STUDY ON PERFORMANCE-BASED TRANSFORMATION IN THE CASE OF AVIATION TECHNOLOGY INSERTION

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Abstract: *The architecture of military aviation organizations is complex and interactive. In this respect, the initiated scientific approach shows combative capacity improvement opportunities by identifying and implementing coherent and effective best practices in major projects and procurement of military weapons systems. The objective of this paper is to draw guidelines in terms of performance, processes and technologies, enabling the planning, implementation and monitoring of successful transformations generated by insertion of new technologies. For the integration of organizational excellence in military aviation architectures the binomial Benchmarking - Lean Enterprise Architecture is used. Finally, the model is implemented in the current Romanian Air Force's case.*

Keywords: *Aviation Technology Insertion, performance based transformation, Benchmarking, Lean Enterprise Architecture, Romanian Air Forces*

1. INTRODUCTION

The term "technology insertion" is used to describe: minor improvements, a new version, major modernization or replacement of the system.

IT projects have a high rate of failure (partial or total), with reference to the operational objectives, especially regarding new technology insertion [1,2,3] or in the case of neglecting organizational aspects [4].

For projects procurement of military and weapons associated systems risks can be grouped into the following categories: technical (e.g. Inconsistencies with initial technical requirements) [5]; costs (e.g. overrun the budget planned) [6]; time (e.g. non-calendar of activities); bureaucracy (e.g. lack of flexibility) [7].

According to technological determinism, the most important factor in achieving success for an organization is the technology [8].

Investment programs such as "technology push" in the military remove the fear of being "left behind" (low confidence in the existing technique).

Complex socio-technical systems theory highlights the limits of predicting organizational behavior, but argues success through the high capacity to adapt to the environment [9].

Other theories claim that technology is a dependent variable in the organization of other factors, such as human (as a decision-maker and user) [10]. Policy makers need to efficiently manage the lifecycles of combat systems without compromising the performance objectives [5].

Repeatedly extending lifetime or reducing procurement of new systems projects are temporary solutions in terms of budget constraints.

The main arguments for the introduction of new military technologies are [11]: cost reduction, the need to develop new capabilities, maintaining knowledge base defense, legislative requirements and industrial capacity.

To minimize costs and maximize value throughout the investment cycle, there are two possible directions to be followed by makers of defense [12]:

- technology insertion (new or upgrading aging systems for increased performance and/or reduce operating costs and maintenance);

- the opportunities offered by civil technology.

Change management in military organization has acquired new meanings amid increasing complexity accelerated technique/weapon systems and reducing their development cycle. Through transformation the military organization develops proactively combat capabilities in order to achieve and maintain competitive advantage, the main change courses being: people, organization, processes and technology [13].

2. STRATEGIES FOR PERFORMANCE-BASED TRANSFORMATION

2.1. Benchmarking best practices

The benchmarking method was originally used for measuring and comparing business processes in an organization in order to improve performance [14].

Developed as a form of competitive analysis, benchmarking can be applied to any type of organization, and strategic investment projects in order to identify the most effective practices.

The need to monitor process efficiency is the main reason for applying this technique [15].

In military aviation organizations, the need for studies of performance was felt along with the strategic decisions acquisition of modern weapons systems (e.g. Change the fleet of fighter jets). Given the environmental peculiarities defense industry benchmarking procedure is the most appropriate method of identifying potential opportunities to improve performance of certain components.

Benchmarking is a cyclical process whose ultimate objective is to determine the best practices that lead to superior performance when implemented in your own organization. Selection of evaluation partner/partners is based on the criterion of possibility to transfer the results of this / these.

Data analysis should provide answers to the following questions: What are the conditions generating performance? There are similar conditions in the transforming organization?

If not, what are the changes necessary to the successful implementation of best practices?

Action Plan Performance resolves the issue of closing the gap by identifying and implementing best practices / equipment in order to enhance the performance level.

Benchmarking best practices for the identified problem (aviation technology insertion) includes specific elements of the benchmarking process (oriented to identify the most effective practices), benchmarking performance (focused on quality analysis equipment) and strategic benchmarking (examination assessment strategies followed by the partners).

In the literature there are several models of implementation of benchmarking, and the great challenge is effective planning and implementation of a strategy. Application cycle P.D.C.A. (Plan-Do-Check-Act) can be successful in terms of total involvement of the management organization that will be responsible for implementing changes [16]. For the integration of organizational excellence in architecture are proposed the following steps: determining the strategic objective knowledge of their organization, identifying areas where there is some malfunction, selecting partner / partners of comparison, the development and implementation of the results of benchmarking to improve performance [17].

2.2. Lean Organization Arhitecture

Designing an organizational architecture is performed in accordance with the strategic objective to be met: the transition to multi-role combat aircraft operations F-16.

The concept of architecture description refers to the specific patterns of organization engineering (instruments and methods of conception, design, implementation and maintenance). Lean Enterprise Architecture (LEA) is an architectural framework for reengineering the organization, design, construction, integration and implementation of Lean organization, using methods from systems engineering.

In the context of the need of reconstruction of a complex system transformation architecture is required and the key factor is the accelerated nature of the transformation that involves quick decisions.

LEA design includes lean type attributes and recreational requirements of the organization, being complementary to continuous improvement processes (e.g. total productive maintenance). Within the total productive maintenance (TPM) optimization refers to minimizing losses (labor, time, materials), in a context based on the principle *just in time.*

LEA architecture uses a multiphase approach, focused on transforming phases in the life cycle, being developed in an integrative perspective that takes into account the strategic elements.

There are five basic elements arranged sequentially according to the principles of engineering and life-cycle of the organization.

The specifications of each block are tools that lead to improved processes for designing and maintaining lean principles functionality.

The interaction of the lean architecture and the concept of transformation in the context of life cycle take place at several stages.

Each phase creates the necessary conditions for transformation.

The combination of specific methodologies of lean organization with benchmarking process steps for the provision of an image processing actions, and support continuous improvement process (Figure 1).

The implementation of such a process to the organizational structure of the Air Force is a challenge.

At the level of functional cells, in addition to deficiencies related to the lack of trained personnel, access to data needed to implement such a process are limited.

For example, in the management of the supply chain, aviation cell function is more concerned with the existence of a contract and / or the quality and timeliness of services, provided that all maintenance at this level are not sufficient to influence suppliers supply and most decisions are made in the acquisition phase, which makes it impossible to change the phase of support [18].

3. A CASE STUDY IN IMPLEMENTING BENCHMARKING-LEA IN ROMANIAN AIR FORCES

Changes looming in Romanian Air Force, amid the transition to multi-role combat aircraft F-16, generate a complex range of challenges for policy makers resizing infrastructure, security and safety redesign, changing operating and maintenance procedures, new requirements for education and training, budget restrictions etc.

All these pressures lead to the use of benchmarking techniques integrated into the strategic planning process.

Romania completed the purchase of 12 Lockheed Martin F-16AM/BM Fighting Falcons from Portugal, the first aircraft is scheduled to be delivered in 2016 and initial operational capability achieved in 2017. The aircraft entered the Portuguese Air Force equipment in 2002, and the contract includes the cost of upgrading (e.g. avionics, engines), modernization and staff training tracks [19].

Benchmarking aims at implementing the aims of the organization's strategic planning, the performance evaluation of different processes and the identification of best practices for integration into operating procedures in order to improve quality [20].

To establish performance indicators and measurable parameters are grouped according to industry: operational culture (skills, English aviation terminology, Flight Operations features, from collectivistic to individualistic approach, frequent operation and the regular scheduled maintenance), pilot training (need for modern training aircraft and operational regardless of the weather, launch preparation of Bologna stage I, outsourcing service, use of foreign instructors), maintenance (staff training), infrastructure and organizational architecture.

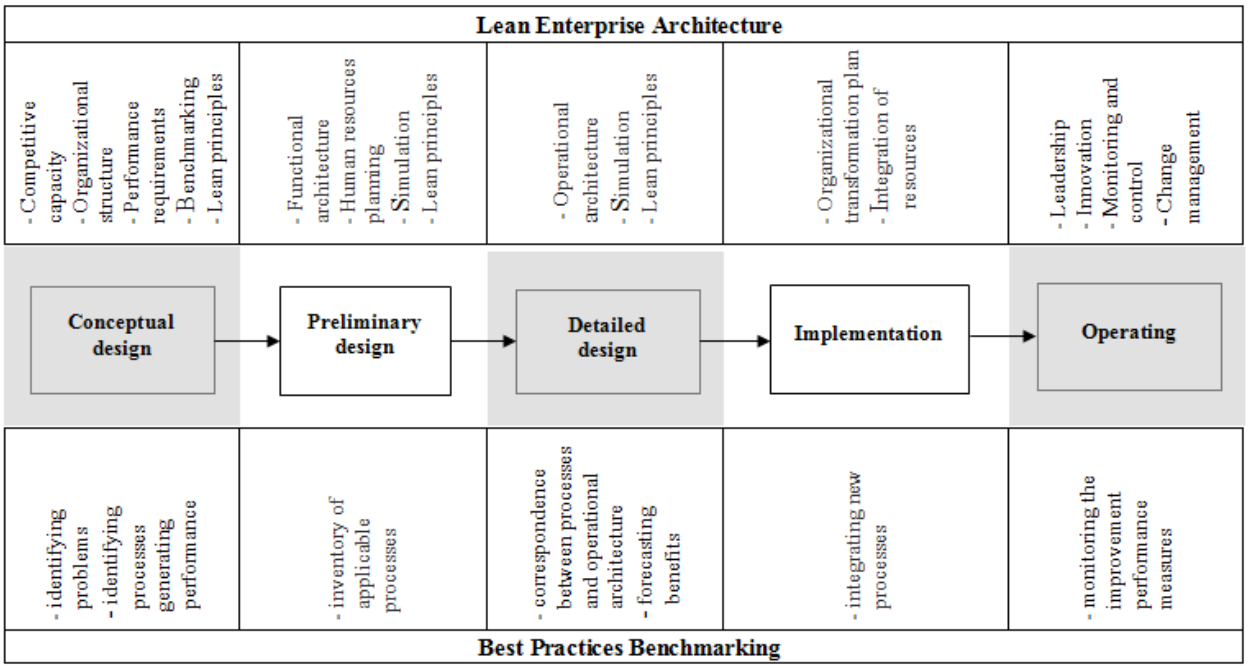

Fig. 1 A framework of implementing Benchmarking-LEA in Air Force

In order to achieve the desired performance characteristics on organizational lean architecture the best practices associated with benchmarking functions and processes are identified and described (Tab. 1).

Aviation technology insertion (ATI) creates a number of difficulties both organizational (technological training, compatibility, operational planning, safety) and local / national (technology transfer). ATI process management provides a flexible, quick and effective response to the demands of modern operational environment. The possible Best-in-ATI Organizations' could be Egyptian Air Force and Polish Air Force (both changed fleet of MiG-21 with multi-role F-16 aircrafts in order to upgrade their military capabilities). Throughout the process of benchmarking, an integrated project team (IPT) in collaboration with decision makers (strategic and operational level) manages the implementation and transformation. Informational resources needed to implement Benchmarking LEA model are diverse: survey (administered by appropriately by questionnaire); web-search (Research Institutions, Institutions benchmarking); reports (from military briefings or news media); scientific research (conferences and workshops papers, PhD Thesis, books).

Tab. 1 Benchmarking Functions, Processes and Best Practices Atributes

Functions	Processes	Best Practices Atributes
Management and Administration	Decision-making powers	- Full integration of all functional areas into an iterative and closed-loop process, with the embedded ability to monitor success and to identify improvement opportunities - Performance management team
	Administrative structure	
	Lean enterprise strategy	
	Redundancy	
	Bureaucracy	
	Audit systems	
Human Resources	HR planning	- Implementation of an accredited quality HR management process throughout the organisation - Adequate training
	Organization structure	
	Education	
	Training	
	Operational culture	
Facilities and Technology	Infrastructure assets	- Asset condition assessment - Process capability analysis - Integrated IT products
	Information Technology	
	Prediction, monitoring and intervention systems	
Logistics Support	Costs of logistics	- Performance-based logistics - Risk management - Implementing resource planning systems
	Transportation	
	Contracting	
	Supply Chain	
	Warranty	
Maintenance, Repair and Overhaul	Budgeting and cost accounting	- Agile MRO facilities using performance-based requirements - Adopt "Just in time" inventory program - Empowered multifunctional work teams - Sustaining manufacturing capability
	MRO planning	
	MRO-decision support tool	
	Location of maintenance checks	
	Availability of supplier resources	
Environmental Performance	Noise impacts	- Formulate a regulatory framework - Monitor air quality and noise - Implement new energy-efficient technologies - Develope fuel efficiency improvement programs
	Emission impacts	
	Power consumption	
	Fuel consumption	

4. CONCLUSIONS

Achieving Romania's assumed objective as a security provider in this sensitive region of Europe is possible in the context of the strategic decision to change the fleet of combat aircraft.

Integration of new aviation systems is not an easy task. Its success is conditioned by the result of the interaction between several factors (training, equipment, personnel, infrastructure, doctrine, organization, information, logistic - TEPIDOIL). The result of such a project is difficult to predict.

The military organization is subject to significant elements of uncertainty in the strategic connections between units and functional cells in the context of ATI. On the one hand there is the influence of the external environment (dynamic security context, technological, budgetary constraints, operational capability requirements) and secondly the impact on strategic units and cells (TEPIDOIL domains). Thus, this Benchmarking LEA approach in Romanian Air Forces may be supplemented to take into account both internal dynamics and the external presented.

Defining performance process – strategic-indicators and identifying best practices do not fully solve this complex problem, a number of challenges resulting from the analysis of possible partners for evaluation:

- increased costs (operational - amid requirements and system reliability "rating standards pilot"; training - providing the necessary flow of training of seafarers to avoid the rise of inactivity problems; the expansion and modernization of operational capabilities - infrastructure, simulation centers);
- limited capacity to absorb investment funds in national defense industry;
- overcoming institutional resistance to change (technical, operational or cultural).

The project must not remain a unique exercise. Future research is directed toward developing Benchmark Performance Metrics based on information provided by the best practice case studies and questionnaires in order to significantly improve the success rate of such an investment project.

Developing a model that incorporates institutional benchmarking process becomes extremely useful in decision making in the context of continuing the trend of acquisition of new military systems.

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