

A Model for Firefighting Managers Making Decisions in Emergencies

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ABSTRACT

Introduction: firefighting managers have a typical profession, during which making recognition-primed decisions is regularly required. This article gives a thorough review of the topic, than shows a simple and a complex model, created by the author. **Method:** one of them was an essay analysis, the second one was a word association test, specially created for this research. **Results and discussion:** the author created a simple and a complex model for firefighting managers making decisions, taking into account time pressure, the limited capability of processing information and also a mechanism complementing the recognition-primed decision.

KEYWORDS

Firefighting manager, RPD - recognition primed decision, model for making decisions in emergencies.

INTRODUCTION

The background of recognition of a special decision-making mechanism in the focus of this article was given that, in some cases, no sufficient time is available, necessary for classic decision-making. Therefore, strategists sought to design and plan the details of military operations in advance, however, the application of different decision support instruments in live situations, designed for optimal decisions, failed many times. Decisions made in reality, often not harmonized, could not be harmonized, considering the circumstances, with the pre-formulated strategies, mostly because there was not enough time needed to achieve them. In the article, author illustrates the limits of the possibilities of analytical decision-making, presents the general operating mechanism of recognition-primed decision-making, elaborate its special model relevant to firefighting managers, as well as explore and systemize the factors that facilitate (catalyze) the processes.

An important element of the activities of emergency responders is that they cannot or only to a very limited extent can modify the terms of the task, improve them as desired. Despite the differences of environment, indications of the *complexity* of the situation, the possibility of the *volatility* in the given situation, *uncertainty* and *ambiguity* of the information available can be recognized and well identified (VUCA environment). The peculiarities of each specialized branch can be illustrated through the examples of several authors: Klein (1989) dealt with the analysis of the decision circumstances of the military, Killion (2000) took examples from the navy, Bruce (2011) shows his own medical case, Johansen (20007) simplifies difficult circumstances.

The most limiting factor from the above is *time*, proven also in author's own studies. This provides a framework impossible to burst and a forced drift, a *pressurized channel* for the decision-maker, entangled in which one can no longer break free.

DECISION-MAKING MECHANISM OF A FIREFIGHTING MANAGER

Author refers, at the general model of recognition-primed decisions, mostly to Klein's work (1989; 1999), which is analyzed by Cohen with others from the direction of critical thinking (Cohen et al., 1996). Killion supplements and combines with his multi-aspect decision-making model, (Killion, 2000). Based on Klein's work, the essence of recognition-primed decisions is that the decision-maker, through his previous experience, has several different solution schemes in his mind, which he is capable of recalling in a new situation from memory. The decision-maker immediately applies the first pattern that matches the typical features of the given problem of, that is to say, makes decisions fast as a result of previous experience. We know from Miller's researches also that the *short-term memory* of the vast majority of people can only process simultaneously 7 ± 2 units of information (Miller, 1956). This information, of course, can be quite different, e.g. a characteristics of fire, the capacity of the response unit, a number, or even the absence of information searched.

Author has proven by essay analysis how complex the tasks of emergency responders are (Restas, 2013); this shows that in several cases, simultaneously, there is or would be a need to process many more units of



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information than the capacity of our short-term memory would allow. *The maintenance of our decision-making capability, i.e. our short-term memory, based on the above, clearly requires that we should omit analyzing and evaluating decision-making processes protracted and use the recognition-primed decision-making procedure, based on previous experience.*

Author wishes to create a model element to demonstrate the decision-making mechanism of firefighting managers, which takes into account the limits of the simultaneous processing of information. Since the information units may be qualitatively independent of each other, author choses the simplest *graphical representation of the unit-based discrete difference* to separate them from each other. A model element must be such, which can graphically demonstrate the schemes based on earlier experience, the characteristics of different fires, and the interlocking of the former as the application of the scheme, which represents the technically correct solution of the task, i.e. effective decision. The model refers, at the general model of recognition-primed decisions, mostly to Klein's work (Klein, 1989; 1999).

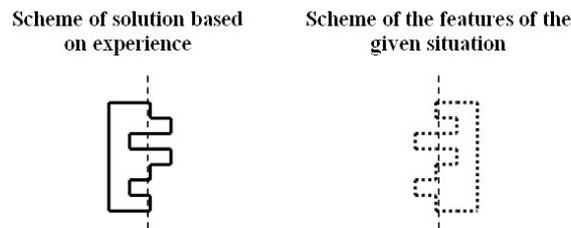


Figure 1. Graphic representation of the empiric scheme of recognition-primed decisions matching a given situation

The schemes in *figure 1* represent 7 graphical discrete values each, which are marked by positive or negative protrusions and their “center line”; these values indicate the amount of simultaneous decision-making capacity. Thus, the “negatives” of the schemes can be matched as a given situation and the solution necessary therefor. As an integration of above processes, decision mechanism functions as follows: an experienced firefighter has performed the elimination of a large number of and different fires. Despite the fact that as far as the parameters each fire is different from another, some characterizing features can be well conceived (*figure 2*).

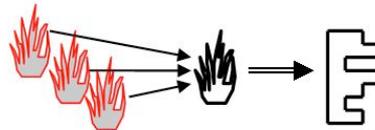


Figure 2. Evolution of the scheme on fire

The characterizing features of identical types of fires are crystallized by experience, and are fixed in our *long-term memory*. Similarly, to the characteristics of a fire, the characteristics of successful extinguishing, the facilitating decisions are also fixed (*figure 3*); just as the mistakes desired to be avoided and the unsuccessful procedures and failures. Experience gained through many years, based on the features of fires, formulate the system of schemes, behind which we can find actions (decisions) efficiently applicable to eliminate them.

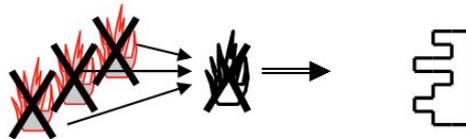


Figure 3. Evolution of the scheme on the lessons learnt from extinguishing a fire

If another incident has almost the same circumstances as one already many times successfully eliminated by a firefighting manager previously (*model of positive confirmation*), he will attempt to use the same ones in the procedures. Therefore, another fire, quasi bearing the typified properties of previous similar fires, a decision-maker involuntarily immediately recalls the typified decisions in his conscience.

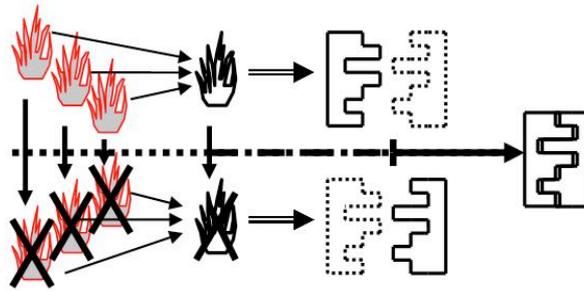


Figure 4. Aggregated scheme on fire and the evolution of the lessons learnt from extinguishing it

The properties of a fire and of previous successful extinguishing operations, based on the above, are closely interlinked; they are each other's "reflections" (figures 4). Author proved with association studies that the above, i.e. the characteristics of a fire and the thoughts directed towards its extinguishing, the schemes of response, in the case of firefighters, are very closely connected in a complex way.

When a firefighting manager identifies a fire, he imagines what would happen if he applies the usual tactics to fight it. If the scheme of solution matches, he accepts it, if not, he rejects it and thinks of the next most typical action. Thus, it is a recognition-primed, model-matching process, which can be followed by a quick and almost automatic decision.

The long-term memory of a firefighting manager, through practical experience, has the schemes of both different fires and their extinguishing characteristics. During another alert, information available and collected on a fire automatically generates the recollection of the scheme necessary to solve it, based on which a firefighting manager defines the firefighting tactics necessary. *However, the results of association studies clearly point in the direction that at a given fire (problem) managers do not focus on the fire as a problem but rather on its immediate solution.* From this, author makes the conclusion that a decision-maker will not follow the change of the characteristics of a fire, but the validity of solution scheme, that is, the dynamics of the implementation of the extinguishing process. This does not mean a contradiction with the previous, but rather a difference in views, the shift of emphasis of the focus of attention.

The difference in views, that is, the shift of emphasis means that a firefighting manager does not focus on the change of characteristics of a fire, but rather on the expected evolution and dynamics of the scheme selected, i.e. extinguishing tactics. The thought sequence fire-characteristics-solution is attractively logical, however, the decision capacity of our memory is facilitated if it manages and reduces the necessary information in the simplest possible way. Since the schemes of characteristics relating to a fire exist together with the schemes of solution, there is no real need for it to appear in our short-term memory. Thus, the function appearing is modified to the simplest and shows the format fire-solution.

The above do not contradict Klein's model, they rather complement it. Klein, in his model, evaluates (imagines what will happen) the results of matching schemes by the decision-maker prior to performing action version, however the aftermath of the decision, in author's opinion, is much more significant in case of firefighting managers. Since the problem immediately and automatically generates both the direction of the solution and start of the action version, rather the process itself is important in terms of efficiency, which is caused by the decision. *The schemes based on experience certainly contain the information on the dynamics of the process of fire, so if it meets the expectations, we do not have to modify the original firefighting tactics.* However, if the dynamics of the process does not suit the expected, the change is inevitable in the performance of efficiency. *Based on the above, the recognition-primed decision is not just an individual act before extinguishing the fire, but it is also the continuous accompaniment as needed.* By doing this, author shares the view that the experienced decision-maker perceives the problem together with its solution, *furthermore, author extends the continuous co-existence of the problem and of the whole process of solution of an emergency (firefighting and technical rescue).*

THE COMPLEX MODEL OF DECISION-MAKING OF FIREFIGHTING MANAGERS

If not enough time is available for analyzing and evaluating decision-making, recognition-primed procedures receive a greater role. Critical thinking uses recognition procedures, during which the decision-making process can be accelerated or analyzed with the help of a quick test and depending on the time available. The quick test, considering the circumstances, hinders recognition-primed decision and prefers critical thinking. However, when the circumstances are inappropriate for critical analyzing thinking, the quick test allows immediate reply.

Despite the limited decision capacity, thanks to recognition-primed mechanisms, in most of the occasions, correct decision are made by firefighting managers. Time limit precludes the possibility for the firefighting manager to carry out analyses necessary for the classic model, therefore, the selection of the optimal possibility is objectively not attainable by the decision-maker. The decision-maker is not striving to achieve ideal results, as a response to the difficulties of collecting information and reducing costs in relation, but depending on the circumstances, he is satisfied with the its satisfactory solution.

By reducing the time available for decision-making and for maintaining decision-making capacity, a firefighting manager applies the management (decision-making) method based on exceptions in numerous situations. Its essence is that several moments of interventions proceed protocol-like, thus, they need not be controlled all the time; on the other hand, not all the phases of the processes require direct management decision.

Based on the study of creativity, author has concluded that there is no such a feature characteristic of the working circumstances of firefighting managers that would not be advantageous to perform efficient work in a VUCA environment. Therefore, it is sure that the creative capabilities of firefighting managers can be explicitly advantageous to facilitate the professionally correct decisions on firefighting and rescue tasks.

Heuristics are not random-like errors or specific distortions facilitating our everyday activities. These are the results of simplifying mechanisms, through which decision-makers can make difficult tasks manageable for themselves. Besides the benefits of heuristics, the greatest challenge for a firefighting manager can mean the inherent erroneous distortions, which surely often help, but their uncritical acceptance, in certain cases, can end up in fatal dangers.

The declared objective and sense of the decisions of firefighting managers is the efficient implementation of emergency interventions. It is symbolized by the principles of firefighting with structured division, on the top of which we clearly find the saving of human lives (Restas, 2013).

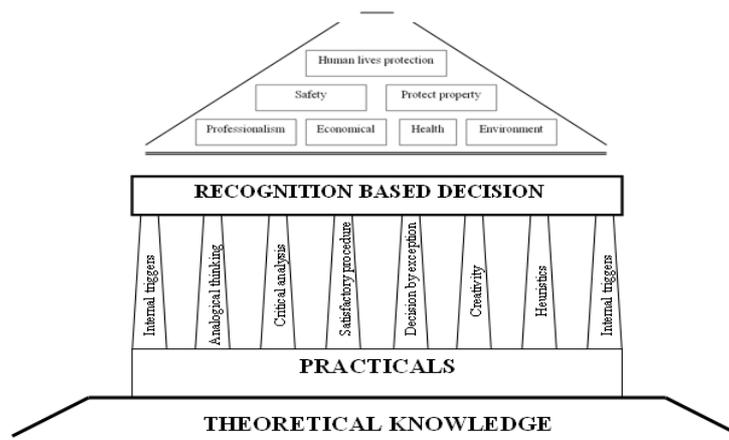


Figure 5. Complex model of decision-making of firefighting managers in emergencies

Firefighting managers certainly have less time to make their decisions compared to the time interval of classic decisions, so, their decision mechanism is strongly based on recognition procedures due to the peculiar environment (VUCA), and the limited process possibility of simultaneous pieces of information. *The competence of firefighters is based on the unity of theoretical knowledge and practical experience. Building on practical experience, the different mechanisms like analogical thinking, critical analysis, satisfactory procedure, decisions based on exceptions, creativity and heuristics, together with the internal triggers, hold as pillars and make recognition-primed decision procedure of firefighting managers operational.* Author illustrates the above as a complex system of emergency decision-making of firefighting managers in figure 5.

REFERENCES

- Bruce, E. [2011] A Picture is Worth a Thousand Words – at Least; Pentington Media Inc. USA
- Cohen, S. M., Freeman, J.T., Thompson, B.B. [1996] Integrated Critical Thinking Training and Decision Support for Tactical Anti-Air Warfare; Report, Cognitive Technologies, Inc., Naval Air Warfare Center Training System Division, Contract No. N61339-96-R-0046.
- Johansen, B. [2007] Get There Early: Sensing the Future to Compete in the Present. San Francisco, CA: Berrett-Koehler Publishers, Inc.. pp. 51–53. [ISBN 9781576754405](#)
- Killion, T.H. [2000] Decision Making and the Levels of War; Military Review, United States Army Combined Arms Center, Fort Leavenworth, Kansas, 2000 november-december
- Klein, G. A. [1989] Strategies of decision making, Military Review, No.5
- Klein, G. A.: [1999] Sources of Power: How People Make Decisions Cambridge, MA: MIT Press 1999 [ISBN 0262611465](#)
- Miller, G. A. [1956] The Magic Number 7 Plus or Minus 2; Some Limits on our Capacity for Processing Information, Psychology Review, Vol. 63
- Restas, A. [2013] Principles of Decision-Making of Firefighting Managers, Based on Essay Analysis; Poster, The 11th International Conference on Naturalistic Decision Making, 22-24 May 2013, Marseilles, France