New Trends and Issues Proceedings on Humanities and Social Sciences

Issue 5 (2016) 199-204

Selected paper of 4th Cyprus International Conference on Educational Research (CYICER-2015) March 19 – 21, 2015, Girne American University in Kyrenia, CYPRUS

Leadership – Training of Military Specialists in Particular Disciplines Focused on Mathematical Modelling

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Suggested Citation:

Hoskova-Mayerova, S. (2016). Leadership – training of military specialists in particular disciplines focused on mathematical modelling. *New Trends and Issues Proceedings on Humanities and Social Sciences*. [Online]. 05, pp 199-204. Available from: www.prosoc.eu

Selection and peer review under responsibility of Assoc. Prof. Dr. Cigdem Hursen, Near East University

Abstract

The primary mission of the Faculty of Military Leadership consists in providing university education for military professionals to become qualified experts, educated in military science and specially trained for the military service, able to fulfil a socially important role in carrying out security and state defence. In accordance with legislation in the students are also prepared for a "second career" after finishing their active service in the Army. This is not an easy goal. A quality commander should be thoroughly trained, able to make right decisions, know tactical and strategic levels of leadership, accomplish correct judgement, vision and planning, implementation and progress…, just a few terms frequently quoted and referred to this problem. Managers must often deal with factors that are beyond their control. Labour force has changed and grown during the past few decades; therefore, personnel managers must develop alternative attitudes in order to face current demands. Personnel directors must be cognizant of the many individual differences that are among employees: there are varying education levels, physical abilities, psychological and behavioural attributes, different levels of motivation, personality characteristics, etc. The paper deals with the situation of military professionals´ education at University of Defence in Brno, Czech Republic.

Keywords: Crisis situation; Mathematical modelling; Training of military specialist

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1. Introduction

The primary mission of the Faculty of Military Leadership consists in providing university education for military professionals to become qualified experts, educated in military science and specially trained for the military service, able to fulfil a socially important role in carrying out security and state defense. In accordance with legislation in force and considering the anticipated time limiting of military service the students are also prepared for a "second career" after finishing their active service in the Army. This is not an easy goal. A quality commander should be thoroughly trained, able to make right decisions, know tactical and strategic levels of leadership, accomplish correct judgement, vision and planning, implementation and progress…, just a few terms frequently quoted and referred to this problem (See, for example, Hoskova, 2010). Managers must often deal with factors that are beyond their control. Labour force has changed and grown during the past few decades; therefore, personnel managers must develop alternative attitudes in order to face current demands.

Personnel directors must be cognizant of the many individual differences that are among employees: there are varying education levels, physical abilities, psychological and behavioural attributes, different levels of motivation, personality characteristics, etc.

Adopting the "crisis legislation" in the Czech Republic has gradually been arising; these are particular Act No. 239/2000 Coll., On the Integrated Rescue System, Act No. 240/2000 Coll., On crisis management (Crisis Act) and other related legislation documents; they specify completely new, qualitatively higher demands on the approaches to the solution of population protection and crisis management in the Czech Republic. Considering this fact, there are also specified higher quality demands for government and administration workers.

Education covering this area can currently be divided into several domains, in which many subjects participate; their role in the education system is highly justified and irreplaceable (Hoskova-Mayerova & Rosicka, 2012).

Protection of the population cannot be underestimated; emergencies, natural disasters, industrial accidents, landslides, floods, fires, etc. can never be predicted and always come unexpectedly.

Emergencies always select the time when they attack!

This emergency situation can efficiently be prevented if the staff is professional, well trained and sufficiently flexible to respond. This goal can be reached only using high quality and properly targeted curricula. This type of education in the Czech Republic is offered by University of Defence in Brno. The University is able to prepare professionals for all levels of management ranging from professional courses, bachelor's and master's degree to doctoral studies in order to solve any type of crisis and emergences (Hoskova, 2010; Urban & Urbanova, 2014).

2. Characteristics of Current Civil Protection

There is much diversity in civil protection activities and organizations in the world and some common elements have evolved. When entering the 21st century, civil protection has finally come to be accepted as a major governmental responsibility practically in every country in the world. Two decades ago, United Nations survey found dozens of countries with no formal national disaster planning and no explicit civil protection organization at that level.

Planning for disasters is not too high on the attention agenda of citizens at large. Most of population in modern societies can see civil protection as both an acceptable and accepted responsibility of the government; this percentage crosses various political ideologies, regardless left or right oriented. On a world basis, the civil protection arrangements are highly heterogeneous. At one extreme, there are elaborate social organizations and organizations and arrangements in societies as

Japan, the U.S.A., Russia with full-time personnel comparing to another extreme with a couple of part-time volunteers. In some developing countries, there is sometimes at best a social organization at national level and no formal planning at all. In case when disasters occur, the urgent crisis time activities are carried out by international relief organizations, religious organizations and often by the armed forces of the society. (See, for example, Malone, 1993; Van David, 2002). Civil protection is establishing itself both organizationally and functionally at the international level. The United Nations had several disaster oriented organizations with diverse missions. The major lead agency some years ago was the Department of Humanitarian Affairs – DHA seated in Geneva dealing with refugees as a result of civil strife situations, maintaining stockpiles for quick responses to natural disasters. As to political considerations, UN replaced DHA with the Office for the Coordination of Humanitarian Affairs – OCHA dealing with the same missions. All the existing structures and functions of civil protection reflect the prevailing political-economic patterns of various societies. All governments', regardless political ideology, have come to accept that the idea of civil protection is a governmental responsibility and a specialized organization is needed for this purpose.

There is a move toward differentiating disasters into time and stage phases. This idea was first developed by disaster researchers at the end of 1970s. The explicit typology was first advanced by Hilary Whitaker as a part of 1978 Emergency Preparedness Project: disaster planning is mostly applying four stages: mitigation, preparedness, response, recovery. In brief, they can be characterized as follows: mitigation includes policies and actions undertaken at a time before an actual disaster situation; it is intended to prevent or reduce disaster impact (educational and training information, land use, building code, insurance and so on); preparedness has to do with steps and measures planned for and undertaken when the probability of a disaster in a locality is immediate (warning and evacuation of people); response refers to actions taken during and immediately after the impact (search and rescue efforts, emergency medical services); recovery has to do with activities carried out after the response in the time the crisis is over (rebuilding, reopening, recovery businesses and so on).

Nevertheless, not every society formalized officially fourfold differentiation and implemented it into practice. This specification is helpful in term of disaster planning, emergency management and civil protection. The term emergency management typically means a major concern with mostly preparedness and response phases. Disaster planning has the reference to the full range of activities from mitigation to the recovery. Civil protection usually has less reference to a time stage than to a social arrangement in place for generally dealing with disasters.

In many countries there has been growing emphasis on disaster mitigation; there has been acceleration of the efforts made to institute measures which if not prevent at least reduce the impact of disasters. In developed countries this change is driven by several factors: economic costs of disasters, complains and pressure from citizens who think more and more that government should try to prevent disasters rather than responding to their occurrence.

It is obvious that it is easier to plan than to being managing an actual disaster. Results of various studies show that preparedness phase is better developed than the response patterns: "What is puzzling is that after years of research on organizational behavior in emergencies, local government continues to be surprised when standard procedures in lengthy, detailed plans are irrelevant in the real disaster".[*] Nowadays, there is more sophisticated approach to issues associated with disasters. There is, for example, growing recognition that planning is not managing. The former has to do with strategy and overall approach to disasters, the latter; more or less tactics has to do with specific contingencies which are dealt within an actual disaster situation. This difference between the processes is starting to be recognized in societies with the most advanced disaster planning. Another

[*] Quarantelli, E.L. Historical Development of Organized Efforts to Plan for and to Respond to Disasters. Paper # 227, p. 19. Disaster Research Center, University of Delaware Newark, Delaware 19716 USA.

example of this tendency is an increasing acceptance in the civil protection area: the greatest problematic areas in preparing for and responding to disasters are with the participating organizations more than with affected victims. Research shows that human beings as a whole react well to the crisis of a disaster occasion. They do not break down in panic flight or engage in antisocial behavior. Instead the survivors show much pro-social behavior by far the bulk of search and rescue efforts for casualties, they are also active in providing food, clothing, and shelter.

In most countries, the equipment, facilities and personnel of civil protection agencies improved in recent years. In some social systems, political considerations were the major factors which strongly affected who were given positions. The future of emergency management is characterised by rapidly changing information technologies, increasing mass of scientific and technical information on current and future hazards, demand for experienced emergency managers. However, technological developments create new problems: overdependence on technology and underestimation of social infrastructure necessary for effective operation.

On the one hand, there are more and worse disasters, on the other hand, better and increased research about disasters is and will be available. We will be challenged by future disasters; however, there will be far more understanding and knowledge about the crises and emergencies than ever before (Rosicka, 2008).

3. Mathematical Modelling

Many everyday activities carried out without a thought are examples of mathematical models. A geographical map projection of a region of the earth onto a small, plane surface is a model, which can be used for many purposes such as planning travel, or any other human activity taking place in the open air (or at any place on the Earth, resp.), including rescue or military activities call for planning (modelling, resp.). Knowledge of mathematical models, their creating and application is of high importance not only for military personnel; therefore, this chapter has to become a part of military professionals' education.

Another simple activity is predicting the position of a vehicle from its initial position, direction and speed of travel, using the equation that distance travelled is the product of time and speed.

What is a mathematical model in fact?

One of various definitions can be found in Wikipedia and it says that a mathematical model is a description of a system using mathematical concepts and language. The process of developing a mathematical model is termed mathematical modelling. Mathematical models are used in the natural sciences (such as physics, biology, earth science, meteorology) and engineering disciplines (such as computer science, artificial intelligence), as well as in the social sciences (such as economics, psychology, sociology, political science). Physicists, engineers, statisticians, operations research analysts, and economists use mathematical models most extensively. A model may help to explain a system and to study the effects of different components, and to make predictions about behavior. (Wikipedia) For practical examples of such mathematical models see e.g. (Hofmann et al., 2013; Hoskova-Mayerova, et al., 2013; Hoskova-Mayerova, 2015).

Mathematical models can take many forms, including but not limited to dynamical systems, statistical models, differential equations, or game theoretic models. These and other types of models can overlap, with a given model involving a variety of abstract structures. In general, mathematical models may include logical models. In many cases, the quality of a scientific field depends on how well the mathematical models developed on the theoretical side agree with results of repeatable experiments. Lack of agreement between theoretical mathematical models and experimental measurements often leads to important advances as better theories are developed.

3.1. Significance in the Natural Sciences

Mathematical models are of great importance in the natural sciences, particularly in physics. However, mathematical modelling is highly important in social sciences as well. Mathematical modelling infiltrated various branches of natural sciences, technology, economy as well as social sciences and became a powerful tool in modelling systems and simulations, analyses and predicting various processes, activities, species and community behaviour (For more see: http://en.wikipedia.org/wiki/Mathematical_model).

Mathematical models offer understandable characteristics of every relevant factor of a particular situation and enable to discover substantial relationships within components of the system studied.

Applying a mathematical model can bring many positives: Information about a system behaviour is available; The process of objective reality recognition is accelerated. Processes in a real system pass slowly and long-term; using a model, they can be monitored in the course of calculations resulting from information and communication technology applied.

4. Conclusion

Emergency management is highly dependent on economic and social conditions relevant to the emergency or disaster. Emergency or disaster management involves preparing, supporting and recovering society when natural or man-caused disasters happen. It can be characterized as a process in the course of which individuals and communities try to manage hazards in order to avoid the impact of disasters resulting from hazards. Emergency management is one of a number of terms which have replaced the term Civil Defense whose primary focus consisted in protecting civilians from a military attack (See, for example, Stepanek, Urban & Urban, 2013).

Another term, Civil Protection is widely used within EU and refers to government-approved systems and resources whose task is to protect the civilian population in the event of natural and man-caused disasters. Within EU the term Crisis Management focuses more or less the security and political dimensions. The academic trend is towards using the more comprehensive term disaster risk reduction, specifically for emergency management within management context. "…effective emergency management requires both improvisation and preparedness. Without improvisation, emergency management loses flexibility in the fact of changing conditions. Without preparedness, emergency management loses clarity and efficiency in meeting essential disaster-related demands".[*]

Many everyday- activities carried out without a thought are examples of mathematical models. Knowledge of mathematical models, their creating and application is of high importance not only for military personnel; therefore, this topic has to become a part of military professionals' education.

Acknowledgement

The work presented in this paper was supported within the project for "Support for Mathematical and Physical Research" as well as the project "Development of the methods of evaluation of environment in relation to defense and protection of the Czech Republic territory" (Project code NATURENVIR) and project "Development of basic and applied research in the long term developed by

[*] Kreps, G.: Organizing for emergency management, In *Emergency Management: Principles and Practice for Local Government.* Washington, D.C.: International City Management Association, 1991. 33.

the departments of theoretical and applied foundation FMT" (Project code VÝZKUMFVT) supported by the Ministry of Defence the Czech Republic.

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