THE END OF PROCESS MANAGEMENT?

IS THE PROCESS-DRIVEN APPROACH THE OPTIMAL WAY TO SOLVE CRITICAL SITUATIONS?

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Abstract

The process management has become an evergreen in each "well kept organization. This paper discusses the relevance of the process management method in emergency situations as has been researched in the T-SOFT Ltd. Company in consequence with the software tools development. The situations where processes are not followed or defined and still proper results are obtained are described. Emergent behaviour in extreme situations can be recognized and the discussion about its general usability for the newly defined approach is introduced. Possible positive influence of the software products for the decision support in emergency situations is indicated.

Introduction – Process management approach

The provocative title does not necessarily mean to quit the process management, but rather it would like to show an alternative way of thinking about the critical situations evolution and management. The process management has become a traditional way of thinking in companies and institutions in recent years. What are the common features for emergency management and traditional or business management of companies?

In the business area the ISO 9001 standard has been implemented for last few years. This standard, after several revisions, accepts the process approach as a base for the management and quality assurance.

This approach has definitely many advantages. It allows finding critical path in processes, tracking redundant steps, checking the responsibility for all of the process phases etc.

This approach is excellent for auditing the system itself. The essential need for the process is to deliver an output required. But many times the audit focuses to the formal check of the inner process itself, result of such might be negative. Even if final effect is adequate to requirements.

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In other words, everything is working well but processes are not being used as they were defined.

The question is: is it wrong or is it ok? The behaviour of people in the systems ensures obviously the proper results at the end – so what method and way of thinking and doing are proper for efficient management? And what might be consequences for the management in critical situations?

The secret of processes

Many people from ISO 9001 certified companies would agree that in many cases the certified processes are not being used. They admit the process definition is required just for the formal certification but things themselves are being done in some other way.

In the emergency management the situation might be similar. Having discussed those issues with people from the ambulance, they also admit that during large incidents etc. they use different procedures than those officially defined.

But in spite of this it works somehow. How it is possible? People simply behave somehow…

Emergent behaviour

When a collection of individuals, each following specific rules are studied, unexpected behaviour of the whole group may pop out of the system. Very simple examples are numerous:

- Crickets tend to sync their mating calls, calling all at once at the same speed
- Birds flying around can create large groups of birds that seem to behave as one
- Robots start to follow walls
- Economic agents all act together in an economy that can rise and fall, and may even crash down.

All of these higher level behaviours cannot be described the same way as their agents themselves.

"**Emergence** is the process of deriving some new and coherent structures, patterns and properties in a complex system. Emergent phenomena occur due to the pattern of interactions between the elements of a system over time. Emergent phenomena are often unexpected, nontrivial results of relatively simple interactions of relatively simple components." (From http://en.wikipedia.org/wiki/Emergence)

Emergence is the process of complex pattern formation from simpler rules.
This can be a dynamic process (spanning over time), such as the evolution of the human body over thousands of successive generations. Or it might be emergence, happening over disparate size scales, such as the interactions between a big number of neurons resulting in a human brain capable of thinking (even though the constituent neurons are not individually capable of thought). The original term was "categorial novum" coined by Nicolai Hartmann. [2]

For a phenomenon to be termed emergent it should generally be unpredictable from a lower level description. But, in the management of the company, for example, we need to predict the behaviour of the whole system from the behaviour of lower level elements. At the very

[2] Nicolai Hartmann (* February 20, 1882, † October 9, 1950) - German philosopher.

low level, the phenomenon usually does not exist at all or exists only in trace amounts: it is irreducible. Thus, a straightforward phenomenon such as the probability of finding a raisin in a slice of cake growing with the portion-size does not generally require a theory of emergence to explain. It may, however, be profitable to consider the "emergence" of the texture of the cake as a relatively complex result of the baking process and the mixture of ingredients.

But for practical management we need something different. We need to be sure that the description of behaviour will result in the proper outputs of the process, which would be reached by the global process definition.

One of the examples of the emergent behaviour is the problem solved by cellular automata.

What is Cellular Automata?

From the theoretical point of view, *Cellular Automata* (CA) were introduced in the late 1940's by John von Neumann (von Neumann, 1966; Toffoli, 1987) and Stanislaw Ulam. From the more practical point of view it was more less in the late 1960's when John Horton Conway developed the *Game of Life* (Gardner, 1970; Dewdney, 1989; Dewdney, 1990).

CA's are *discrete dynamical systems* and are often described as a counterpart to *partial differential equations*, which have the capability to describe *continuous* dynamical systems. The meaning of *discrete* is that space, time and properties of the automaton can have only a finite, countable number of states. The basic idea is not to try to describe a complex system from "above" - to describe it using difficult equations, but simulating this system by interaction of cells following easy rules. In other words:

Not to describe a *complex* system with *complex* equations, but let the complexity emerge by interaction of *simple* individuals following *simple* rules.

Hence the essential properties of a CA are

- a *regular n-dimensional lattice* (n is in most cases of one or two dimensions), where each *cell* of this lattice has a discrete state,
- a *dynamical behaviour*, described by so called *rules*. These rules describe the state of a cell for the next time step, depending on the states of the cells in the neighbourhood of the cell.

The first system extensively calculated on computers is - as mentioned above - the *Game of Life*. This game became that popular, that a scientific magazine published regularly articles about the "behaviour" of this game. Contests were organized to prove certain problems. In the late 1980's the interest on CA's arose again, as powerful computers became widely available. Today a set of accepted applications in simulation of dynamical systems are available.

Can we reach any kind of compromise?

Is there any possibility how to combine both process and behavioural approaches? Or in other words : Is there even a possibility to describe the behaviour of participants of any process in order to ensure the process results even the participants do not know anything about the process described on the higher level?

The process approach defines the process from the upper level or from outside. This kind of description we need for audit – for checking if the process works properly.

The optimal status we would like to reach is to ensure the participants would acts exactly as it is described on the higher level.

The problem is processes are usually defined for let us say "ideal situation" which can vary in the real life.

In essence we could find following directions for the future thinking and experimenting:

1. define the behaviour of people in order they do in certain situation exactly what is requested by the process definition,
2. implement the simulation system which can help us, based on the experiments with the behaviour of all the participants, to define the process which will be able to cover most of the functionality in the real life,
3. precise the behaviour of participants in such a model backwards based on the simulation on the simulator, which is controlled by the process definition.

There are probably more variants and options in the effort how to combine both approaches. Next essential question should be if the behaviour description is not a process itself on the lowest level.

We believe the basic difference is that the process is usually sequential while the behaviour is rather event driven.

On the level of behaviour we can abstract away from the specific process. The description of some participant behaviour can serve for more processes not only for one.

In the process definition we have usually sequences of steps defined, which are executed step by step.

In the behaviour description we can find also some definitions like following:

4. XZ must be done every time
5. XY must be done each hour
6. This must not be done anytime
7. If AB happens do XY
8. etc.

The very typical historical example of such a description is the Decalogue from the Bible.
The Emergent Behaviour paradigm can serve as a base for development of a new strategy of software for decision support, command and control, alerting and other activities in emergency management. Current Standard Operation Procedures (SOPs) can be complemented by a *rule-based* modules, which would support the emergent behaviour. There is an example in the software tools developed by T-SOFT.

Further development of T-SOFT software emergency tools

The objective of the further research in the area discussed above is to find the way how to support the behaviour of people in order to fulfil the requirements on processes outputs, not being forced to follow the process itself.

Next steps in development of our tools (mainly Emergency Office - **EmOff** and simulation system **ESIM**) are to extend the process definition features the following way:

1. enable to define standard operation procedure using also steps which are not time framed
2. add steps which are to be done every time
3. add definition of activities which must not be done
4. define situations or constellations which are to be excluded
5. add a feature enabling the possibility to monitor and analyse actual behaviour of participants during the an emergency situation solution
6. upgrade the ESIM simulation system in order to have a possibility to change the processes dynamically according to the behaviour of participants

It means to enhance the tools by the rules-based engine, taking into account the real emerging situation, either by monitoring single agents or the "crowd" as a whole. Then we expect an increased performance and exactness of the decision support system.

Conclusion

The most requested conclusion of any work is to answer the questions given in the beginning. If we ask the question according to the header of this paper, i.e. if we can expect the end of the process management, or if the process management will be replaced by the behavioural approach, it is very difficult to give the simple answer.

We can see good possibilities how to enhance the process management approach by some features of emergent behaviour. The goal of this paper is to open this question as a next chapter for possible research and development in the area of management and emergency management information support.

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Authors Biography

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President and co-founder of T-SOFT Company (Crisis management, Interoperability, Security). Before T-SOFT worked at the Electronic Research institute Tesla VÚST as Director of IT Division (120 people). Founding member of the AFCEA Czech Chapter, member of the Board of Directors. Member of the Czech National Committee of ISDR.

Member of the Presidium of the Czech Association of Crisis Managers. 1975 – Czech Technical University – Faculty of electronic. Publication activities in areas of computer graphics, computer user interfaces, information and communication technologies, information logistic, systems for protection of citizens and environment, interoperability of systems, crisis management, critical infrastructure protection. Married, 4 children. Hobbies: Music (active piano player), Mountaineering, Photography

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Since the 1991 he is the stockholder and managing director of T-SOFT Ltd. Company. From the beginning he is responsible for the internal organization of the company, definition of standard processes and quality assurance. He also took part in research projects, mainly in the area of simulation. In the area of simulation systems he obtained the Ph.D. title in 2004. Problems of process management and an emergent behaviour are also the theme of his dissertation MBA work.