Process Modeling for Crisis Management

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Abstract – **Crisis management is one form of management. It is applied in situations that we refer to as crisis. A crisis is a stressful situation for all interested parties, in which there is a greater or lesser threat to the values and assets. Coping with a crisis situation depends on many factors, while preparation is absolutely necessary, which must be done at a time when there is no crisis and ideally there is no threat. This preparation must also include the definition of crisis processes, i.e. the description of the behavior of each subject. At the time of crisis activation, everyone must know what rights and obligations they have and how they should fulfill these tasks. For the definition and description of these processes, it is possible to use proven means of process modeling, which have been used for a long time in many fields of human activity. An appropriately described process model, or a complex process map, can then be the optimal source of information for all entities.**

Keywords – **Business process, process modeling, crisis management, crisis state.**

1. Introduction

Unfortunately, crisis situations are a common part of our lives. Managing them requires a different approach than what we are used to from normal situations. We are therefore talking about so-called crisis management.

These are situations in which the basic values of society are threatened and which potentially threaten large losses - in lives, health or property [4]. National or international legislation can provide additional definitions, for example the definition resulting from the Czech legislation, which defines a crisis situation as "harmful effects of forces and phenomena caused by human activity, natural influences, as well as accidents that threaten life, health, property or the environment and require the execution of rescue and liquidation works, disruption of critical infrastructure or other dangers in which a state of danger, state of emergency or state of national threat is declared". Concrete crisis management institutes usually follow directly from these legislative definitions.

It is obvious that the usual means of management cannot be used in the case of these crisis situations. The reasons are mainly regarding time constraints, stress factors, changes in competences, but also, for example, the simple fact that the usual management tools (internet, telephone lines, transport infrastructure) can be limited or excluded [5]. If we talk about changes in competences, then in crisis situations it is not possible to fully use the usual decision-making processes based on broad and long-term discussion or on the cooperation of various elected and appointed bodies [6]. Crisis management usually requires the transfer of competences to specialized bodies, which (often with considerable limitation of democratic discussion) make decisions quickly and efficiently - also because they are trained for these situations. Although it is impossible to fully prepare for many things, it is possible to achieve a high-quality level of crisis communication and decision-making [7].

2. Resources and principles of crisis management

This preparation consists of several aspects. The first thing to consider is the material preparation. Nevertheless, this fact is generally accepted, mainly because material equipment is easier to grasp and measure [8]. However, where major problems occur is the preparation of the human factor [7], [8].

It is necessary to realize that crisis management comes into play in situations that place significant physical and psychological demands on the participants, when people's existence is threatened and when logically there is a greater risk of people failing, whether due to frustration, nervousness, a sense of threat or other aspects [9]. For this reason, it clearly follows that all preparation (material, personnel, etc.) must take place in times of non-crisis. It is understandable that at this time it will be difficult for the relevant political representation, as the willingness to make significant investments will understandably be less [8] - questions will be asked about the purpose of investing in an area that is not current. Unfortunately, by the time they become current, there are not many options for correction. Crisis management must be resolved before the crisis. [9]

Crisis management is usually understood as changing almost all the principles that we use in standard management when there is no crisis. Many things are changing - competences, rights and obligations, the focus of the work of state bodies and private entities, but changes are not the only thing that crisis management entails [10]. Crisis management also brings strengthening of existing principles, limitation of benevolence when assessing objectionable behavior, unambiguous determination of obligations for unified entities. Here, for example, we can mention increased penalties for criminal acts, the consequences of which may threaten the interests of society. Such penalties are common in the legal system of most countries.

However, if we want to manage society in a crisis, it must be clearly determined for individual entities what their rights and obligations are, and this information must be available both in times of peace (including training and preparedness exercises) and especially in times of crisis itself. Here we must realize that a crisis can also bring information infrastructure failures, especially a crisis caused by disasters (of anthropogenic and natural origin) [11].

Crisis preparation and crisis management planning mustbe in accordance with the politics and culture of the country in question, they must correspond to objective and subjective aspects, such as the mentality of society, but also its intellectual and material maturity [13]. At the same time, we must be aware of the changes that are taking place within society. The nature of crises is changing, and so is the nature of society [12]. For example, we have to realize that earlier times (not so distant) did not count on a permanent online connection of the whole world. Thus, local crises mostly remained local crises, while nowadays the disruption of this online connection can trigger a cascading crisis in many other areas [14].

The degree of globalization, cooperation and mobility is essentially absolute. As an example, we can cite the military aggression in Ukraine, which at first glance has the character of a local military conflict. Of course, this in itself triggered a huge crisis in Ukraine, but its consequence is, for example, the shortage and increase in food prices on global markets, as Ukraine is a world exporter of grain [15], [16]. Military operations also have a huge impact on inflation in many parts of the world [17], with inflation being a separate crisis in some countries.

Modern crisis management must consider all these aspects. Crisis plans that were created decades ago are redundant. They do not describe current risks, and if by chance they do in some aspects, then they do not describe them from the point of view of today's paradigm of perception of the world around us. They use outdated means of expression, count on outdated means of solution, do not emphasize the thinking of today's people. Crisis management must correspond to the needs and possibilities of the complex modern world [18].

3. Process modeling

The goal, which we want to achieve in the optimal case, is the description of the individual processes of crisis management in such a way that it describes the legislation, other documents and general customs in a precise, yet generally readable manner. It is, of course, possible to argue that this is duplicative work, as everything needed, can be found in the primary documents. This is of course a true statement, but so is the statement that finding all the consequences in primary documents presupposes knowledge of those documents (the process is often described across laws and other documents). It is also necessary to consider the fact that a large part of the legislation is written in a substantive, not a procedural way, which means that the procedural side of things is suppressed in these documents. The goal of process modeling should be a situation where everyone affected by a crisis situation will have the opportunity to reach for a document that will describe him in a procedural way how it will impact his life and activities (what obligations and rights he has, , what activities they expect from him, with whom he should cooperate, what documents are important for him, etc.).

The key is the choice of suitable process modeling tools - i.e. tools that allow us to describe (ideally graphically or semi-graphically) crisis management processes. There are several approaches, i.e. options for understanding processes - behavioral, structural, functional or status [1], [2]. In this case, the behavioral and state approach will best suit the needs.

By behavioral approach we mean an approach that understands the process as a sequence of subsequent activities [1] - this approach is suitable for processes that are deterministic and for which individual activities and relevant roles can be identified. The state approach is one that understands the process as a transition between the initial and final state [3]. This approach is suitable in areas where we cannot identify specific activities, but we know what the goal of our action is, or we know what aspects of the process we want to measure.

Specific methodologies will then have to be chosen not only with regard to needs, but also with regard to the expected knowledge of individual interested parties. Therefore, one can logically expect a combination of proven methodologies, for example Business Process Modeling Notation (BPMN) [2] and additional information, for example informal, especially text and image resources [1]. This combination must be chosen for practical use in such a way as to be able to combine good expressive ability with general intelligibility. Professionals from the field can be expected to have greater knowledge, or the possibility of requiring an increase in qualifications with the ability to create or at least read more formal models. For ordinary citizens, we must work with knowledge that can be legitimately expected.

4. Process models for state authorities

A process map for state authorities and components of the rescue system should offer similar information as legislation and related documents, but in a form that is easier to understand and, above all, in a form that allows searching for situationally adequate information without the need to search for documents. So it is not primarily about bringing additional, completely new information, but better structuring and filtering information that is already commonly used. After all, information that is in conflict with applicable legislation is completely unusable and inherently dangerous.

4.1. Principles of process map for state authorities

In this sense, a process map for state authorities and components of the rescue system would be a basic document (outside of legislation, which would have to be accurately and precisely reflected in the process map) describing the processes of crisis management and protection of the population from the perspective of different roles, different situations, etc. Individual components should be able to obtain the necessary information quickly and efficiently for their activities, both information resulting from general documents and customs, as well as information that is contextually linked to the current situation - optimally as an integral connection.

It is obvious that, for example, the components of the rescue system know their powers, duties, tasks and responsibilities very well, however, a comprehensive information source is always useful, in addition, it would also be possible to obtain information about the tasks and powers of other bodies. The following criteria should be followed when creating a process map.

- The process map must be easily accessible, including the possibility of filtering and structuring - emergency services and state authorities, if they are to use the process map, must have the necessary information available quickly and efficiently, including filtered and structured views. In other words, they must find what's important in the least amount of time and with the least amount of effort. Especially at the moment of a real crisis situation, there is no time for a lengthy search for information. Such system would be no different from the need to examine legislation and other documents in detail - an available system that will give an answer in a few moments is needed. The answer must then be well-founded and applicable.

- The process map must be strictly linked to the legislative framework – state authorities and emergency services must take every step-in accordance with the applicable legislation, including the fact that they must be able to defend their actions by referring to the relevant legislation. Therefore, it is necessary for the process map to be clearly supported by legislation, including the possibility to refer to the legislation if necessary and obtain a qualified interpretation. Acting outside the legislative framework could cause significant problems.

- A process map must be a comprehensive tool – if a process map is to be useful, it must be clear and easy to understand for users. A tool that does not give the necessary answer at a critical moment is an unusable tool, at least not for state and emergency services. It is, of course, possible to gradually process different areas or different roles, but in such a way that at least the given area is processed in a comprehensive manner. The relevant authorities and emergency services must then know whether their area is processed or not.

- We can assume the possibility of retraining users in new procedures - for individual rescue services and state authorities, it can be assumed that it will be possible to use new procedures in the framework of crisis management, in this case the use of process modeling and the relevant methods mentioned in the previous chapter. In order to use new technologies and procedures, users must be trained, but in principle this is not a new approach - workers are commonly harmed in this way. There is a significant difference here compared to ordinary citizens, where such a procedure is not entirely simple.

4.2. Realization of process map for state authorities

During implementation, we will primarily use process modeling methods, especially the BPMN method.

The models constructed in this way must be interconnected, as it is obvious that the individual processes of crisis management follow each other, the termination of one (or more) processes is the impetus for the initiation of other processes.

This is a very important aspect, because individual bodies have their duties and competences defined in this way, which are usually derived from the decision of a higher (government, region) body or from the decision of a specialized body (fire brigade, hygiene). The ability to track this continuity is a key in this case. Process models must, of course, be supplemented with additional information of a textual, tabular, or graphic nature - according to the specific process and the information related to this process. Linking with legislation must be necessary, because, as already mentioned state authorities can act only and exclusively in accordance with the intentions of the law and can only do what the law imposes and allows them to do.
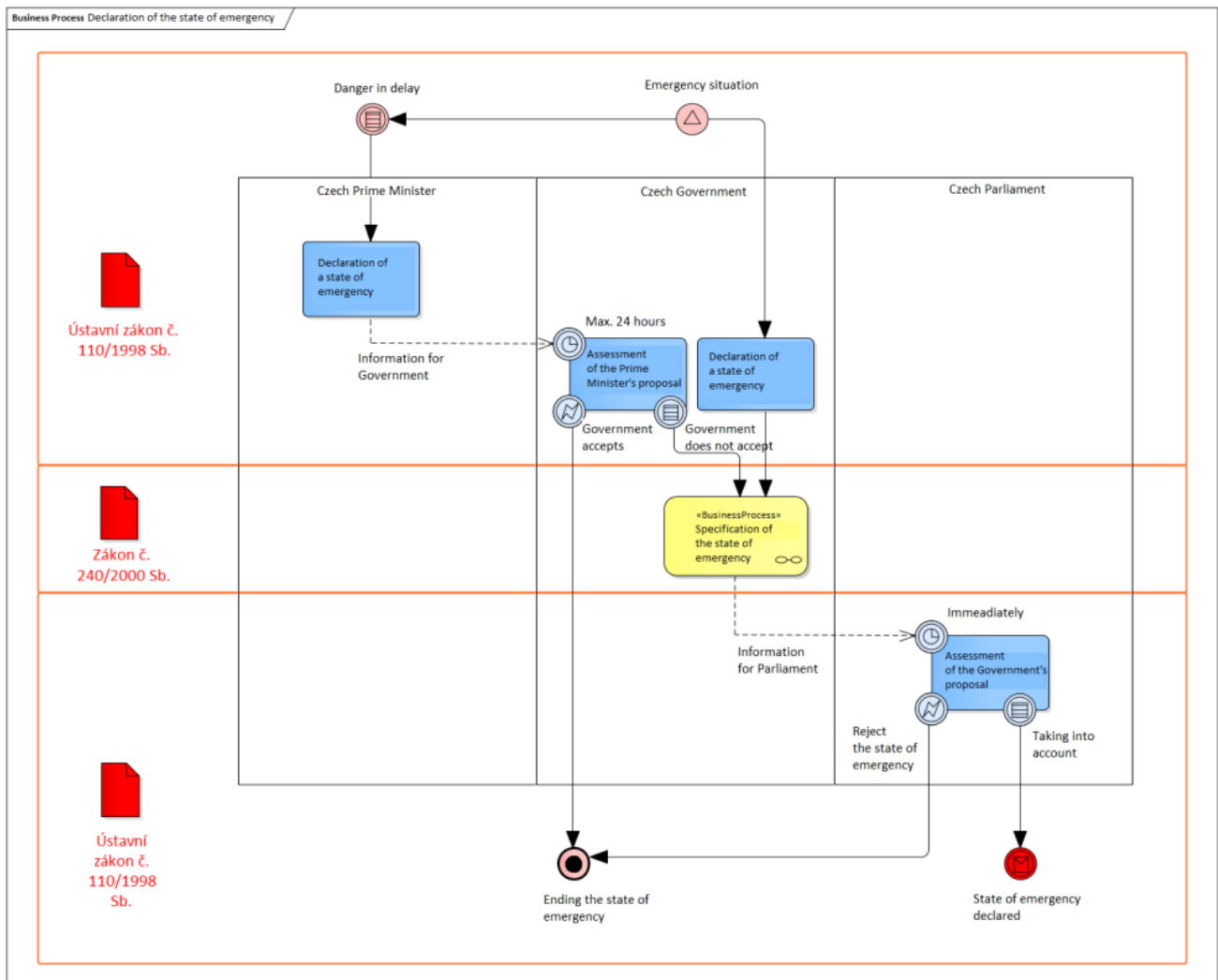

Figure 1. - Process model - process "Declaration of the state of emergency" in Czech law

The figure 1 demonstrates a relatively simple model of the process, in this case the declaration of a state of emergency by the government. The process was chosen for simplicity and timeliness. Of course, this process would be supplemented by continuity within the process map – the end state of the message type (Declaration of an emergency state) is a message that is the starting point for many other processes that are tied to the declaration of an emergency state. These follow-up processes should be readily available, just as the emergency declaration message should be available to those waiting for it. For the process, it is indicated which laws constitute individual activities - in the comprehensive map. There should be a specific mention of the legal regulation that prescribes, imposes and defines this activity in the comprehensive map (of course, each state will have these processes different and handled by different laws). Other information that could be relevant can also be added. In this way, it is advisable to describe all processes in crisis management and protection of the population, while observing the rules and conditions mentioned above.

5. Process models for citizens

Logically, the process map for citizens cannot be a separate structure, independent of the already described process map for state authorities and emergency services, especially because the very principle of crisis management and protection of the population envisages the integral connection of the involvement of all interested entities. Processes directly affecting citizens are processes triggered by a cascade of triggers and higher-level processes, i.e. processes and decisions under the responsibility of individual state authorities and emergency services. Thus, for example, measures in a state of crisis are linked precisely to a state of crisis and conditioned by its announcement. What is specific, however, is a subset of processes, activities, and artefacts that relate to citizens or other private law entities.

5.1. Principles of process map for citizens

Information provided to citizens must be in such a way that they:

• Were comprehensible to citizens and to be presented in a way that is expected to be readable by most of the population. It cannot be assumed too much that citizens will be familiar with specialized process modeling methodologies. After all, the goal of public administration should be to provide information in a way that it is comprehensible to an ordinary citizen with ordinary education.

• Were useful for the citizen – the citizen primarily requires direct information concerning his person, situation, or measures that directly concern him. Only in the second sequence, and this only applies to some citizens, will there be an interest in information of a wider scope.

It is necessary to realize that the citizen is not a subject for the state, but a de facto master, voter, or a sovereign. When preparing information for citizens, it is necessary to start from the principle that it is the citizen who determines what information he wants and in what form. The approach to creating a process map must also correspond to this. Otherwise, it could happen that the process map is created, but not used, and thus becomes another in a series of not very successful projects, which, however, relate to the expenditure of public money.

Here it is necessary to state a fundamental difference between the approaches to citizens as natural persons and between the approach to legal entities or entrepreneurs. In the first case, the state is limited by the fact that duties can only be imposed on the citizen in a limited way, while, for example, the state is obliged to enable the fulfillment of civic duties even for those citizens who do not want or cannot control modern technologies.

If we consider Czech law , it applies that a citizen cannot be forced to perform digital actions and must always have the opportunity to make his submission in the traditional form, i.e. by physically visiting the office and delivering paper documents. On the other hand, entrepreneurship is an activity that can be limited and conditioned from the state's point of view by the fulfillment of given obligations, which may include, for example, the obligation to acquire and use digital means. Even here, the degree of pressure on private law entities is a matter of discussion, especially regarding the friendly approach to entrepreneurs as economic entities however, these discussions are rather political.

5.2. Realization of process map for citizens

As mentioned before, it follows that the process map for citizens (respectively, the part of the complex process map of crisis management and protection of the population primarily intended for use by ordinary citizens) will mainly use commonly available means - i.e. text, table and image information. The process models themselves will be used rather in the minority, and if they are used, it will be a basic notation without complicated elements and constructions. Models constructed in this way, leading subsequently to text, image and tabular information, will be acceptable to citizens.

Processes will be mapped, modeled and described in the form of life situations, i.e. specific situations in which the citizen finds himself and needs to be addressed, such as

- My house was damaged by a flood, what should I do, who should I contact?
- I have been ordered to quarantine, what should I do, how should I provide for my needs, how long will the quarantine last?
- I am a shop owner, what measures apply to me?
- The fire brigade used my car, how do I get compensation?

These situations must be properly identified (in the case of implementation, this would be a necessary first step – to reveal possible life situations legislatively and procedurally for the citizen) and then described from a procedural point of view, in the manner described above, comprehensible for the citizen. Of course, the citizen should also have access to general process diagrams, where there is no longer such pressure to adapt them, as they are an optional part. Of course, only what is not subject to one of the levels of secrecy can be published.

6. Discussion

This article describes the possibility of using process modeling in crisis management. It is obvious that this is a mere tool that must be used within the framework of a well-developed philosophy of response to crisis situations, which should also be widely adopted. This needs to be explicitly mentioned, because for crisis situations, there are no miraculous ways to manage them, but only honest work with the conscious involvement of all actors.

Nevertheless, it makes sense to use the tool mentioned in the article, i.e. process modeling. Adequate information and predictability are among the basic aspects that should be observed in crisis management. Only if the interested parties have enough information available (quality information in terms of content, form, but also adequacy in relation to the situation), the adoption of crisis measures can be expected. Crisis measures are almost always restrictive measures, so it is necessary that these measures are understood and accepted as truly necessary. The opposite situation can lead to chaotic behavior, which not only does not help the resolution of the crisis, but which can even worsen the situation further. There may also be a situation where many subjects will trivialize the crisis and when various conspiracy theories will spread. From this point of view, it can be concluded that any tool that improves the awareness of all affected entities is a useful tool.

The tool itself, i.e. process modeling, is also up for discussion. We have to ask ourselves whether the process model can fulfill what is expected, i.e. increase the awareness of all (or at least some) subjects. In our opinion, the answer is yes, provided certain conditions are met:

- **Proper communication** - every new principle means that the concerned subject must step out of his comfort zone, and bring new obligations to this subject, although in this case not significant ones. It is therefore necessary to discuss with the subjects and prove to them that the proposed innovations are advantageous for them and that the benefits (at least in the longer term) outweigh possible negatives.
- **Proper education** - the affected entities must have the opportunity to familiarize themselves with new tools - regardless of the fact that tools (modeling methods) should be chosen in such a way that they are easy to understand, training, manuals, advice must be available.
- **Trust** - if this tool will present descriptions of processes, these processes must be followed in case of activation of crisis situations - otherwise the whole tool loses its meaning, as there will be a general belief that the described processes will not be up to date in the event of a crisis. In the event of a necessary process change, the first mentioned point must apply - i.e., proper communication of the change, explanation of its nature.

It is also necessary to distinguish between the quality of the process model and the quality of the process itself and its real implementation. The latter aspect is absolutely a key - if we better model and present a bad process, the result will be a bad solution to the situation. By permanently recording the process and presenting it, then in such a case we will cause considerable resentment.

7. Conclusion

The article describes some of the needs of crisis management, in particular the need for a detailed description of the activities of individual entities involved in solving a potential crisis or the need for a definition of competences. Of course, these needs are also valid in non-crisis situations however, in the situation of activation of crisis management, they become more important, even critical. As a potential solution, we offer the possibility to use process modeling as a possible tool to describe individual processes.

Process modeling, as described in the article, can be an interesting tool that expands the possibilities of recording and sharing information. However, it should be noted that no tool can correct a situation where the primary information is wrong or incomplete. The introduction of process modeling as a tool to support crisis management presupposes the fulfillment of certain conditions that were mentioned in the article. It is about education in this area - this education applies mainly to professionals, but to a lesser extent it also affects ordinary citizens. For this, it is necessary for the population to accept the need for such a tool and to evaluate this tool as useful.

In the case of efforts to incorporate this instrument, certain changes in legislation or methodological rules of crisis management would of course have to be made - this would depend on the current situation in the given state/country. In the area of crisis management, it is necessary that everything is properly supported by relevant legislation, ad hoc procedures are not appropriate here.

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