

AGILE APPROACH TO SOLVING UNUSUAL SITUATIONS

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Abstract

The aim of this article is to find the critical success factors of information distribution during extreme situations. From historical events as tsunamis, flooding, extensive fires, nature disasters, terrorist attacks, black-outs of energy etc. we can see that the traditional approaches to information systems are not sufficient. Therefore the agility dominates to crisis management not just in the organizations but also during the information distribution in extreme situations. The article also brings the technological solution of targeted broadcast for a geographically defined area (Radio Help). Problem of agile approaches to information distribution in extreme situation is supported by Technical university of Liberec (Student's grant competition).

Introduction

During the last few years we could see many extreme events creating with the power of nature, heavy traffic or power cut. The aim of this paper is to refer to the agile approach to solving unexpected situations. It is obvious that the researches are more and more documenting and describing important factors which are necessary for successful problem solving. These factors like improvisation, adaptability and creativity are critical to the coordination, collaboration and communication in the same way as in business environment. This article reviews some recent experience in developing plans and procedures for managing these extreme situations.

From historical events the critical success factors are achieved for emergency management. Emergency management is a complex and multidimensional process that does not respond well to traditional approaches. The information needed for decisions is changing during unusual situations and it is necessary for the responses to react quickly. The discipline and agility are aroused from the organizational and emergent management literature. Discipline creates well organized memories history and experience and agility is the counterpart of the discipline. Where discipline ingrains and strengthens agility release and invents. Agility applies also memory and history but to adjust to new environments to react and adapt, to take advantage of unexpected. Therefore agile approach is connecting with adaptability and creativity that are especially important to coordination, collaboration, communication and successful problem solving during unusual situations.

1 Extreme events and critical success factors of quick response

January 27, 2011, Egypt turned off the Internet. There was no giant lever or big red button involved, but in reality it was almost as easy: the Egyptian government simply issued an order

for ISPs (Internet Service Providers) to shut down service¹. “The authorities have the right to issue such an order and we are obliged to comply with it,” Vodafone Egypt explained in a statement shortly after. One of the high-tech communication channels can not only be decommissioned by black-out of electricity but also by decisions of governmental authorities. In the Czech Republic was in February published for discussion the general principle of the Law on Cyber Security. On the base of this law the government would have possibility and right to switch-off the Internet in cases like terroristic attacks, cyber-attacks and information-attacks on key enterprises.²

Until this year not only police but also the army of the Czech Republic has a right to interfere with radio communications, as well as mobile networks. Turn off the mobile phone network uses the police several times a year. It was yet realized only locally, e.g. if was necessary to avoid possible detonation of explosives by mobile phones.³ In such situations mobile networks are unable to notify people in affected areas.

We observe that today the sensibility of our structures are affected more easily by the disasters and we are not well prepared for the accumulation of multiple-source risks [8] and our current communication media are not always available to deliver needed information.

Henry Quarantelli [6] described the attributes of catastrophic events that impact the social structure of the community:

- Local officials are unable to undertake their usual work role, and this often extends into the recovery period. Many leader roles may have to be taken by outsiders to the community.
- Help from nearby communities cannot be provided.
- The mass media system constructs catastrophes even more than they do disasters.
- The political arena becomes even more important.

Here is some experience from Senior US official during Hurricane Katarina:

“Everyone is making the point that we need information, interoperability and communication – but no one is articulating how it is used for decision making, how you apply it for saving and protecting property.”

According Gelling [10] the massive coordination problems encountered by governments and non-governmental organizations during the international response to the Indian Ocean Tsunami exposed the limitation of existing coordinating authorities and mechanisms supported by minimal common structures and procedures.

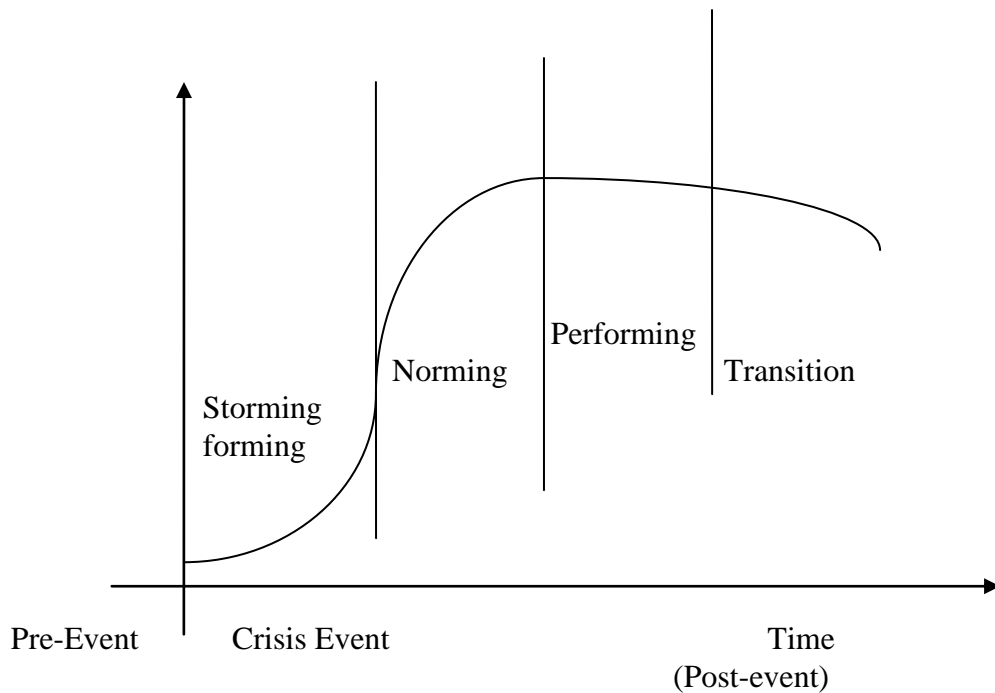
The response and recovery requires the contribution of many organizations and some times of thousands of people. Figure 1 shows that the response phase can be divided into four processes reflecting functions over time.

The critical success factors developed by MIT’s Jack Rockhart [17, 18] can be used to describe the essential factors that must occur in each phases (Fig. 1). This framework is based on observation of the responses to a series of extreme events.

¹ <http://gizmodo.com/5746121/how-egypt-turned-off-the-internet>, accessed 2012-05-05.

² <http://www.parlamentnilisty.cz/arena/monitor/Podle-pripravovaneho-zakona-bude-mit-stat-moznost-vypnout-internet-224077>, accessed 2012-04-28.

³ <http://www.techzon.cz/armada-bude-mit-mozna-moznost-rusit-mobilni-a-datove-site/>, accessed 2012-04-28.



Source: [11]

Fig. 1: Parts of disaster response

- **Critical success factors: Preparedness and Prevention**
 - Domain awareness and detection capability are created and maintained
 - Mobilization and response plans are based on realistic scenarios
 - Mobilization capacity and capability is adequate to meet expected needs
 - Adequate resources are available for initial response in high threat areas
 - Inter-organizational coordination is pre-planned, stakeholders are identified
- **Critical success factors: Initial Reaction and Mobilization**
 - Situational awareness is obtained and shared across distributed organizational network
 - Resources in place are capable of initial life and safety response
 - Resource mobilization is based on accurate estimate of need of people, funds and equipment
 - Resource mobilization is governed by pre-planned organizational structure and process
- **Critical success factors: Organizational Integration Phase**
 - Mobilized response resources are rapidly and efficiently integrated into predetermined response organization
 - Coordinated multi-organization, networked response system is established
 - Ability to manage the collection, synthesis, analysis, and internal and external distribution of is established
 - Organizational and operational adaptability and agility is maintained
- **Critical success factors: Production Phase**
 - Organizational productivity and resources are sustainable and supported
 - Requirement and productivity metrics are developed and monitored
 - Accountability is established
 - Requirements for recovery are identified
- **Critical success factors: Transition / Demobilization Phase**

- Continuing needs are identified
- Plan for transition to local support of continuing needs is developed and followed
- External resources are demobilized according to established plans and procedures
- Resources are provided to support economic and social recovery
- Organizational learning is accomplished

ICT needs to support all of the four above mentioned phases. Turoff [22] proposed nine premise that need to be addressed in an emergency response information systems (training and simulation, information focus, crisis memory, scope and nature crisis, exceptions as norms, role of transferability, information validity and timeliness, free exchange of information, coordination).

As described in [5], it is necessary to respect the psychological and physiological aspects of received information in stress situations. “Being a First Responder is a stressful experience for many reasons.” It is necessary to share such kind of responsibility by majority of people in affected areas. The only way is to have no information barriers, to generally share important information. In order to utilize available possibilities of technical, organizational and rescues options faced to correct interpretations of information, is of high importance to become adequate training and education – not only in all levels of school facilities but also in life-long learning process. In this field is possible to find current lacks of education system – as described on the example of the Czech Republic in [9].

To contribute to the well-being of the community following a disaster by ensuring the dissemination of information that (1) is timely, accurate, consistent, and easy to understand and (2) explains what people can expect from their government. The provision of timely and accurate information directly to the public is critical to the success of any response and recovery effort.



Source: Inspired by [6], p. 40

Fig. 2: Model for situational crisis communication

The crisis response phase is the most heavily researched aspect of crisis communication. [6]. How and what an organization communicates during a crisis has a significant effect on the outcomes of the crisis, including the number of injuries and the amount of reputational

damage sustained by the organization. Principles of relations among stakeholders of crises are indicated in Fig. 2.

2 Agile approach and organizational typology

Agile approach (www.agilemanifesto.org) is based on new practices and techniques that make product development more cyclical and incremental. It relies on lean governance (management) as opposed to more traditional techniques that rely on heavyweight governance. Agility is also about empowering the team and getting closer to what the customer wants. In place of rigorous upfront planning and the phase-based process, it offers a dynamic, iterative build-and-test cycle, where change is handled well [1]. One of Agile’s hallmark features is that it drives the decision-making process lower in an organization, making that organization more responsive and adaptive (table 1).

Agility dominates the approaches to crisis management, if we see crisis as “the perception of an unpredictable event that threatens important expectancies of stakeholders and can seriously impact an organization’s performance and generate negative outcomes” [6]. In the next paragraphs we will not generally distinguish among crises and other unexpected situations mentioned above. Crisis management including notification and communication is more than reaction; it can be prevention and preparation too.

Crisis communication can be defined broadly as the collection, processing, and dissemination of information required addressing a crisis situation. In pre-crisis, crisis communication revolves around collecting information about crisis risks, making decisions about how to manage potential crises, and training people who will be involved in the crisis management process [5].

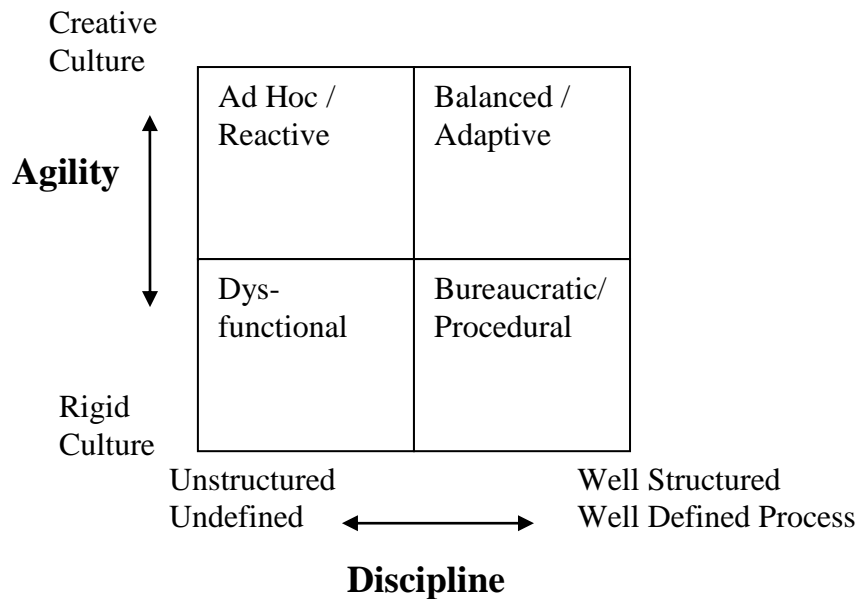
Tab. 4: Rules & Cases of Agile Methods

Rules	Cases
General knowledge	Specific knowledge
Work best in well understood, narrow domains that are stable	Work best in poor understood, wide domains that are dynamic
A lot of knowledge is included from the beginning	Only a limited amount of cases available at the beginning
System is limited to predefined rules	System adapts itself to a new situation

Source: own

The critical success factors mentioned above indicate that organization must use agile approach. This brings to them the ability to monitor and detect changes in the environment, to formulate solution, to adapt them and to customize the response to the current situation.

Successful improvisation and creativity during response to the attacks on the World Trade Centre are discussed by Kendra and Watchendorf [13]. Harrald [11] explains that discipline and agility can be combined and creates four organizational types (Fig. 3).



Source: [11]

Fig. 3: An organizational typology of response

- **Type 1: Dysfunctional**
 - Relatively unstructured, poorly defined processes and procedures
 - Relatively rigid, unable to move or change
 - Weaknesses – unable to create repeatable or predicted processes, unable to adjust to unexpected events or conditions
- **Type 2: Ad Hoc / Reactive**
 - Relatively unstructured, no defined processes and procedures
 - Weakness – difficulty in creating and sustaining large organizations, difficulty in coordination with other organizations
 - Strengths – ability to change rapidly, to adjust to the unexpected
- **Type 3: Bureaucratic / Procedural**
 - Defined structure, well – defined processes and procedures
 - Relatively rigid, unable to change
 - Weaknesses – inability to recognize and adapt to unexpected events, danger of becoming procedure – bound
 - Strengths – ability to mobilize and coordinate large complex organizations, ability to develop consistent training
- **Type 4 Balanced / Adaptive**
 - Defined structure, well – defined processes and procedures
 - Able to create and improvise
 - Weaknesses – leaders must be innovative as well technically competent, selection and training difficult
 - Strengths – ability to mobilize and manage large, complex organizations, ability to change rapidly, adjust to other organizations

Which of the above mentioned typologies does respond the Czech “Unified warning and notification system”? During first floods in 1997 the warning system was definitely Type 1, after experience was moved towards Type 2 and 3 [14, 20]. Still now it is necessary to

improve “Unified warning and notification system” to be balanced and adaptive according Type 4.

When we look at the current early warning system in the Czech Republic we can see, that it is designed to work independent of the electric power in defined mode for 72 hours (defined mode means function ability for 10 minutes...). And what will be after this time?

As it was published in [19], the core task of the Radio-Help project was to find an appropriate technology for targeted one-way communication. In other words – it was necessary to define two main components of a radio-broadcasting system, sender and receiver, based on current transmitting protocols and technologies.

Position-based distribution of information uses synergy of wide applied technologies in different devices for reaching a new quality. The technology of Radio-Help system is in detail described in [19, 20]. In principle the solution of targeted broadcast for a geographically defined area consists in a superposition of digital positional data to the transmitted information. The receiver of such signal is equipped with a positioning system (GPS and/or Galileo). Broadcast targeting is performed by comparing the positional coordinates of the receiver (in the form of a satellite positioning system) with the codes that are a part of the trigger partition in the beginning of each broadcasting session. When an external position code, which is transmitted by an authorized transmitter, conforms to an internal position code of the receiver, the forced listening broadcast session is activated (i.e. the session targeted for listening in the defined area). More detailed information about the locally target distribution of information is listed in the patent applications [2, 3].

Through the time the other system options were elaborated and developed, mainly encoding broadcasts based on geographic position of receiver. This Radio-Help system is also the base for large number of useful applications. The representative of them is e.g. “System for automated forewarning of vehicle crashes” as is mentioned e.g. in [21]. Also the favorite broadcasting standard of Radio-Help system – HD Radio – in recent years, vastly expanded not only in the USA but also in other countries around the world.

Conclusion

Radical change in the system for informing the population in crisis is not a question of discussion in terms of whether to carry it out, but only a question of how and when to decide on its implementation and where to allocate the necessary resources. Unfortunately the period of economic and social crisis is not inclined to the introduction of new communication systems for crises and disasters. It is not a favorite topic for politicians regardless of their party affiliation. It is by our opinion the reason why the responsible institution in the Czech Republic (like Czech Radio, Fire and Rescue Services, etc.) despite of declared interest do not possess any own initiative or activity. According to available information, nobody properly studied the impact of crises and of its macroeconomic and microeconomic aspects, from the perspective of prevention of some losses due to full accessibility of all relevant information.

Experts say that in near future due different reasons our civilization will be with higher intensity faced to such problems like black-outs of electricity lasting to several days, local floods, heavy snow falls, terrorist attacks etc. Agile approaches are the only solution for the management of similar situations. All these situations, although very different in nature, have one problem in common – how to ensure real-time dissemination of relevant information to the affected areas.

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AGILNÍ PŘÍSTUPY PŘI ŘEŠENÍ NEČEKANÝCH SITUACÍ

Článek poukazuje na problémy spojené s řešením distribuce informací v extrémních situacích. Na základě zkušeností s povodněmi, tsunami, požáry a podobnými situacemi jsou v článku identifikovány kritické faktory úspěchu týkající se distribuce informací, neboť se stále potvrzuje, že současné informační a komunikační systémy nedokážou uspokojivě zabezpečit distribuci nezbytných informací v potřebném čase občanům v konkrétních lokalitách. Tradiční přístupy k informačním systémům jsou v současné době nahrazovány agilními metodami, které umožňují rychlou reakci na neočekávané změny. Článek rovněž poukazuje i na možné technologické řešení (Radio Help), které je založeno na principu cíleného směřování informací do postižených oblastí. Tato problematika je řešena katedrou informatiky Ekonomické fakulty Technické univerzity v Liberci v rámci podpory projektů specifického vysokoškolského výzkumu (Studentská grantová soutěž).

AGILE ANSÄTZE BEI DER LÖSUNG UNGEWÖHNLICHER SITUATIONEN

Der Artikel verweist auf Probleme, die mit der Lösung der Informationsverbreitung in extremen Situationen verbunden sind. Auf Grundlage der Erfahrungen mit Überschwemmungen, Tsunamis, Bränden und ähnlichen Kalamitäten werden im Artikel kritische Erfolgsfaktoren identifiziert, welche die Verbreitung von Informationen betreffen; denn es bestätigt sich immer wieder, dass die gegenwärtigen Informations- und Kommunikationssysteme nicht in der Lage sind, die Verteilung notwendiger Informationen in der nötigen Zeit den Bürgern konkreter Örtlichkeiten zu gewährleisten. Die traditionellen Ansätze zu Informationssystemen werden zurzeit durch agile Methoden ersetzt, welche eine schnelle Reaktion auf unerwartete Veränderungen ermöglichen.

ZWINNE PODEJŚCIA W ROZWIĄZYWANIU SYTUACJI NIETYPOWICH

W artykule przedstawiono problem związany z dystrybucją informacji w sytuacjach ekstremalnych. W oparciu o doświadczenia związane z powodzią, tsunami, pożarami i podobnymi sytuacjami w artykule wskazano krytyczne czynniki sukcesu dotyczące dystrybucji informacji, ponieważ nadal potwierdza się, że obecne systemy informacyjne i komunikacyjne nie są w stanie w zadowalający sposób zapewnić przekazania niezbędnych informacji w potrzebnym czasie mieszkańcom w konkretnych rejonach. Tradycyjne podejścia do systemów informacyjnych są obecnie zastępowane tzw. zwinnymi metodami, umożliwiającymi szybką reakcję na nieoczekiwane zmiany. W artykule wskazano także możliwe rozwiązanie technologiczne (Radio Help), które oparte jest na zasadzie specjalnego kierowania informacji do dotkniętych rejonów. Zagadnienie to stanowi przedmiot zainteresowań Katedry Informatyki Wydziału Ekonomii Uniwersytetu Technicznego w Libercu w ramach dofinansowanych projektów dotyczących specyficznych badań akademickich (Studentki Konkurs Grantów).