Risk Management in Canadian Health Care

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• EMERGENCY MANAGEMENT OF SARS: A QUANTUM LEAP OR A PARADIGM SHIFT? •

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BACKGROUND

A quality management audit was conducted to determine how the British Columbia Centre for Disease Control (BCCDC) handled the emergence of severe acute respiratory syndrome (SARS) during the first half of 2003. The Centre has been administered in accordance with Quality Management (QM) principles over the past 15 years. The emergence of SARS was seen as providing an opportunity to ascertain if QM practices made a difference under such conditions.[1]

These activities led to some valuable observations concerning the relationship between risk management and crisis management in a knowledge vacuum. These observations will be discussed following an explanation of the role of the BCCDC in Canada's public health system, an articulation of why a learning environment should be fostered, and how it should be managed.

PUBLIC HEALTH ADMINISTRATION IN CANADA

The legal framework overseeing the Canadian public health safety net relates to agreements negotiated between provincial and federal authorities under the *British North America Act* of 1867, with each province being responsible for its own management of communicable diseases within its jurisdiction.[2] SARS evolved in the Guangdong province, mainland China, and rapidly spread worldwide, including to the Canadian cities of Toronto and Vancouver. The rapidity of these events demonstrated that prevailing arrangements between provincial and federal authorities for protecting Canadians from communicable diseases are not designed to accommodate the reality of modern day jet travel.

As a consequence of the impact of SARS in Toronto and the way municipal, provincial and federal levels of government handled the situation, the Hon. Anne McLellan, federal Minister of Health, insti-

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RISK MANAGEMENT IN CANADIAN HEALTH CARE

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tuted a National Advisory Committee on SARS and Public Health. Dr. David Naylor, Dean of Medicine, University of Toronto, chaired this committee. Dr. Naylor's committee discovered that there are major structural inadequacies in the management of communicable diseases in Canada and made several recommendations to address them.[3]

British Columbia is the only province to have consolidated the management of its communicable disease responsibility within a single provincial Centre for Disease Control. The Centre is closely allied to the University of British Columbia. The Centre is also responsible for providing technical and scientific advice to the Provincial Health Officer and has close working relationships with Medical Health Officers at the regional level and Infection Control Officers in provincial hospitals. In addition to spearheading the public health management for British Columbia (BC) in dealing with an unknown communicable disease, BCCDC, in collaboration with other institutions around Canada, played a major role in the worldwide effort to identify and contain the SARS agent.

Conventional genuine disasters, *e.g.*, hurricanes, earthquakes, fires and plane crashes, are relatively easy to plan for. As a consequence of 9/11, both "God-made disasters" and "man-made disasters" are initially suspect.[4] This was evident during the early days of the SARS outbreak, when bioterrorism was suspected. The eastern seaboard blackout that occurred during the summer of 2003 was initially suspected of being a terrorist attack, as is every plane crash. The new reality is a need to learn about the unknown very quickly. This reality will require rapidly facilitated access to new skills that have common discipline relationships, and which can be quickly brought together.

MANAGING A LEARNING ENVIRONMENT

In addition to serving as a provincial public health resource, BCCDC is a centre of learning and discovery. In consultation with colleagues at the National Microbiology Laboratory in Winnipeg, at centres in Toronto and Ottawa, as well as locally in the Vancouver Genome Science Centre, BCCDC contributed to discoveries in learning about the SARS virus.

Initially there was no understanding of the nature of the threat. Being able to rapidly confirm, through DNA sequence, that the entity was a natural virus

and not likely due to bioengineering, was very helpful in applying appropriate containment. This initial phase of dealing with SARS was described by anecdotal accounts as involving long hours of work, participating in national teleconference calls, e-mailing experimental results to colleagues across the country, collecting tissue samples, etc. This phase was documented mostly by a large number of e-mail messages and telephone calls with colleagues around the world that demonstrated a period of intense activity.

As the work on SARS at the Centre became more complex, it was realized that individuals were taking on increasing responsibilities and experiencing stress. The realization of this increasing complexity and the strain it was having on key personnel resulted in the establishment of a formal management structure in the form of the Emergency Operations Centre (EOC). With the EOC in place, a new form of management evolved that served to better coordinate decision-making and track decisions and actions taken.

From a QM perspective, the initial period was recognized as a time of significant scientific "output". This scientific work was described by Dr. Julie Gerberding, Director of the U.S. Centers for Disease Control and Prevention, as "a scientific achievement that I don't think has ever been paralleled in human history".[5]

Measuring the risks associated with conventional disasters is a challenge. The uncertainty of terrorism being a major determinant adds further to the complexity of such calculations. Having to deal with a knowledge vacuum prior to taking any actions can only add to the complexity. For example, in the SARS situation the elimination of the possibility of the virus being a bioengineered pathogen was very important. This meant that the scientists were able to focus specifically on aspects of a naturally occurring virus. It also resulted in those individuals who were dealing with the possibility of a terrorist situation exiting the team.

In order to manage a "knowledge vacuum", it is necessary to create learning and discovery processes that can address highly specific issues very rapidly. With respect to communicable disease management, this was precisely the type of environment existing at BCCDC at the time of the SARS situation. BCCDC is the only facility in Canada where provincial epidemiologists and microbiologists work together in the same building and develop public health communicable disease policies as part of an integrated team to track and respond to outbreaks.

In order to manage a "knowledge vacuum", it is necessary to create learning and discovery processes that can address highly specific issues very rapidly.

Figure 1 (see Appendix A) illustrates how risk management relates to the learning environment relative to the more corporate structured environment.

Figure 1 identifies risk management as being an integral part of emergency preparedness. The interface between risk management and crisis management for this model is understood to be the process whereby the decision is made to activate an emergency plan. Crisis management is then concerned with managing the emergency response. The expectations around the management of these functions have to be viewed differently in the more structured "corporate" environment relative to the "academic" learning environment.

Emergency preparedness and emergency response in a corporate environment are traditionally comprised of a command/control, "paramilitary" culture. This management culture contrasts sharply with the "ad hoc/chaos-theory" type of environment that prevails in a learning situation. These cultures are not mutually exclusive, however. The challenge is making both cultures symbiotic when the need arises. This model would suggest that such a need occurs when there is a "knowledge vacuum".

Figure 2 (see Appendix B) compares the cultures that prevail in institutions of research and discovery with the more structured corporate/government business environment. In the corporate setting there tends to be a built-in backup that ensures some degree of continuity in the process. In the learning environment the emphasis is on discovery and little consideration is given to increasing complexity. Burnout is a problem in those instances where there are a finite number of experts available and backup is not so easy. Adding to the complexity, during their handling of the SARS situation, scientists at BCCDC were also expected to engage in high stress media conferences and answer questions about their work.

The BCCDC scientists who were interviewed justified the ad hoc style of crisis management because it allowed for inter-divisional relationships to

develop within BCCDC, particularly between epidemiology and the laboratory. Dr. Mel Krajden, Associate Director of Laboratory Services at BCCDC, described this culture in the following way:

> Within BCCDC we have a laboratory component and an epidemiological component. You could never crystallize the value of the academic piece, the value of the administration, the value of the epidemiology, the value of the lab piece coming together until SARS because it showed the benefits of having a structure to foster divisional needs and allow them to coalesce when necessary. It was the defining moment, I think, for BCCDC about the need to synthesize local, provincial, and national with international information to respond to a new entity.
>
> What the SARS experience did was compress/evolve, in 6 to 8 weeks, from an ad hoc process of discovery and convert it into a sustainable structured process, i.e., is SARS here to stay? What you realize is that you need enough structure and enough "ad hocness" to allow you to respond to events that you can't predict.

Debating the degree of "ad hocness" present during the initial period in the SARS crisis in BC, Dr. David Patrick, Director, Epidemiology Services at BCCDC, who served as the Incident Commander in the BCCDC Emergency Operations Centre (EOC) for SARS (and who is also a jazz musician) said:

> I don't know if I would call it totally "ad hoc". Certainly there is a lot of improvisation but there is improvisation on a form. It is a little like playing the blues. You know you've got a chord progression and everything else and you are not exactly sure what the other guy is going to play and you are different, but there is a pattern to it. So what I say is that there is an improvisation over a known template of outbreak response, which is generic.

Accepting Dr. Patrick's interpretation of events unfolding at BCCDC during the initial handling of SARS, one comes to the conclusion that emergency management of the unknown is a little like playing the blues.

Understanding how the processes of learning and discovery influence the management of an emergency situation is necessary in order to compare conventional emergency management with management of a "knowledge vacuum". The intent of such an exercise is to gain insight and understanding that may serve to quantify the allocation of resources in order to prepare for such situations, *i.e.*, measure the risk of not being so prepared.

In order to demonstrate the consequences of going from a routine state of performance to the management of an emergency situation, the "quantum leap" model is employed. Organizing learning environments so that they can serve to rapidly fill in a knowledge vacuum is discussed in terms of requiring a "paradigm shift" in the rate of discovery and learning. The use of such scientific models is not uncommon in organizational management, as shall be addressed in the discussion section of this article.

CONVENTIONAL EMERGENCY MANAGEMENT: THE QUANTUM LEAP MODEL

Conventional corporate plans for emergency preparedness are traditionally based on the "quantum leap" approach towards emergency planning. In Figure 3 (see Appendix C), the routine state of emergency preparedness is recognized as Q1. Going to an emergency state, Q2 is described as requiring an outburst of energy. In the physics analogy of a "quantum leap" such change is instantaneous along the vertical arrow. The rapidity with which transition can be made from Q1 to Q2 in the corporate context is dependent on the resources committed to the need for such an event and the competency of the staff responsible for making it happen.

By way of illustrating how resource allocation can influence response time, the comparison is made of the relative sizes of angles y and x. Both angles have an inverse proportional relationship — as one increases the other decreases. Correspondingly, the amount of resources committed to preparedness is likely to have an inverse relationship to the response time — the fewer the resources the longer the response time. Using this model it is suggested that through the discipline of risk management it may be possible to come up with a measure of preparedness — the Coefficient of Preparedness?

The model illustrated in Figure 3 makes the assumption that an emergency plan does exist to deal with the situation that can be activated upon confirmation that a state of emergency is present. Not having a plan in place on such occasions would likely suggest the need for another model. As is evi-

dent from the Naylor Report, the latter scenario existed in Canada when SARS arrived.[3]

In addition to considering the start of an emergency situation, Figure 3 also suggests that serious consideration be given to the management of the return to normality. For example, in Toronto the containment measures were relaxed too soon when there was insufficient information to turn off the controlled response, and this resulted in the second outbreak of SARS.

EMERGENCY MANAGEMENT OF THE UNKNOWN: THE PARADIGM SHIFT MODEL

The institution of a learning environment to serve an emergency necessitates a new way of looking at the learning process. The generic way of managing the discovery and learning of new knowledge is illustrated in Figure 4 (Appendix D). Following a series of experiments represented by the vertical spikes, there is one set of results that permits the realization of a new level of learning. This process is repeated over subsequent years, possibly decades, usually involving researchers from several disciplines, and results in a new level of discovery (eureka) each time.

The free exchange of knowledge and understanding in times of emergency is critical to the rapid discovery of a new approach. If the customary rules of the marketplace prevail under such circumstances, the patent implications of new scientific discoveries could result in restrictive monopolies arising from discoveries made in these cases.

It is from such experimentation that prototypes are developed and, with sufficient investment, go on to serve humanity and provide a return on the original investment. Clearly this mode of learning is not appropriate in an emergency situation, such as when there is a need to develop a new vaccine. However, a similar process has to unfold rapidly if there is to be any significant breakthrough in understanding the problem. Figure 5 (see Appendix E) serves to illustrate the type of environment needed in order to facilitate rapid learning relative to the conventional learning environment.

Figure 5 illustrates the "compression/evolve" situation described by Dr. Krajden that occurred around BCCDC during the initial phase of the SARS situation. One of the repeatedly recognized driving features that made BCCDC a success was the collegial relationship that existed both among scientists at BCCDC, around Canada and internationally. These scientists were comprised of team-targeted applied researchers. To succeed, there had to be a totally open systems approach of management where there is no proprietary ownership of the knowledge being created and processed in order for the work to be done — no single entity can satisfactorily perform in isolation in such a short time.

Managing the unknown involves managing in a knowledge vacuum. A knowledge vacuum in a knowledge-based economy could become a goldmine with the commercialization of new sciences through the execution of patent legislation. The free exchange of knowledge and understanding in times of emergency is critical to the rapid discovery of a new approach. If the customary rules of the marketplace prevail under such circumstances, the patent implications of new scientific discoveries could result in restrictive monopolies arising from discoveries made in these cases.

DISCUSSION

When we think of emergency management, the general impression is someone, usually wearing some kind of paramilitary uniform, taking control of the situation and issuing orders. Police officers, firefighters, ambulance attendants — all portray their authority to take charge and issue commands within the context of their uniform. Without this security blanket most persons confronting an emergency situation would likely not know what to do next. The record shows that having such a cadre of trained first responders is critical, particularly in a community disaster situation that involves fire, flood or earth movement.

Managing outbreaks of known diseases is the duty of public health and clinical professionals trained in handling infection control procedures. This process involves the implementation of outbreak plans designed to accommodate situations that appear in textbooks. In the situation where large sections of the population are being exposed to a new kind of virus, or the water supply is being deliberately poisoned, or the food chain deliberately contaminated, there is a need for a different type of front line of first responders.

In times of emergency, the basic human emotion that overshadows all others is fear. Fear of fire, flood

or earth movement is a different kind of fear to the intellectual fear of knowing there is a "knowledge gap". Under these circumstances there is a need to quickly establish relationships that are based on recognition and respect for colleagues. A close sense of collegial recognition, respect and acceptance among people working in and associated with BCCDC was identified as a major motivating force in determining the outcomes achieved during the first outbreak of SARS in Canada. Using scientific models in describing the observations made during an analysis of an organization and the personal motivating forces that make up successful organizations is well documented in the literature.[6,7,8,9,10,11]

With the advent of SARS, the organization culture at BCCDC supported the creation of a climate of "lateral interdependence", where the leader functioned in gathering information for the "sub-units", obtaining assistance and cooperation, negotiating agreements, defending the image and serving as spokesperson.[12] All BCCDC staff interviewed stated that the culture existing at BCCDC prior to the advent of SARS did serve to foster a close collaborative working relationship between the divisions of laboratory science and epidemiology.[13]

Critical to the evolution of the process at BCCDC was the cross-functional team structure that developed between lab and epidemiology.[14] This characteristic was attributed to the culture of scientific discovery and learning of the organization and its close ties with the University of British Columbia. In keeping with this learning philosophy, the sharing of information was not limited to persons within the organization. It was the openness and sharing of the science that was said to differentiate the process from similar endeavours in the corporate for-profit environment.[15]

A system will need to be developed for handling such situations in the future. Senge *et al.*[16] describe systems thinking as a process encompassing a large and fairly amorphous body of tools, and principles, all oriented to looking at the interrelatedness of forces, and seeing them as part of a common process. This description of systems provides an interpretation of the type of forces in play at BCCDC during the management of SARS.

In his book *Chaos: Making a New Science,*[17] James Gleick quotes Conrad Aiken as saying: "What else, when chaos draws all forces inward. To shape a single leaf". This kind of a "leaf" pattern emerged during the analysis, as shown in Figure 2. Gleick then goes on to discuss "Inner Rhythms", quoting John von Neumann, who said, "The sciences do not try to explain, they hardly even try to interpret, they mainly make models. By a model is meant a mathematical construct, which, with the addition of certain verbal interpretations, describes observed phenomena. The justification of such a mathematical construct is solely and precisely that it is expected to work". These observations would suggest that during its initial phase of managing SARS, BCCDC was close to being in a state of "perfect chaos".

CONCLUSION

Chief Executive Officers are responsible for ensuring that the management of their business is of the highest quality. Quality management reviews and audits can provide some assurance to the CEO that "best practices" are being followed. An established culture of QM throughout the organization is valuable in bringing the best out of people at the right time in the interest of the organization overall.

Most often, emergency management QM audits tend to be conducted on a retrospective basis. The assumption seems to be that no one knows how good one's emergency state of preparedness really is until it has been tested. QM audits are ideal methodologies to conduct such reviews since they involve analysing a decision-making trail over a set period of time.

The reality is that structures, personal linkages and resources need to be in place prior to any emergency happening and such protocols should be subject to periodic QM review. While a theoretical understanding of "preparedness" exists, there is limited use of set templates for conducting such an exercise, since every situation is different. Each situation needs customized instrumentation, which can change significantly in an organization when considering different types of disasters.

A QM audit of a state-of-emergency preparedness performed, prospectively or retrospectively, cannot be seen as a stand-alone exercise. The QM review of a state-of-emergency preparedness will only be possible if it is part of an existing cultural acceptance of "best practices" in normal times.

Resources for conducting QM audits of emergency preparedness always appear after the system has been tested. An assessment of the state of pre-

paredness prior to it being tested can sensitize all stakeholders to a better understanding of their roles and responsibilities when an emergency occurs, be they uniformed personnel or knowledge workers.

[*Editor's note*: Tim Lynch is a Health Systems Analyst with Info-Lynk Consulting Inc. He served as consultant to BCCDC in its QM review of its handling of SARS. Paul Cox serves as Provincial Pandemic Planning Consultant to BCCDC and provides emergency management consulting services to several BC health organizations. This article is based on a presentation given at the RIMS Conference, Victoria, B.C. on October 21, 2003. Please send comments to <tim@infolynk.ca>.]

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APPENDIX A

Figure 1: Structured/Learning Approach Towards Risk and Crisis Management

	Structured Environment – Corporate accountability	**Learning Environment – Research & discover**
Risk Management (Emergency preparedness?)	- Routine activity - Incident reporting - Monitoring - Line responsibilities - Departmental/Functional	- Routine activity - Surveillance - Discovery/Learning - Peer review - Interdisciplinary
Crisis Management (Emergency response?)	- Preparedness - Response/Structure - Command/Control - Definitive leadership - Paramilitary	- Ad hoc - Creative thought - Collegial relationship - Organic leadership - Chaos theory

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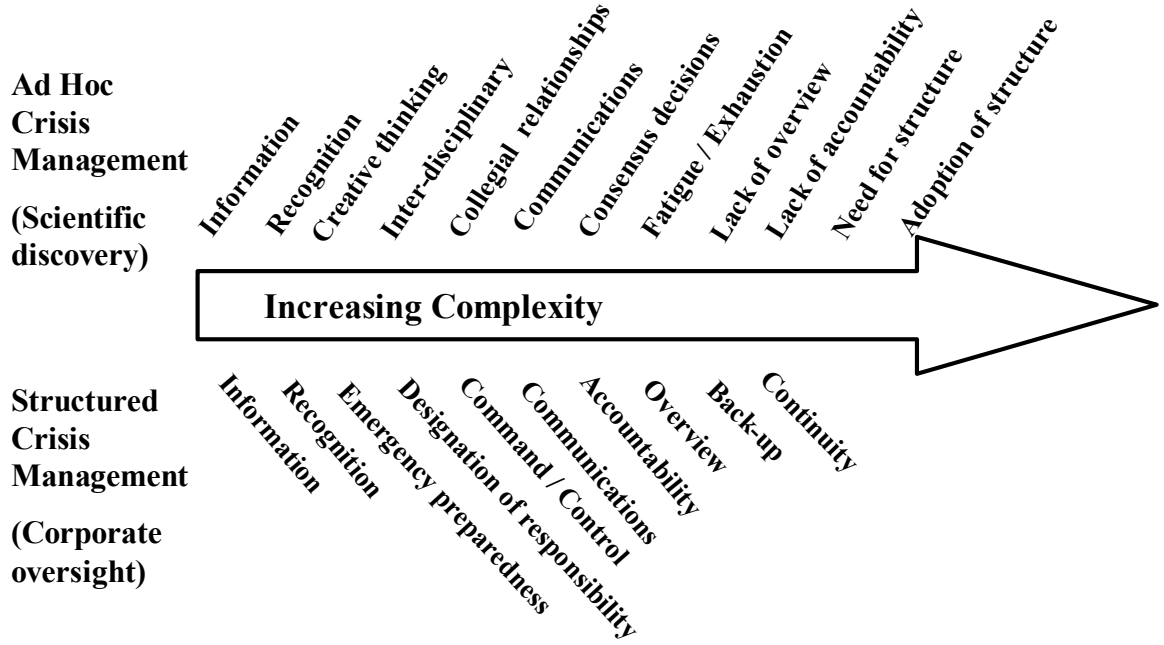
APPENDIX B

Figure 2: Ad hoc versus structured emergency management



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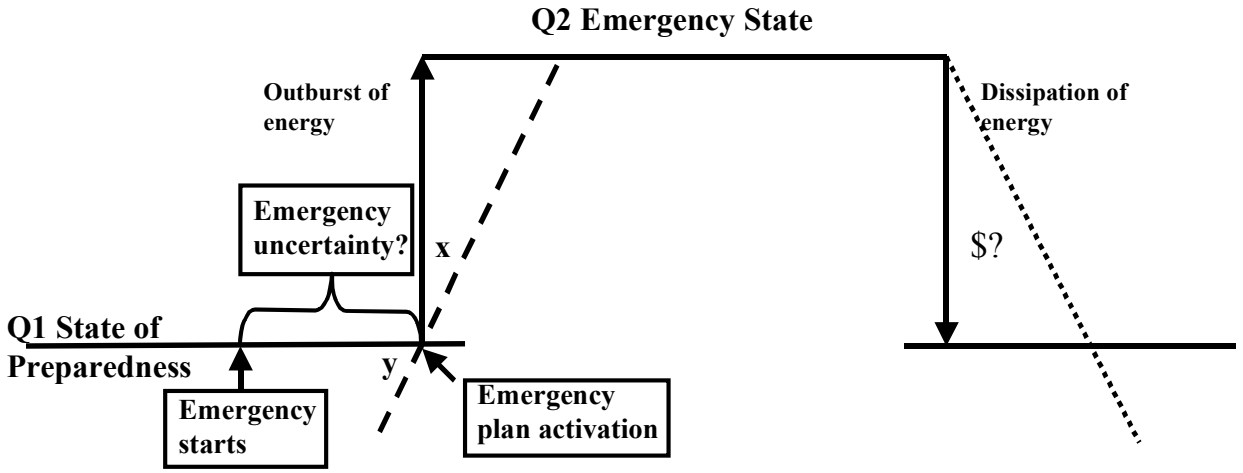
APPENDIX C

Figure 3: Classic Emergency Preparedness Management

– Making a Quantum Leap



$$\text{Coefficient of Preparedness} = \frac{\text{Angle y}}{\text{Angle x}} = \frac{\text{Team commitment + investment}}{\text{Uncertainty period + Response time}} \stackrel{?}{=} \frac{\$y}{\$x}$$

– – – – Gradient of preparedness? ····· Gradient of recovery?

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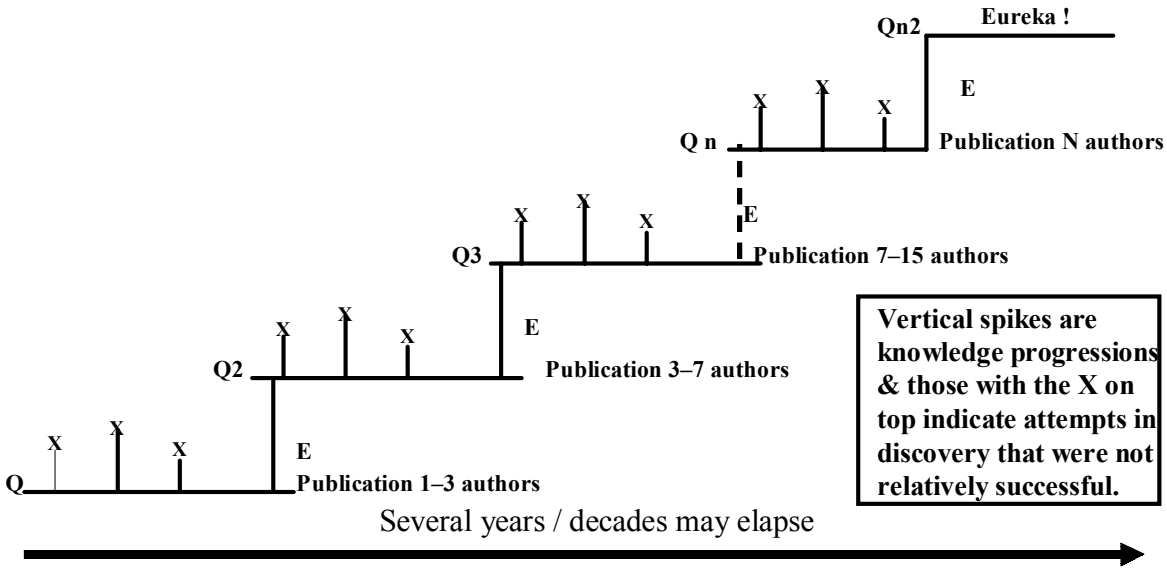
APPENDIX D

Figure 4: Managing a Learning Environment in Normal Times

University/College Administration Model



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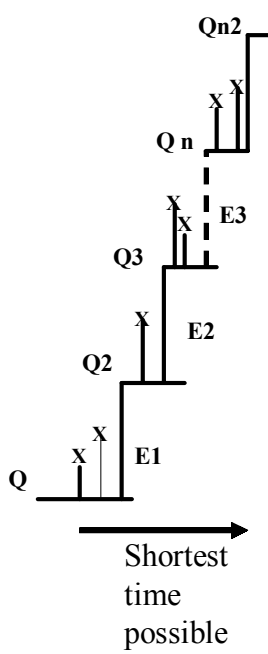
APPENDIX E

Figure 5: Managing a Learning Environment in Times of Emergency

- Facilitating a Paradigm Shift?



The success of such an experience is not dependent on any single institution, or individual.

It has to be seen as being managed virtually through open systems that share ideas and knowledge.

Does the need to share information during crises mean that there is a conflict between corporate (for-profit) values and societal (not for profit) values in planning such a vision?

Is there a need for new legislation surrounding the ownership of discoveries made under such circumstances?

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