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CONSIDERATIONS ON MODERNIZATION AND THE COMPETENCIES AND EDUCATION OF AIRCRAFT MAINTENANCE ENGINEERS

Absztrakt

A precondition of the proper functioning of our organizations and the success of their operations is a sizeable body of well-trained professionals. The ongoing development of educational content and structure, the changing needs of the labour market, and the novelties of the technological environment make it necessary to conduct regular research to clear what competencies new generations of military engineers of the Hungarian Defence Force should possess. Change in the past term in higher education exerted influence, and they also practice the aircraft engineer to an education yet in our time. Competences appeared as requirement on output of the educations, what besides (different forces of nature) you appear as a criterion of change of the educations. These effects also touched higher-education establishments, of the defensive sector, what portfolio his existing educations called his transformation into life. The education proceeds from competences according to the new requirements and they are tracing subject structure back the education from this, system time ratios (credit), and methodological elements of his different contents.

A szervezet működésének, és az elvárt minőségű feladatvégrehajtás biztosításának egyik alapfeltétele a megfelelő számú, jól képzett szakember. A képzési szerkezet, az infrastruktúrák, a humánerőforrás fenntartása és folyamatos fejlesztése érdekében fontos ismerni, hogy milyen kompetenciákkal rendelkező műszaki szakemberekre van szükség a Magyar Honvédségben. Az elmúlt időszakban a felsőoktatásban bekövetkezett változások jelentős hatást gyakoroltak, és még napjainkban is gyakorolnak a repülőmérnök képzésre. A képzések kimenetén követelményként jelentek meg a kompetenciák, melyek (más elemek mellett) a képzések változtatásának kritériumaként szerepeltek. Ezek a hatások a védelmi szektor felsőoktatási intézményeit is érintették, melyek a meglévő képzési portfólió újragondolását hívták életre. Az új követelményeknek megfelelően a képzések kompetenciákból indulnak ki, és ebből vezetik le a képzés tantárgyi struktúráját, belső idő (kredit) arányait, más tartalmi és módszertani elemeit.

Keywords: *aviation engineering, military engineer education, competency, model ~ repülőmérnök, katonai műszaki oktatás, kompetenciák, model*

INTRODUCTION

In the past decade the fact that they had to balance their decisions against the biased activity of related organizations in their environment, the Hungarian Defence Forces and their organizations had been making enormous effort to maintain the efficiency of their operations. The appearance of a new type of aircraft in the system required also the introduction of a new maintenance strategy that set new requirements for our maintenance engineers. The technological transfer necessary for the adaptation of the new technology made it essential to enforce a new systems thinking approach for the whole process. It was therefore unavoidable to see and analyse mechanical, electronic, weapons and other functional subsystems all together instead of their classical functional separation in order to identify and make use of the existent contingencies. As a result, the new view concentrated on the cooperation of mechanic, electric, weapons etc. capabilities on a subsystem level.

The appearance of new technologies and new approaches in the world and in our organizations requests also a re-thinking of our education and training schemes both in structure and in content, so that new generations of professionals may be taught the necessary skills and know-how to do their jobs effectively and to be able to keep up with expected future developments.

Beside the fact that the enforced fluctuation of workforce made it difficult to give over the know-how to the next generation let alone to provide them with enough on-hand experience to develop the necessary professional and organizational skills, the ongoing reforms of the educational institutional system did not provide the necessary stability and background either. There is therefore a certain need for a proper analysis of discrepancies between education and maintenance engineering practice so that a common platform can be provided for future cooperation in terms of what to teach and how to teach. [5]

"Teaching the staff how to use new gadgets, however, is far from enough. Even a modular training scheme that focuses on the operative level and helps maintain and improve the running of key processes is essential but insufficient. Taking a management point of view, it is easy to agree that regular brush-ups and drills as well as courses deepening the specialist knowledge of the “hard core” that also enable them to take a more active part in common organizational process improvement efforts are to be held advantageous on multiple levels. They not only help the more effective utilization of our staff but also provide management with a useful tool to build internal motivation, a common culture and employee loyalty." [1]

There is a significant disequilibrium characterizing the relationship between the present education of aircraft maintenance engineers and the needs of those organizations that require and use their knowledge. To restore and keep their balance, competence should be put in the centre again so that the invested efforts of the educational input may result in the building of those skills and knowledges that are truly required by the output-side, that is the future employer's organizations and processes.

The unavoidable rethinking of our professions, equipment, work processes, education content and techniques and all the methodologies involved in a competence-based education and work scheme of aircraft maintenance engineers requests also the re-thinking also of meta-methodological level behind the questions arising. All this has to be done in an environment that may be described as not quite supportive, if only we think of the macroeconomic influences resulting in constant ambiguities and unsteadiness of employment, working conditions, prestige or market values.

PROBLEMS OF A SCIENTIFIC ANALYSIS

The problems appear in reality in the form of some kind of a negative phenomenon. As practically all activities are in one way or another interlinked, any issue may create contemporary or delayed symptoms within the system. The appearance of a new aircraft in the system will have foreseeable and unforeseeable consequences of various seriousness. As high risks may be implied, it is necessary for a professional leader with the necessary level of authority and autonomy to take over direction and set up before the new aircraft is introduced so that even the initial steps requested by such technological innovations can be planned, prepared and executed without haste. Also in the duration of time after the arrival of a new aircraft it is necessary that the teams involved are given the necessary pace to learn, practise, and to get used to the new situation without being overburdened with additional tasks and duties from above. Even so, they will have all hands full with internalising the new skills and know-how necessary to keep the new aircraft in function. To require full potentials from the maintenance staffs of a new aircraft in this period of working may definitely lead to immediate or later problems. The only way to ensure that the introduction period does not take too long is to use all possible ways to improve the professional knowledge of staff members on such machines beforehand. Education and training in advance, if well targeted, may be an effective way to shorten time periods and lower costs of introduction as well as to avoid later problems.

To forecast future effects of any change within a complex system is an important direction of scientific research. It is unavoidable to concentrate on such issues of multiple effects of innovation within the technical, process and organizational system, including, of course, the human perspective too. To prepare such forecasts is an unavoidable step of any feasibility study, and they are the basis for the planning of the introduction of new aircrafts too. Their preparation necessitates the application of the best available level of analytic methods and know-how.

Even the formulation of the problem cannot be developed without minding certain traps. One of the issues to be considered is the choice of the right time horizon and perspective. Evidently, if the analysis uses a too long time sequences for the forecast, it will take too much time to map all the possible risks and other consequences, while using too short time sequences may result in a situation when we remain unaware of major issues resulting from the introduction of the new aircraft. It is therefore also important to properly plan the process of the forecasting analysis as well. [9, 10, 11]

SYSTEMS THINKING

Another major task in the planning of the introduction of major technologies such as a new aircraft is to decide which level of complexity we should handle (e. model) the problem. To identify major possibilities, Boulding's classification of systems according to their levels of complexity may come handy.

Boulding in the 1950' identified nine levels of system complexity and named them so that it is easy to remember them as well as to link them a useful metaphor. The nine levels are those of the structures, clockworks, controls, cells, plants, animals, man, society and that of the transcendental. The nine levels represent a hierarchy from the simplest to the most complex. Each system at a certain level of hierarchy can be modelled and analysed according to the lower levels, but not those above it. As an example, if you analyse a human person as a member of the animal world, your results will be relevant, while to handle a pet or a machine as a human being is mere personification and leads us in the world of fantasy or literature rather than that of creative analysis.

In case of analysing the education scheme for aircraft maintenance engineers, it seems to be logical to start with trying to understand it at the level of the human individual, that is at a level

of complexity dealing with active planning of the future, foresight and other complex thinking processes.

Also, when looking for a solution, the symptoms and problems identified will help us choose which disciplines are there to consult with. As our aims are to think over what management can do in terms of helping the workforce to get prepared for working with new technologies, it seems to be evident that most suggestions and solutions will come from the areas of disciplines such as education, psychology, social psychology etc., probably those in and around the interest of Human Resources Management (HRM).

After identifying and utilizing these starting points, it will be of course unavoidable to involve also other levels of complexity as well as disciplines in due course of the analysis and planning, whenever need be. Multidisciplinary approaches in the world of complexity are usually amongst the most successful when forecasting future problems.

COMPETENCIES, COMPETENCY - BASED EDUCATION

The management perspective of engineers, and following from their professional culture, has been tending to be overtly task-oriented [2]. Traditional military organizations even strengthened and conserved this attitude. “Our organizations seem to follow patterns that go back to the 19th century or even earlier”. [6] Human Resource Management is the function within an organization that focuses on recruitment, management, and providing direction for the people who work in the organization. It deals with issues related to people such as compensation, safety, benefits, motivation, training and so on. Our organizations will never develop unless we succeed in remembering that HRM requests a very different mindset from that directing our decisions now: from the task-orientation of the present, we will have to change for people orientation. No competency-based organization may exist without it.

And competencies will be at the core of any solution of the complexity of the modernization problem. [7] To understand properly what its definition is meant by is a guide for us to make the necessary decisions: “A competency is an underlying characteristic of an individual that is casually related to criterion referenced effective and/or superior performance in a job or situation. Any valid competency requires knowledge, skills and attitudes that affect the job, correlates with job performance, can be measured against specific standards, can be improved, develop, learned and acquired. A competency is the qualification to perform, not the actual performance”. [8]

Any introduction of a new technology raises questions of competency analysis. What are the necessary job skills we do not have yet? How to define performance standards for the introduction period? And afterwards? How does it require the emendation and modification of our standard processes? How to make it possible for our people to acquire the necessary skills and knowledge in the most successful way? What can education and training to for solving such problems in general, and aid each innovation project in particular? Proper answers to such questions may lead us in a direction where competencies are well-defined, and Human Resources Management can methodologically re-form our organizations and processes by choosing by educating management and workforce alike.

If competency analysis can identify the unavoidable complementation of our job skills and set the right performance standards, if HRM and knowledge management can identify the necessary skills and knowledge areas to develop, if they are to help or even enable performance to improve in various ways so that all types of co-workers, professions and personalities can find the right selection for themselves with their support including all types of self-directed, individualized and facilitated (e. g. mentor services) training and education, only then will the organization be able to face such changes with considerable readiness and preparedness.

Whatever type or combination of types or forms the methodology used is to represent, the aircraft maintenance engineers are basically influenced by the correct designation of training's main aims, and the exact education objectives and the quality of presentation. Particularly important to organize and execute the correct training program if a new security system or technology is taken in at the airports which can basically influence the process of security system. We should organize and execute the element of the training which will modify the new competence of the specialist and choose the effective methods.

All the competency building and knowledge adaptation process has to be done with the individuals and their community in mind. Old skills and know-how is easier to be repositioned and brushed up than to be erased – in fact, they are part of the professional and organizational culture keeping people together. As a conclusion, all the necessary learning and competency building processes have to be done by the people and their organizations – there is no easy way imposing all the necessary changes on them from outside. If the results are not theirs, if the new explicit and tacit knowledge does not build together with the old one, if the new skills do not form an integral part of a system together with the old ones, they will always represent an alien body in their culture and thinking and will not properly function – even further, they will trigger "allergic" reactions of the organization defending itself against them. Internalization, even if it starts in time (that is, quite a time before the technological innovation), will not succeed without building desire and triggering action on the side of the participants. Without this all new knowledge will remain, at best, an item in the database unable to be activized and used in daily work. Building internal motivation, however, may on the long run be much less expensive for the organization than piling up useless knowledge. [3, 12, 13, 14]

CONCLUSIONS

Any introduction of any new type of equipment, let alone aircrafts is stressful for the existing maintenance engineering staff for multiple reasons. Their antagonistic reactions and the imposing of further stress on them by the traditional task-centred organization can be avoided by a cultural change for people orientation, the reorganization and modernization of the practices and concepts of the human resources management function and put more effort in the proper targeting of educational and training activities before, during and after the event. Beside the unavoidable investments, a wide range of conceptual and cultural changes should be considered. One of them is to consider concentrating on a multi-model analysis of issues focusing on and starting with the "individual" level of complexity models. Another key may be the active adaptation of modern management disciplines and methodologies in such fields as human resources management, knowledge management or total quality management in order to set the focus fixed on the needs of the co-workers and to provide ourselves with new planning and control tools. If we succeed doing so, our organizations will adapt themselves to the modern concepts, will learn to use the proper thinking tools and processes, and will have more chance to manage technological modernization with more success and less stress. The weak point is that nobody can do it instead of us. "The new era requests a new type of thinking, new philosophies, new concepts" [4]. It cannot be built on solutions other than the cooperation of highly educated, internally motivated professionals.

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