Towards a Conceptual Framework for Early Warning Information Systems (EWIS) for Crisis Preparedness

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Abstract. This paper highlights the need of many organizations nowadays for early warning information systems (EWIS) that can predict the future and help prevent crises or reduce their negative effects. These EWIS should be based on a reliable and consistent framework. The frameworks currently available are mostly deterministic, simplified or inconsistent in application and assumption; thus making them unreliable and impractical. The goal of this paper is twofold. Firstly, it provides guidelines for system analysts, designers, engineers and experts seeking to deal with crisis or disaster information systems. Secondly, it aims to present a novel framework for EWIS that can be adapted to the dynamic needs of the field of crisis management, and that can also be used efficiently in crisis preparedness. Finally, the paper will describe a case study in the law enforcement sector as a proof-of-concept for the conceptual framework; to demonstrate both the theoretical and practical approaches.

Keywords: Early Warning, Framework, Crises, Forecasting, Model, Indicators.

1 Introduction

Although information systems are used in order to collect and share information at a time of crisis, such systems are not always effective and do not always bring about the intended outcomes. While Assilzadeha believes that the development and implementation of application software for early warning especially for disaster data and information management is very important [1], Glantz claims that there is no perfect Early Warning System (EWS), except on paper, or in governmental plans, or in a PowerPoint presentation and that most of the current systems are not as effective as they should be [2]. Along the same lines, Sanada also agrees that the information systems which are used in order to collect and share information at a time of disaster are not always effective [3]. Furthermore, Harff argues that at present, early warnings are rarely "early," seldom accurate, and moreover lack the capacity to distinguish among different kinds of crises [4]. In this context, after analyzing the current problems in existing early warning information systems used in crisis or disaster preparedness, we have found that in many cases these systems tend to be fairly narrow in scope and do not have an adequate or clear framework for collecting,
classifying, processing and producing accurate forecasting information. The limitations of existing EWIS suggest the need for a more comprehensive framework. This is the goal we aim to achieve from this paper. Furthermore, other motivations for this paper are:

1. The scarcity of specialized EWIS researches and early warning applications used in crisis preparedness.
2. Most of the previous studies did not address the key steps used in building EWIS.
3. There is no agreement on the ideal structure or functions of EWIS.

The proposed framework provides a guideline for any organization or sector in the country (such as: health, security, education, etc) that needs to have an EWIS for crisis preparedness. Moreover, this framework will support any information system in producing more effective and accurate predictions of the future. In addition, it will provide decision makers with a reliable and manageable amount of warning information for taking preventive actions.

2 Early Warning Information Systems (EWIS)

The idea of early warning emerged in the fifties of the past century, and was used for the first time in military domains to predict risks and potential attacks before they occur. Until the early eighties; the concept of early warning had not evolved noticeably due to a number of reasons; such as the difficulty of creating its applications and its high cost. However, the concept has been rediscovered again after a series of crises and disasters had taken place in the world and after witnessing their major impact on lives and property [5]. The expression ‘Early Warning’ is used in many fields to mean the provision of information on an emerging dangerous circumstance where that information can enable action in advance to reduce the risks involved [6]. A universally accepted definition of an EWS does not yet exist and most probably never will [7]. There are many definitions of an EWS that are used to guide the actions of individuals, groups, and governments. The formal UN definition is as follows: “The provision of timely and effective information, through identifying institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response” [8]. An EWS can also be defined as “a social process for generating maximally accurate information about possible future harm and for ensuring that this information reaches the people threatened by this harm, as well as others disposed to protect them from the harm” [2][9]. An ‘Early Warning Information System (EWIS)’ (see Fig. 1.) can be understood as a set of institutional and technical solutions designed and