ASSURING HOMELAND SECURITY :
CONTINUOUS MONITORING, CONTROL AND ASSURANCE OF EMERGENCY PREPAREDNESS

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Abstract: This paper examines the potential relationships of Auditing and Emergency Preparedness with respect to the domain of the design of Emergency Response Information Systems. It proposes normative objectives for the integration of all these areas in the design of future organizational systems. It also proposes a series of steps to evolve in this direction and create a new interdisciplinary professional community to guide research and development for this field of endeavor.

1.   INTRODUCTION

Homeland security depends critically upon the ability of people and organizations to respond appropriately and reliably in the face of sudden and potentially catastrophic emergencies. However, emergency preparedness (EP) of organizations is not transparent to themselves, the public, or decision makers. Further, EP is subject to an adverse selection problem in that outside observers cannot readily determine whether the lack of information about an organization's EP status is due to security considerations or to actual lack of preparation. In this paper we argue that there is a critical need for an objective, consistent and publicly available measure of the EP status of an organization and discuss a proposal that we are working on to lead to the creation of a new assurance product focused on EP.

Auditing is defined as "a systematic process of objectively obtaining and evaluating evidence regarding assertions about economic actions and events to ascertain the degree of correspondence between those assertions and established criteria and communicating the results to interested users"

(Auditing Concepts Committee 1972). Thus auditing may be defined as consisting of four main steps: setting up audit objectives based on management's assertions, gathering evidence about the assertion, testing that evidence against objective criteria, and communicating the conclusions reached. In other words, auditing is not concerned with the development of original judgments but with assessing the validity of an assertion already made by another party. Such an assessment can only be made in relation to a model constructed by the auditor of what that assertion "should" be.

The advent of integrated information systems and a more responsive information technology allows for ongoing monitoring and control of organizational operations and thus facilitates the creation of close-to-the event reporting and assurance. We propose to apply the new technology of Continuous Auditing (CA; Alles et al, 2002), building on experience with the development of the System Reliability Standards (SysTrust) product of the American Institute of Certified Public Accountants (AICPA, 1997), to the problem of monitoring, controlling and assuring emergency preparedness by local, state and federal government bodies, first responders and private sector firms.

Making use of CA technology we will make available to policy makers and the general public the assurance they are seeking that organizations that they depend upon have workable EP plans, without compromising the security necessary for which EP planning depends.

As the scholar of auditing, Professor Theodore Limperg of the University of Amsterdam, stated more than seventy years ago, auditing is a way of inspiring confidence in society about economic transactions and the manner in which organizations upon which society depends are run. Post 9/11, there is a much greater awareness amongst the general public that the integrity of society itself, not to mention their own lives and well being, depends on the ability of first responders and other organizations, both private and public, to plan for and respond to unprecedented emergencies. While auditing was initially focused on financial reporting, the complexities of the organizations being audited has led auditing to be increasingly extended towards assuring decision processes for financial transactions/data/information, which include the evaluation of value and risks. It is a short step from that towards the assurance of the delegation of authority, of oversight, responsibility for decisions and advisement for decisions.

In the U.S. the Sarbanes-Oxley Act of 2002 was passed following a number of accounting scandals such as Enron. Its objective is "To protect investors by improving the accuracy and reliability of corporate disclosures made pursuant to the securities laws…." Section 404 of it requires attestation of the control systems in the firm that affect financial reporting. Minimal requirements included the certification of the internal processes on the financial reports they file, by the end of 2003. At a later date, not yet set, the law will require the real-time disclosure of any event that might affect performance (http://www.optimizemag.com/issue/020/law.htm, retrieved March 21, 2004).

The control level assurance mandated by Section 404 of the Sarbanes-Oxley Act further extends the domain of auditing away from accounting rules compliance towards a more holistic assessment of how organizations act and perform. Assurance of emergency preparedness is a logical outcome of both this progression and the newly identified needs of society for assurance as to how well prepared the organizations it depends upon are able to cope with 9/11 type crises.

What is needed is the creation of a new assurance product, which we label EP Trust, and which we envisage will be implemented by combination of auditors and regulators working with developers and managers of emergency management information systems. EP Trust thus fills in a vital gap in homeland security, which depends as much upon on the public's peace of mind as it does on actual planning and preparation. This paper discusses the project that we are initiating that will lead to the creation of EP Trust.

2. EMERGENCY PREPAREDNESS ENVIRONMENT

The EP environment presents an unprecedented challenge for monitoring, control measurement, and integration of manual and automated controls in the assessment of system reliability. While many EP features are live systems that operate even when there are no emergencies and can be automatically monitored and controlled, some of the EP features are passive (have to be available in emergencies) and behavioral (e.g. cooperation and defined leadership). The development of internal control quality indices is challenging as a problem. The complexity of comprehensive EP indices will further expand the difficulty of traditional control and monitoring measurements.

While certain aspects of EP, such as business continuity, are already being assessed by auditors or consultants, such assessments are primarily for internal control purposes or as a byproduct of a financial audit. They do not provide the full assurance about the spectrum of emergency preparedness as demanded by policy makers and the general public, and perhaps most problematic of all, are predominantly in the private sector and not focused on the first responders and local and state government bodies that would be at the forefront of a homeland security emergency.

There is a need to think from first principles what is entailed in providing assurance about EP in the wake of the post 9/11 challenges facing the nation. EP Trust will require advanced auditing techniques that will continuously monitor and test controls, procedures, and capabilities across organizations. The emerging Continuous Auditing (CA) methodology, described in the following section, offers the potential to establish an EP Trust regime that is both comprehensive and cost effective. However, while the CA technology has been evolving in living corporate systems, it is still in its early stages of maturity. The advent of the Sarbanes-Oxley act has reinforced the need for not only reliable corporate controls but also for methodologies of quantification of control combinations, overlapping and complementary controls.

3. AN OVERVIEW OF KEY CONCEPTS UNDERLYING A CONTINUOUS TRUST SERVICE

Figure 1 illustrates the relationships between continuous monitoring, continuous auditing, and continuous reporting. Short interval processes when perfected tend towards "continuous" but in a short enough time cut, no process is ever continuous.

Continuous Monitoring is a process by which online/ real time systems are used to manage, on, or close to a real-time basis, the performance of corporate processes. Continuous monitoring typically results in a timely detection of significant variances from expected performance with resulting rapid intervention and corrective action. For this purpose, a continuous monitoring process must be based on: (i) effective models of expected performance, including clear definitions of what constitute significant deviations from expected performance; (ii) metrics that accurately and completely measure the desired aspects of performance on a timely basis; and (iii) effective controls that operate within the desired tight time constraints. The process of comparing actual with benchmarks of performance is the monitoring process and the actions that ensue from this comparison comprise control.

If monitoring is close to real-time, or at least in sufficient time for management action, this process may be called "continuous monitoring." In this regard, it must be kept in mind that all transactions take place within time constraints and must be evaluated in relation to event time, for most transactions are context specific, both in time and space. The time component is perhaps even more of a constraint in the EP environment, which by its very nature, is a race against time. Thus events in an EP situation have relationships that are time dependent such as the conflict for resources and events that cause cascading problems (e.g. power loss causing communication or transportation interruptions). A time conscious tool such as continuous monitoring is thus essential in the EP environment.

Continuous Assurance is a type of auditing which produces examination (audit) results simultaneously with, or a short period of time after, the occurrence of relevant events. The results of the continuous examination (audit) can form the basis of internal or external practitioner reports on (i) controls over the specified system (including controls over continuous monitoring processes) and/or on (ii) specified subject matters, typically related to key aspects of the entity's performance. Continuous assurance will typically produce evergreen (always updated except in exception cases) reports [AICPA, 1999], with warnings when
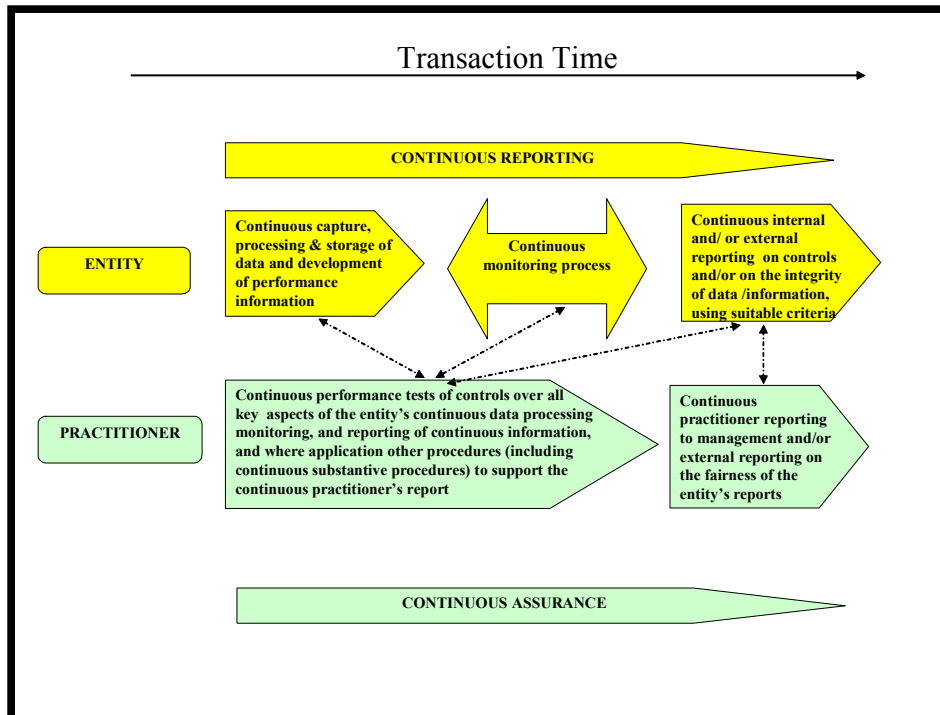

Figure 1 Continuous Monitoring, Auditing, and Reporting

substantive discrepancies are found. On the other hand the continuous audit is a report that current auditors can use to help in the evaluation of processes that traditional audit methodologies do not address, or to facilitate and/or accelerate traditional auditing procedures (Vasarhelyi et al, 2004).

Continuous Reporting is the dynamic creation of real time reports. In the real-time economy, corporate IT systems provide a continuous stream of data that measures characteristics of corporate processes. These streams of data, when subjected to an effective continuous monitoring process, can be used for the creation of close to real-time reports for internal management of the firm as well as potentially being used for continuous external (Web) reporting (Alles et al 2004). Taken together, these emerging technologies provide a base for the construction of a comprehensive, real time EP monitoring, reporting and assurance system. But they need to be overlaid on a thoroughly thought through EP control framework.

4. EMERGENCY RESPONSE DECISION AND ACTION FRAMEWORK

By definition, an "emergency" means that an event has occurred that makes it impossible for an organization to "conduct business as usual". Historically, a response to crisis situations, even natural disasters, always has a high degree of unpredictability with respect to the specific actions that must be taken, where they will happen, what resources will or can be assigned, and who will be responding (Turoff, 2002). Plans function as guides but do not ever predict the details. Because of the time constraints on reactions authority always flows to those on the front lines. This is not a fault of lack of planning but a real property of the nature of a crisis (Hardeman, et al. 1998; Weick 1993; Dynes and Quarantell 1997; Horseley and Barker 2002).

In emergencies people must make life and death decisions and take actions based upon incomplete information. People in a crisis environment can operate under such stress given the morale associated with the mission they are engaged in; however, when their information does not provide what they know should be available the "rigidity threat syndrome" is likely to set in (Rice 1990; Staw, Sandelands and Dutton 1981). When this happens people revert to established rules of behavior, and the creativity and improvisation that are essential to successful crisis response, are compromised. This also occurs when critical information is present but hidden in the noise due to information overload, a phenomenon which is quite common in computer based communication systems, and likely to be exacerbated in emergency situations. (Hiltz and Turoff, 1985, Turoff 1993, Turoff et. al. 1993, 2001).

With the existence of terrorist type risks and the sensitivity of wide area networks to even natural phenomena the nature of crisis situations today can extend far beyond a local area and involve the actions and resources of many different agencies and organizations from the governmental and private sectors. The missions of coordination, command, and control have necessitated the growing use of computers to track, update, organize, and facilitate the timely exchange of information on all the interrelated activities taking place.

In this environment the key objective for emergency response systems is giving first responders the ability to know that their information and communication processes are providing the best possible understanding of reality at the moment, and that they have the information they need to make a decision and/or take an action (Hale, 1997). This implies a new set of specific requirements for the technology of Dynamic Emergency Response Management Information Systems (DERMIS, Turoff et al. 2004).

In order to be able to express the controls necessary in Emergency Preparedness situations we must have a conceptual model from which we may build virtual representation of decision and action process that are involved. Our model of the decision-action process relies on the Virtual Organization theory developed by Mowshowitz (1997, 2002) in which his concept of requirements represents both the uncontrolled external events and the internal events generated by responder roles. The responder roles which people and agents are assigned to are the satisfiers as they assume responsibility, accountability, authority, and oversight (Turoff 2002, Turoff et al. 2004).

In a crisis situation roles must exist on a continuous and real time basis. Different people at different times will have the same roles and in some cases they may even share the same roles when the volume of action and response becomes too demanding for only one person. The two metaphors that are the foundation for the virtual model are *events* and *roles*. Both of these represent the framework for collecting, specifying, and prototyping the interrelationships among audit controls for emergency decision and action process. Typical Events and Roles associated with just the function of requesting resources are outlined in (Turoff 2004). This represents a template of the events that can be associated and linked to the initial

request for a resource of any type (e.g. medical units, fire, police, construction equipment, etc.). Roles are defined by such things as their ability or privilege to generate events, react to these events, and report on information or analysis. In an emergency response system built with these concepts, roles would be built into the software and the software would handle the tracking of assignments of people to roles and the sharing of the roles by different people (Turoff et al. 2004).

The approach we plan in developing EP Trust involves the following major tasks:

1. Developing a virtual model that will act as a knowledge database for collecting the requirements and organizing and providing them in the above framework.
2. Work initially with auditors who have experience in the area of emergency response with respect to the security audits of information systems or natural disasters response planning and recovery audits.
3. Develop a web based center for working nationally with professionals in auditing and emergency response and providing them useful professional services.
4. Develop a scenario generation model that can illustrate sequences of events and the interplay of the underlying relationships in given situations.
5. Approach emergency response professionals through their organizations to begin to extend the development of requirements.
6. Develop Web based seminars and training programs for both auditors and emergency response professionals (Hiltz and Turoff, 2002).

Our approach to the investigation of the development of specific audit controls for emergency response would have two very significant derivatives in the areas of developing the appropriate information technology for emergency response. The first is the ease by which a Virtual Command and Control Center could be designed and meet interoperability functions across a wide range of participating organizations (Roose 2002; Turoff, et. al. 2004, Turoff 2002). Such a center capability would mean the whole center can function regardless of where the critical professionals are, as long as they have a portable computer or a PDA and Web access. The second is the ease with which intelligent agents can be designed and implemented with any ERMIS utilizing the EP Trust in a continuous auditing mode. We do not think such agents have any role in taking actions or making decisions. Rather, they should aid in gathering and displaying the most relevant timely information and

aiding in the dynamic formation of subgroups to address a sudden problem (Van de Walle, 2003, Van de Walle and Turoff, 2001, Turoff, 1997).

To be specific, the kinds of issues that must be systematically dealt with in the construction of an EP system include:

1. What data/information desirable or helpful to making a decision can be made available before the decision must me made?
2. Are all those involved in making or advising on the decision aware of and have access to the available data/information?
3. Are those involved in the process all of those that should be involved?

Clearly, these types of questions have answers that can, and must, be assured on an ongoing basis if confidence in the entire EP system is to be established and maintained. Further, it should also be clear that if a virtual model can be designed that will handle the tracking verification of the decision process in an emergency environment as part of a monitoring and control backbone, then it can also track and verify the normal decision process in any organization. The recent experiences with Enron and other such scandals have led to a call for auditors to take responsibility to ensure that decision processes follow an assured meta process where those that need to be involved and the information they need to make reasonable decisions are in fact included in any decision making process. There are no specific accepted technologies or guidelines for effectively auditing decision processes. This project will produce processes, procedures and findings that while focusing on EP will have a much wider application to business controls in general.

5. BROADER IMPACTS OF ASSURING EP

The principles described in this paper can have substantive impact in offering a methodology and a Trust product whereby organizations and localities can be evaluated and rated in terms of emergency preparedness. The aim is not only to provide policy makers and decision makers, as well organizations themselves, assurance about the state of their emergency preparedness. EP Trust will also have a motivational role, by providing a means of ranking organizational EP effort and facilitating benchmarking. A hoped for objective is that a created EP Trust would be endorsed by the American Institute of Certified Public Accountants

(AICPA) as one it its Trust services and published as set of Principles and Criteria for attestation on Emergency Preparedness (EP), as well as a proposed methodology of issuing opinions (certificates) on emergency preparedness. This would allow a consistent measurement of the relative status of "Preparedness" across all organizations.

On a wider view of assurance methodology, society could substantially benefit from the evolution from black or white audit opinions to system health assessment with different tones of gray. Furthermore, this research area would provide a valuable input for the development of methodologies that can link the documentation of controls, the monitoring of its functioning, the assessment of the effectiveness of the resulting control systems, and the methodologies of attestation and presentation of the results through media of public access like the Web. Successful work here would resolve a major problem emerging in the implementation of Sarbanes-Oxley section 404 on implementation.

A definite challenge to our approach is the need to develop a new interdisciplinary community comprising auditors, information systems designers and developers, and emergency preparedness professionals and managers. We believe that the formation of an on line Webcenter to attract and provide service for research and development personnel from these different communities, and working through the existing professional organizations, is the best possible approach for the near future.

Given the wide scale introduction in organizations of enterprise wide process design in the development of information systems, the incorporation of a continuous auditing backbone would have a number of highly beneficial impacts for society as a whole. Emergency Preparedness Systems built upon this foundation would be far cheaper to implement than stand alone EP systems, and employees would already be trained in the use of these systems for normal organizational processes and far more likely to be able to adapt quickly to any emergency situation. There are a great many types of emergencies that occur in organizations (e.g. supply shortages, competitor actions, legal actions, etc.). There are also emergencies that represent positive opportunities (e.g. over demand of a product, a takeover opportunity, etc.). EP systems integrated into the day to day operation can serve all types of emergencies.

This is the approach that would make emergency preparedness systems pervasive in society as a whole. The resulting need to integrate Information Systems across databases, document systems, and communication systems will greatly improve the flexibility of organizations and their ability to respond to normal free enterprise emergencies (competitors, shortages, legal actions, takeovers, etc.) as well as those brought about by nature and terrorism.

It is clear that in the future most organizations will have enterprise wide process systems, continuous audit systems and emergency response systems. If these are different incompatible systems it will represent a huge waste of resources and opportunity. What would be worse is if they were inconsistent and actually produced conflicts and uncertainties that could very well confound a crisis situation.

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