PSAP and emergency response system.
- Number and coverage of PSAP.
- Communication between PSAPs.
- Standard operating procedure (SOP) and communication between PSAP and agencies serving on emergency.

DEVELOPMENT OF MOBILE COMMUNICATION SYSTEM IN NEPAL

Six mobile network operators are operating the mobile communication services in Nepal. There are two major players: Nepal Doorsanchar Company Limited (NDCL) and Ncell. Overall, the mobile penetration rate is 130.24% and Internet penetration is 61.99% till July 2017 and still growing [7]. If the EWS is integrated with the mobile communication, this will serve to more population as the mobile penetration rate is in growing trend as shown in Figure 2.

The definition given by Third Generation Partnership Project (3GPP) for location-based service (LBS) is a service provided by service provider that utilizes the available location information of the terminal. The GSM Association (GSMA) defines LBS as a service that uses the location of target for adding value to the service where the target is an entity to be located (and this entity is not necessarily also a user of a service).

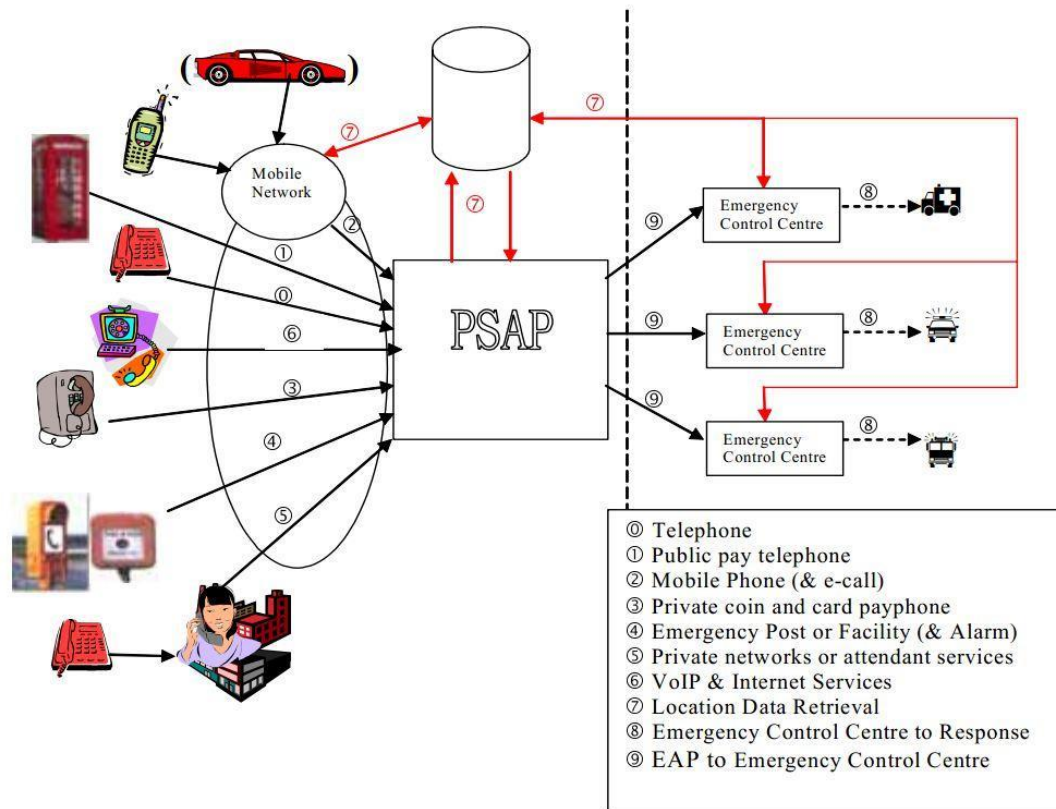


Fig. 1. Functional architecture of PSAP (Source: EENA, 2015).

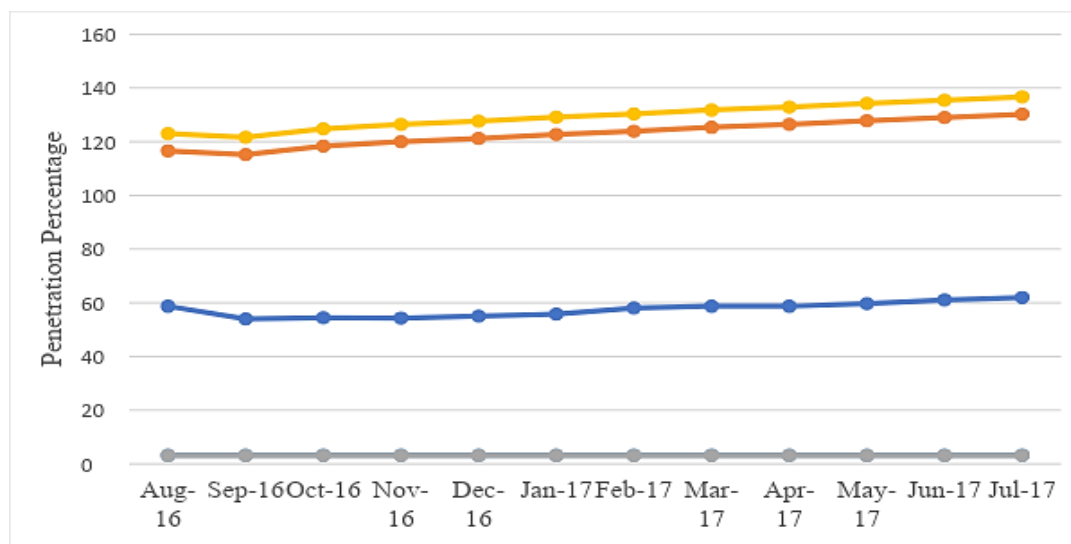


Fig. 2. Growth trend of voice and data service (Source: NTA-MIS, 2017 [7]).

LBS is an application that is used to identify the location of mobiles or wireless devices. LBSs are used to identify the location of a person or an object, track vehicle movements, logistics, and inventory management. The European Telecommunications Standards Institute

(ETSI) defined two types of location-based emergency service applications:

[1] First, initiated by individual in the form of mobile phone call or SMS. In this case, MNOs are obliged to provide the location information of originated call within accuracy between 50 and 150m. This service is known as

wireless E911 in United States and E112 in European Union.

- [2] Second, initiated by the solution providers in which alert, notification, or early public warning are pushed to all active handsets that are within a predefined threat area at the time of unfolding event [1].

Mobile operators in UK are required to pass the location information to the emergency service, but no constraints are placed on the accuracy of these location information [8].

ADAPTATION OF TELECOMMUNICATION SERVICE IN DISASTER COMMUNICATION

LBS can be used in four scenarios:

- Internal (used by operator for O&M, coverage)
- Commercial
- Emergency and lawful intercept.

Entire world is affected by natural disaster, act of violence, and terrorist attack. The government should consider the public safety and protection from disaster. Therefore, government should consider disaster relief as high importance for the citizen and priority for government.

Belgium, The Netherlands, Singapore, Japan, and South Korea are the pioneer to implement the LBS technology. There are needs for legal, political, and technical frameworks to implement such new system for the emergency management [3]. Motivation to adopt the LBS system depends on:

- Attractive business model
- Obligation of MNOs
- Regulations
- Security and privacy concerns

Public mobile networks are used as much as possible to transfer the information related to disaster risk using SMS and data

channel. The Tempere Convention provides a legal framework to use telecommunication in international humanitarian assistance, reduce regulatory barrier, protects providers of telecommunication assistance, while safeguarding the interest of host country. This will help countries to pave the way for faster, unhindered, and effective deployment of telecommunication resources by all humanitarian actors before, during, and after disaster strikes [2].

Hyogo Framework for building the resilience of nations and communities to disaster 2005–2015. Strategic goals are integration of disaster risk reduction into policy and planning, develop, strengthen, and capacity to build resilience to hazard, emergency preparedness for response, and recovery programs [10].

The Asia–Pacific region has suffered from various kinds of natural disasters, and the frequency of disasters is tending to increase globally. Disaster management, overall, is one of the most pressing issue worldwide. Taking into consideration the situation, the Asia–Pacific Tele community has identified it as one of the key priority areas in its Strategic Plan for 2015–2017 and stated that the APT will assist members in improving the preparedness, early warning systems, and rescue and recovery efforts with the use of ICT.

Study Area

Nepal is divided into 3 ecological regions and 75 districts for administrative purpose. All over Nepal is considered for the study. Primary and secondary data have been used for the research purpose. As per NTA Management Information System (MIS) report, 130% of 26.49 million people in the country have access to mobile services. The report includes data of up to July 2017.

The main source of collecting the primary data was the interview with key informant. Unstructured interview was conducted with key informants to gather the information. Initially, judgmental sampling strategy was adopted for the key informant. Based on the input and recommendation, further information was collected through applying snowball sampling methodology.

Following were considered as a secondary source of information:

(a) Literature review

- (b) Reports, publications, and case studies
 - (c) Journals and conference proceedings
 - (d) Books, magazine, newspaper
 - (e) Various publications and records and statistics
 - (f) Official website for publicly available reports from Central Bureau of Statistics, DHM, NEOC, Ministry of Home Affairs [6], NTA, World Bank, and United Nation organizations.
- Figure 3 shows the flow of research which is also summarized in Table2.

Table 2. Summary of methodology.

Assess the emergency communication numbers used in Nepal	Different numbers used for emergency communication purpose	Literature review, news, visit to the mobile operators	Key stakeholder and suggest the integrated solution
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EMERGENCY NUMBERS USED IN NEPAL

The issues of safety have been raised in building construction of Nepal in terms of fire safety [5]. Risk of building has also been highlighted at construction phase of Kathmandu [4]. Different countries have different practices across the globe. Three kinds of emergency are police, ambulance, and fire. In USA, 911 is designated for emergency number and 112 is used in European Union countries. Some countries

practice three different numbers for each emergency services. The three-digit emergency number can be called from any cell phone. It will transfer caller's line to a call center and they will route caller to the emergency service closest to caller. A call to three-digit emergency number on a cell phone is free and is even possible on a cell phone that does not have airtime. Cellphones require network coverage to make calls.

Table 3. Short codes and geographical accessibility.

Service	Short code	Geographical accessibility	Call/control center
Police	100	All over Nepal	One in every 75 districts
Fire Brigade	101	All over Nepal	District level (But not available in all districts)
Ambulance	102	Kathmandu Valley only	Kathmandu
BalbalikaKhoj-Talaash Kendra	104	All over Nepal	Kathmandu
Search and Rescue	1199	All over Nepal	Kathmandu

Source: Official Documents NTA, 2017 [7].

However, if the usable strength of the mobile network of own service provider (the manufacturer/company of the SIM card that one is using) is not good enough at the place where one is making the call,

then they use the network of some other service provider whose usable signal strength is strong enough to make the call. In some western countries (like the United States and England), people can connect

with an emergency number (e.g. 911 or 999) even if their SIM cards are not in proper working order. Note that it's not the SIM card, but rather the antenna in smartphone, that gets you connected to a network tower. Table 3 expresses the geographical accessibility.

As there are multiple three-digit emergency numbers, call is diverted from the MNO gateway to reach the destination. All the three-digit emergency numbers are from NT's domain, other service providers need to define through mobile switching center. This shows the dependency of Nepal *Doorsanchar*'s service to call the emergency number. This is a workaround solution for the emergency communication. There is a strong need of standardization and integrated emergency communication and response system.

National Numbering Plan (updated on 30 June 2010) published by NTA has allotted the short digit codes, as shown in Table 4, for special services including emergency help. Twelve numbers are kept as reserved for the purpose of future need. Eight three-digit numbers are in operation in different districts without integrated in centralized emergency communication system. During interview with the MNO, it was found that the implementation of the emergency number was done only when requested by the concern authority.

These numbers are primarily used in the Nepal Telecom network, and in the past, due to change in the numbering scheme, few numbers were not reachable from the Ncell network. Rectification was done when the customers complaint about the issue. Therefore, there is a need of integrated centralized emergency number so that public will be able to get and send

emergency information irrespective of using the service from different MNOs. Emergency number can be dialed by using any network available in the country so that if some operator does not have coverage in a particular region, customer can use the benefit from other network to reach the responding authority as defined in literature.

ALERT MESSAGE

Effectiveness of early warning SMS will only be realized when people understand the message and take appropriate action to save themselves from the unfolding disaster. The same SMS can have different impact because of the literacy level of the people, timing of SMS (day or night), and understanding of the language, as various languages are spoken all over the country. As forecasted by World Bank by 2020, 1.6 billion tourists per year will travel and they may not understand local languages. Therefore, it is necessary to review the SMS so that timing and literacy will not have impact on the understanding of warning SMS. Sending warning SMS with special ringtone will have more reach in night time when people are sleeping. Similarly, people have tendency to neglect the SMS, so special beep will allow them to react properly without reading the message.

Sending warning SMS with special ringtone will have more reach in night time when people are sleeping. Similarly, people have tendency to neglect the SMS, so special beep will allow them to react properly without reading the message. Mobile pictograph is one of the ways practiced over various countries to inform the people who have language barrier. Examples of pictographs are shown in Figure 4

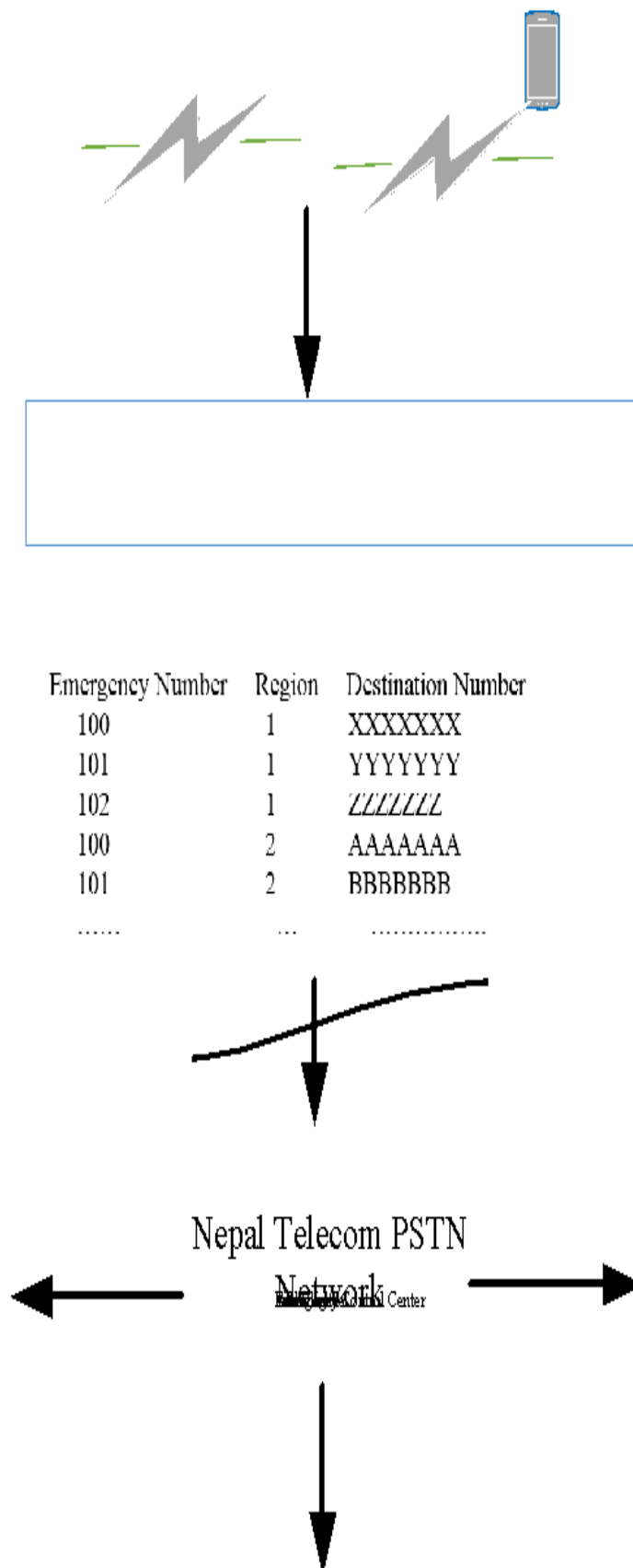


Fig. 3. Existing emergency numbers calls flow.

Table 4. National Numbering Plan for special service.

Service	Short number	Remarks
Police	100	
Fire Brigade	101	
Ambulance	102	
Valley Traffic Police	103	
BalbalikaKhoj-TalaashKendra	104	
Valley Pritana (Army)	105	
Military Police	106	
CIAA	107	
Reserved	108	Proposed for Emergency Service by NDCL
Reserved	109X	
Child Helpline (CWIN)	1098	Coordinated by the Ministry of Women, Children and Social Welfare
Reserved	110	
Reserved	111X	
Traffic Information	1103	
Hello Sarkar,	1111	Region-wise running (Office of Prime Minister and Council of Ministers)
Ministry of Home Affairs	1112	
Police Headquarters	1113	
Armed Police Force	1114	
Tele Medicine	1115	
Yatayaat	1116	
GaribiNiwaran	1117	
Ministry of finance	1118	
Red Cross (International)	1130	
Tourist Police	1144	
Weather Dept.	1155	
Metro Crime	1177	
Supreme Court	1188	
Search and Rescue	1199	
Earthquake	1234	
Yatayaat	1116	
Reserved	112	Can be used for emergency calls from mobile
Reserved	113-119	

Source: Official Documents NTA, 2017 [7].

Flood 	Landslide 	Heavy Rain 	Storm 
Shelter 	Evacuate 	Observe 	Prepare 
Rescue 	All Clear 	Injured 	People 

Fig.4. Mobile pictographs for alerting (Source: Sahana foundation, 2017 [9]).

CONCLUSIONS

Multiple emergency numbers create difficulty to identify the right support. Integrated single emergency number is needed for effective communication. This

number shall be accessible to all the MNOs in the country. Then only all the public who have the mobile connectivity can reach to the responding authority irrespective of customer of any MNO.

Mobile communication together with other means (TV, digital display, electronic media, FM radio, etc.) of communication will ensure the total benefit from EWS. Each system will complement to other; there is no single system which can replace the other EWS.

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