Informal Early Warning Systems, the Utility Y2K Experience

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ABSTRACT

The 2004 tsunami has generated a call for a global early warning system. Political issues may prevent this from occurring soon or at all. This paper explores previous experience with informal early warning systems from the Year 2000, Y2K, rollover. Informal early warning systems, IEWS, are cooperative systems formed outside of direct government control, usually from nonprofit or industry organizations. The two discussed utility Y2K IEWS were formed through an industry group and within a single multinational corporation. The paper concludes with lessons learned from the design and implementation of these systems.

Keywords

Early Warning Systems, Y2K, Emergency Response, Disaster Management

INTRODUCTION

The tsunami of late 2004 has awakened many to the need for early warning systems (EWS) for warning populations in ocean front areas. Many have argued that the large death toll, approximately 200,000, would have been mitigated by a EWS like that used in Hawaii, United States. Hawaii implemented a tsunami EWS following the 1960 tsunami that devastated Hilo bay and killed 61 people. This system, the National Oceanic and Atmospheric Administration's (NOAA) Pacific Tsunami Warning Center in Ewa Beach on Oahu, Hawaii (USGS, 1994), monitors earthquake activity around the Pacific Ocean. The system is capable of providing up to 4.5 hours warning for earthquakes originating in the Aleutian Islands, United States and 15 hours for those from western South America (USGS, 1994). This system detected the 2004 tsunami and could have issued a warning had those countries participated in the system. An anecdote was reported where a worker at the tsunami warning center called relatives in his home town in India to warn them of danger with the result that the town suffered no casualties. Additionally, EWS is not unique to tsunamis. The United States Geological Survey has also created a EWS for volcanic eruptions along the western United States installed after the Mount St Helens 1980 explosion that killed 57 people. This system monitors a variety of activities including seismic motion and movement of ice and rocks and sulfur dioxide and carbon monoxide levels (Davidson, 1997).

There is much debate as to who should fund and provide a global tsunami EWS. This paper avoids the issue of international politics and posturing by looking at previous experience with the use of informal EWS. This paper defines an informal EWS, (IEWS) as a EWS created outside the control of governmental organizations. These systems may be formed by international or industrial agencies or organizations as cooperative ventures supporting common goals. The examples discussed in this paper come from two IEWS created by electric utilities for the Year 2000, Y2K. This author created one of these IEWS and participated in the design and operation of the other. The information used in this paper comes from personal experience, industry documents, and confidential corporate documents. The goal of this paper is to identify lessons learned from this experience.

Y2K

The Y2K problem was caused by the use of 2 digits to represent the year in a date. It was called Y2K because the 2 digit year only became a problem when the date rolled into the year 2000 as computers assumed the 2 digit dates represented a 1900s date. Initial surveys of software found wide-spread use of the 2 digit date representation leading to fears that calculations using these dates in the year 2000 would cause their algorithms to fail, leading to computer and system failures. The Y2K problem was pervasive; an example utility found that approximately 80% of its roughly 600,000 embedded systems or components were date sensitive (used or included dates). This pervasiveness led to the common perception that Y2K could cause widespread system failures leading to the disruption of critical infrastructure such as communications, electricity, financial, transportation, and medical systems/facilities.

Each utility was responsible for preparing for Y2K with oversight provided by the North American Reliability Council (NERC), the Nuclear Energy Institute (NEI), and the Electric Power Research Institute (EPRI) (all industry groups, and the United States Nuclear Regulatory Commission (NRC) (a government agency). Utilities spent 1998 assessing and remediating Y2K susceptible components and systems; and 1999 preparing for the Y2K event. Preparations consisted of three phases. The first phase was the planning and design of EIS's and contingency planning. The second phase was training and practice and generation of the rollover event plans, and the third phase was implementation and the Y2K event. The Y2K event was also divided into phases. The first phase was EIS activation and early warning monitoring (for utilities in North America). The second phase was the rollover itself, and the third phase was post rollover validation and recovery.

EARLY WARNING EIS

The concept of early warning was that as the rollover progressed around the world, information from earlier time zones could be used to prepare response in later time zones. Two of the IEWS used are described below.

EPRI Early Warning System

EPRI is an industry supported research organization that assisted utility Y2K preparation by providing a industry wide database of issues, test results, and other support information as well coordinating quarterly knowledge sharing meetings. To support the Y2K rollover EPRI led an industry collaborative effort in developing an IEWS for industry use. The EPRI IEWS was a password protected Internet-based information collection system. The system provided general users a color-coded status screen for various types of systems, regions, or vendors identified by contributors as being critical or susceptible. Details for each status window were obtained by clicking on the status window. Contributors input status through a series of input screens. Input screens were based on standard templates and utilized standard terminology that had been predetermined by utilities using the EIS to monitor the effects of rollover for early indication of problems. Additionally, EPRI provided a database of plant equipment with test results and findings that could be used to trouble shoot equipment failures should they occur. The key to this system was the identification of critical equipment by users prior to Y2K; this allowed EPRI to locate plants with this equipment for monitoring during Y2K and experts who could input data.

Users were prepared to operate the system through the creation of a training and user manual that was provided upon request. Additionally, hands-on user training was provided in October 1999 at an EPRI Y2K user group meeting and a trial run was performed in November 1999 to ensure the system would work. The system was in operation for two days prior to the rollover through three days after the rollover (EPRI, 1999). Success of the system was hard to judge due to early Internet problems limiting access during the initial rollovers, a lack of detailed data being provided by participants, and a lack of Y2K issues early in its operation causing users to lose interest. Also, the database was expected to be a critical resource should things have gone badly, since this was not the case, use of the database for emergency response did not occur so the effectiveness of this decision support resource could not be determined. Finally, had Y2K caused major problems it is likely the system would not have met its objectives primarily due to contributors not having time to complete and submit the detailed templates, a failure of the communications component of the EIS.

Corporate Early Warning System

My utility developed its own IEWS using plants owned by the parent corporation in Australia, New Zealand, Indonesia, Turkey, Spain, United Kingdom, and the eastern United States. This IEWS was developed collaboratively by the various Y2K project managers at each of the various plants and at the home office. The system was a Lotus Notes template based system using predetermined forms and systems nomenclature. As with the EPRI IEWS, the key to this system was the identification of key components and systems for monitoring prior to Y2K rollover. Decision support was provided by the corporate Y2K equipment and test database. System communications utilized a corporate Intranet with a centrally located database server. Reports were filed within 15 minutes of the local rollover and were used by the Y2K Project Management Office, PMO, to prepare hourly status reports on world conditions. This system was also practiced in November and December of 1999 with key personnel being trained on the use of the templates and reporting schedules. This system worked well and was able to provide status reports to EPRI when the EPRI IEWS went down. One key item contributing to success was the simplified report templates. These templates generally required less than 5 minutes for reporting personnel to prepare and send the report.

ANALYSIS

Jennex (2005) identified an expanded model of an Emergency Information System, EIS, of which an IEWS is considered a subclass. This model considers an EIS as more than the basic components of database, data analysis, normative models, and interface outlined by Belardo (1984); adding trained users, methods to communicate between users and between users and data sources, protocols to facilitate communication, and processes and procedures used to guide the response to and improve decision making during the emergency. The goals of the EIS are to facilitate clear communications, improve the efficiency and effectiveness of decision-making, and manage data to prevent or at least mitigate information overload. EIS designers use technology and work flow analysis to improve EIS performance in achieving these goals.

The two IEWS presented in this paper both used this model in their design. What was found key to success was in managing communication and the protocols of communication. Early warning relies on recognizing the emergency and communicating the emergency. The use of prepared templates that identified the key data for triggering reporting and provided a protocol for communication were essential. The simpler the templates, the better the IEWS worked. Additionally, dedicated, cooperative participants were essential. These IEWS were united for a common purpose and set time frame and cooperation was encouraged by governmental agencies. This encouraged cooperation and minimized the commitment, making these examples less useful for showing how organizations can cooperate in an IEWS but showing how encouragement from governmental agencies encourages participation.

CONCLUSION

IEWS can be successful. These two examples show what organizations, united in a common purpose and with a set goal, can accomplish in an informal manner. These examples illustrate the need for good communication protocols and preset data formats and trigger events. Simpler and shorter protocols work better. Finally, government oversight is not necessary, but governmental encouragement for participation is useful. The ultimate conclusion is that IEWS can succeed for short term situations and may be an alternative while governments work out a long term solution to tsunami early warning

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