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The Key Role of Risk Management in Integrated Management Systems

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At the beginning of the 21st century, integrated management systems (IMS) are the key for quality management, in order to meet customer needs, restructuring the organization, reducing costs, increasing productivity and profit, and the long-term sustainable development of the organization. ISO 9001 forms the backbone of an integrated management system, as it establishes a systematic approach keeping in mind risk in business. Risk-based thinking is already a part of the process approach. This approach establishes a link between the likelihood of a particular danger and the seriousness of the consequences. The paper presents the principles of risk management that are embedded in the integrated quality management system at the Military Technical Institute. The specificity of the development of armament and military equipment requires an integrated approach to risk management. The presented structure of the IMS enables a simple extension with the requirements of the new standards that are planned for implementation in the future.

Key words: **risk, integrated management systems, product lifecycle management.**

Introduction

ALL the principles of a society's development, in case of ever-present hazards and risks, can be applied to any organization. The survival of every company on the market is closely linked to the existence and control of diverse risks that appear in all aspects of the business. In order for the organization to be successful, it is forced to manage the existing risks in the best possible way in order to achieve its business goals. Therefore, the leadership of each organization must insist on establishing an effective risk management system in order for the organization to achieve its goals and meet the requirements of all stakeholders in the best way.

Risk management in organizations implies a systemic reduction of the possibility of any kind of error, along with minimizing the consequences of that error. For every modern organization, errors mean cost, that is, the loss of competitiveness, and the avoidance of loss resulting from errors in work processes is the basic goal of every company.

Based on the above, it is concluded that risk management must be a part of a comprehensive decision making process in each company, and that the survival and development of each organization depends on the effective management of risks. One of the ways in which the organization's management can systematically deal with business risks and risks proactively is to align business with the requirements of relevant international management standards.

If the organization decides to introduce any management standard and adheres to the requirements defined by the concrete standard, it will definitely reduce certain risks that could jeopardize its business. By implementing a number of international standards, organizations establish an integrated management system (IMS) and thus reduce entropy in the performance of the workflow, if the requirements of these standards are met in a way that is consistent and not disharmonic. Management standards, each from its standpoint, regulate organization processes and create better conditions for the business of the organization, which contributes to a greater number of risks being controlled.

Principles of Risk Management

Because life is filled with risk, smart people and well-run organizations set out to manage it as effectively as possible. ISO 31000 is a family of standards relating to risk management codified by the International Organization for Standardization. The ISO 31000 family include [1, 2, 3].

In management science, experts sometimes distinguish between the concept of risk and the concept of uncertainty [5]. When making decisions under conditions of risk, you know the probability of the risk event you are examining. When making decisions under conditions of uncertainty, you do not.

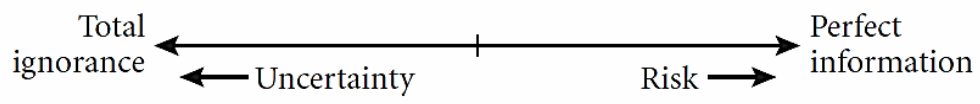

Figure 1. Risk, Uncertainty, and Levels of Information. [5]

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Various approaches to classifying risks, lead to the following list [5]:
- Pure (or insurable) risk: possibility of injury or loss.
- Business risk: opportunity for gain as well as loss
- Project risk: if something can go wrong, it will (Murphy's Law)
- Operational risk: risks associated with carrying out operations.
- Technical risk: the risk of not achieving budget, schedule, or specification targets is substantial.
- Political risk: decision making is heavily colored by political factors.

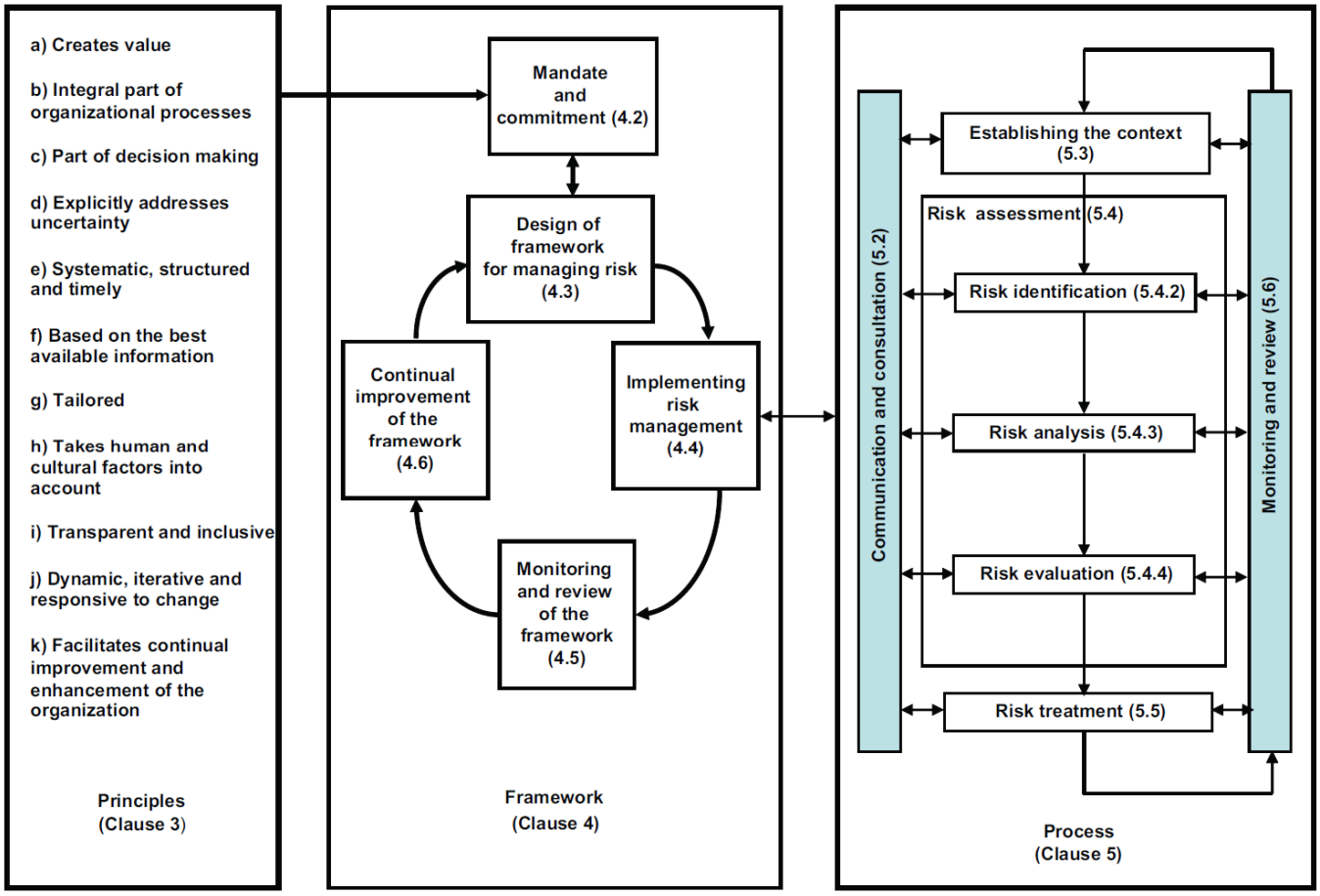

Figure 2. Relationships between the risk management principles, framework and process [1]

Risk assessment is a part of the risk management process, Fig.2, which provides systemic identification of hazards and assessment of their impact on the organization's projected goals [1]. Based on the risk assessment from the aspect of the likelihood of the occurrence of the disorder and its potential consequences, information necessary for making appropriate decisions for the prevention and remediation of potential deviations can be obtained.

The risk management framework has five steps [1]:

1. Plan for risk
2. Identify risk
3. Examine risk impacts, both qualitative and quantitative
4. Develop risk-handling strategies
5. Monitor and control risk.

Different ways that risk identification exercises can be carried out [5]:
- Checklists
- Brainstorming sessions
- Issues logs
- Behavioral models
- Diagramming techniques
- Flowcharting project and process models
- Regular meetings

Risk comprises two components: likelihood and impact. The likelihood-impact matrix offers a good way to categorize risk events qualitatively in terms of their probability of occurrence and their consequences. As Lord Kelvin (Sir William Thomson) says: "Until you can measure something and express it in numbers, you have only the beginning of understanding". The risk can be presented mathematically as a triplet: $\{Scenario_{(i)}, Probability_{(i)}, Consequence_{(i)}\}$. For financial risks (where consequences can be all un-controversially expressed in monetary units), it can be converted into an expected loss. Risk is then the mathematical expectation of the total loss.

$$E_{(\text{loss})} = \sum P_i \times C_i \tag{1}$$

Table 1 shows a possibility of completing a risk matrix. As an example, the matrix 4x5 is selected. Companies choose different matrix formats (3x3, 4x5, 6x4, 5x5, ...) depending on the context of the company and the details of the risk assessment. Weighing coefficients for the consequences and frequency of events should describe real situations. Table 1. is just an example of applying eq.1.

Table 1. Risk estimation

		SEVERITY/CONSEQUENCES				
Probability/Frequency	4x5 Risk Matrix	Insignificant		Minor	Severe	Major
		1		2	3	4
	very infrequent	1	Low (1)	Low (2)	Low (3)	Low (4)
	infrequent	2	Low (2)	Low(4)	Medium (6)	Medium (8)
	fairly frequent	3	Low (3)	Medium (6)	Medium (9)	High (12)
	frequent	4	Low (4)	Medium (8)	High (12)	Extreme (16)
	very frequent	5	Low (5)	Medium (10)	High (15)	Extreme (20)

Probability:

1 = very infrequent: Possible to occur, but only in unlikely circumstances or very unreasonable use

2 = infrequent: Unlikely, but possible to occur at some time during expected lifetime of product

3 = fairly frequent: Might occur at some time during expected lifetime of product

4 = frequent: Reasonably expected to occur at some time during life of product

5 = very frequent: To be expected on every use of product although not necessarily occurring.

Severity:

1 = Insignificant:

2 = Minor: Temporarily affects but no permanent damage

3 = Severe: Permanent damage or loss of product quality

4 = Major: Permanent damage and major loss.

Evaluation risks are assessed against a defined criterion. The company calculates risk level, choosing the limitation: Low (1→5), Moderate (6→10), High (11→15), Extreme (16→20). In addition, risk level is marked with color: low (green), medium (yellow), high (orange) & extreme (red). Selecting a risk analysis technique is specific to each specific situation or problem.

Integrated Management Systems

It is long past that companies have only one Quality Management System. The demands of the market, customers / users, the community and, above all, the legal regulations require companies to have multiple Management Systems: QMS (Quality Management System), EMS (Environmental Management System), OHSMS (Occupational Health and Safety Management System), CRSMS (Corporate Responsibility Social Management System), FMS (Financial Management System), FSMS (Food Safety Management System), SMS (Security Management Systems), ISMS (Information Security Management Systems), CTCL (Competence of the Testing and Calibration Laboratories), DMS (Dependability Management System), A-BMS (Anti-Bribery Management System). In a single word, the overall quality of business becomes the ultimate goal of any serious company. A large number of standards, time needed for implementation and necessary resources have become a heavy burden on the resources of any company. Integrated Management Systems (IMS) is the only logical solution, but the key problem is how to build a functional system that will remain easily upgraded and expanded with new standards that are expected in the future.

Table 2. Overview of standardized management systems [7]

	Name	Code	Interesting side
QMS	Quality MS	ISO 9001:2015	Customer / Client
EnvMS	Environmental MS	ISO 14001:2015	Community
OHSMS	Occupational Health & Safety MS	ISO 45001:2018	Workpeople / Employee
CSRMS	Corporate Responsibility Social MS	ISO 26000:2010	Employee; Society
FMS	Financial Management System	Sarbanes - Oxley Act	Shareholders
FSMS	Food Safety MS	ISO 22000:2018	Customer / Client
SMS	Security MS	ISO 28000:2007	Shareholders, Community
ISMS	Information Security MS	EN ISO/IEC 27001:2017	Shareholders
CTCL	Competence of the Testing & Calibration Laboratories	EN ISO/IEC 17025:2017	Customer / Client
DMS	Dependability MS	EN 60300-1:2014	Customer / Client
EgyMS	Energy Management Systems	ISO 50001:2011	Shareholders, Community
A-BMS	Anti-Bribery Management System	ISO 37001:2016	Society

The generally accepted definitions of IMS from the point of view of the top management of the organization are as follows [7]: "Integrated management systems is a comprehensive management tool that connects all elements of the business system into a single process management system in the organization, in order to meet the requirements of stakeholders and achieve business goals in accordance with the vision and mission of the company".

Approaches to the Design and Implementation of IMS

A key issue of the practical approach to the implementation of integrated management systems and the rationalization of these approaches, as well as the benefits of their subsequent use, is its flexibility to future requirements from the environment [6]. Many authors referred to different approaches for IMS implementation. In the literature, the most well-known approaches are: "Total Quality Model" [Karapetrovic & Willborn; 1998], "System Model" [Seghezzi; 1998], "St. Gallen Model" [Seghezzi & Schweickardt; 2001], Organizational Model [Conti; 1999]. All these models have different advantages and disadvantages and indicate that there is no the best approach for all possible situations.

However, the practice in the implementation of integrated management systems in organizations has often been based on the "blind" fulfillment of the requirements of selected standards, and these requirements are not directly related to the risks of the organization.

Therefore, it often happens that the established IMS is not functional, i.e. it is not in line with the real needs of the organization. Not a small number of organizations, as the sole purpose of implementing the IMS, have the right to obtain the appropriate certificate, even the top management is not interested in the implementation of the IMS. The company expands certificates only to improve the image on the market [11].

Another problem that arises when designing the necessary documentation of IMS is its scope, which ultimately depends on the free assessment of the project / consulting team. In order to establish precise criteria that will define the required scope and type of IMS documents, a general model for establishing an integrated management system based on risk assessment needs to be developed.

The conclusion is that it was not possible to create a best IMS model, nor is it possible to develop a technique that could work in all cases [6]. This is due to the fact that the goal and initial conditions (starting points) on the way to the IMS are different for different organizational systems.

All the aforementioned authors, in the basis of their approaches, state the standards and their implementation as the most necessary detail. This is understandable because of the general importance of these standards for the functioning of organizational systems in today's business conditions. This can create an impression and a practical consequence of the separation of these systems from the existing management. As a consequence, often these systems become artificial structures rejected by the regular flow of the process.

The fact is that the organizational systems existed and functioned even before the publication of the international standards of the management system and will exist after these or future standards. The solution of the problem should be set in the processes of design and development of the organizational system itself and its parts.

This approach defines the IMS as a set of interdependent processes to achieve the set goals. The IMS system model contains 5 elements [6]:

- Defining goals,
- Planning and designing the system,
- Gathering and allocating resources,
- Implementation of the system,
- System evaluation and continuous improvement

Integration of requirements of different standards

The first approach to IMS implementation is based on the requirements of different standards for management systems and the level of integration, Picture 1. Special attention is paid to documentation and possibility of its rational design. Options for this approach [6]:

- Sequential approach
- Parallel approach
- Combined approach

Integration of the management systems

The second group of approaches, as the starting point for the design and implementation of the IMS, has the demands of different stakeholders. These approaches define the IMS (as well as each system) as a set of interdependent processes that work harmonized, sharing human, material, information, infrastructure, and financial resources in order to achieve the set goals [6]. Goals can refer to quality, environment, health and safety at work, etc., but they will be unified through the integration of IMS.

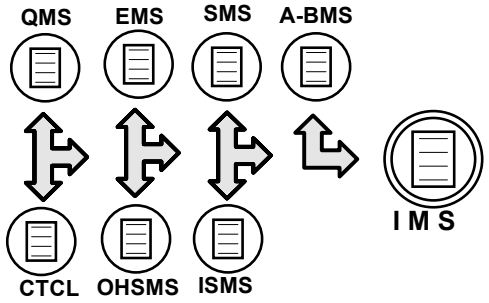

Figure 3. IMS –Integration of different standards

In this approach, the organization is viewed as one system, rather than set of independent functionally specific management systems, Fig.4. Once all the functional requirements of the existing management system are integrated, there are necessary components for IMS and it is possible to include appropriate standards of the management system within the IMS framework. Research and development (R&D) in the organizational system can be the basis of this approach for IMS design.

Therefore, integration is primary in the existing management system, and secondary at the level of the requirements of the strong standards of the management system.

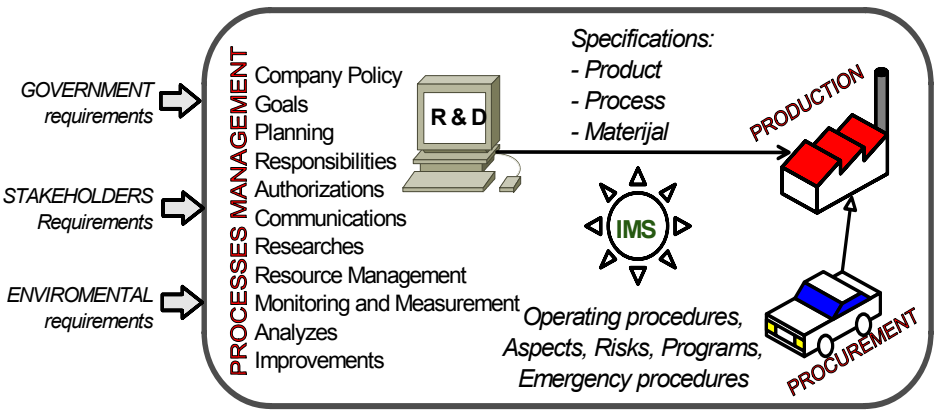

Figure 4. Integration of the management systems

As a result of previous observations, it is possible to notice certain levels of implementation of an IMS as well [6]:

- Complete integration (highest level); Implementation of the requirements of the management system standard in the existing organizational system

Incomplete integration (middle level); Implementation of standards and design of a management system with not respect the organizational system; two parallel management systems:

- Incomplete integration (lowest level); a variant of the previous incomplete integration that continues in case of continuation of the implementation of the requirements of other standards.

PAS99 Framework

Publicly Available Specification [10], prepared by British Standards Institute (BSI) is well known as PAS99. The IMS framework used in this document is based on ISO 72 Instruction, with some changes and is tested in practice. Many of the requirements in standards/specifications are common and these can be practically accommodated under one generic management system.

PAS99 is intended for use by those organizations that apply the requirements of two or more management system standards. These organizations should use PAS 99 in combination with specific requirements of standards such as ISO 9001, ISO 14001, ISO / IEC 27001, ISO 22000, ISO / IEC 20000, OHSAS 18001 and others. The specification insists on two elements:

- System approach in defining all processes and documents of the management system
- Risk analysis.

Compliance with PAS99 does not by itself mean compliance with other management system standards or their specifications. Specific organizational standards must be met and satisfied if they wish to achieve certification. Starting from the PDCA cycle, this specification gives the distribution of its own elements within the specified cycle.

Risk Base Thinking

As is always the case, the solution also creates new problems, so the implementation of the idea of designing an IMS based on risk assessment has been addressed with the following problems:

- Identify potential dangers of relevance to the organization. A detailed analysis of the key processes in which different types of deviations can occur, the first step is required for a successful risk assessment, and therefore must be treated with great care.
- Selecting a universal risk assessment method. The risk assessment method must be applicable to all types of organizations, adapted to all the processes taking place in them and to all identified types of hazards. From the results obtained by the assessment, the IMS is directly dependent on the need to be established in the organization, so this step is of exceptional importance.
- Developing a risk-based IMS implementation model. Establishing a model that will assess the assessed risks in an adequate manner and, depending on the ranks obtained, suggest the development of an appropriate level of documentation of an integrated management system, is a fundamental problem whose solution is expected within this manuscript.

ISO 9001 is a backbone of the integrated management system, and therefore, it is inevitable when integrating more standards into the system (moreover, should begin with this standard).

Considering the applicability of the ISO 9001 standards to the entire management system (it only contains a recognized system of general requirements that relates to the entire organization's management system without regard to the activity, size and other specificities), it can be said that the first condition of an integrated management system is to fulfill the requirements of this standard.

The IMS is a system that primarily meets the requirements of the ISO 9001 standard and then the system in which the requirements of other management standards applicable in the organization are integrated. There is only one basic reason to fit the requirements of other management standards into a management system that applies the requirements of ISO 9001. This is an improvement.

Systematic approach to considering risk, instead of "prevention" as a separate component of a QMS is the key changes in the ISO 9001:2015. Risk is inherent in all aspects of a QMS. There are risks in all systems, processes and functions. Risk-based thinking ensures these risks are identified, considered and controlled throughout the design and use of the QMS [16].

Risk-based thinking is not new, it is something we do already, ensures greater knowledge of risks and improves preparedness, increases the probability of reaching objectives, reduces the probability of negative results and makes prevention a habit. Risk-based thinking is something we all do automatically in everyday life [16].

Different approaches to risk for AS&D organizations

The International Aerospace Quality Group (IAQG) updated AS9100 [4] for aviation, space, and defense organizations (AS&D) to align with ISO 9001:2015. The concept of risk is particularly emphasized in both standards. Risk is not a new concept for the standards, but it has a more pronounced role, content, and influence in an organization's actions and approach to processes and the QMS. While ISO does not mention risk at all for external providers, AS&D the operational risk significant and provides additional detail of risk considerations.

The AS9100 standard enhances the ISO's use of risk, making sure that organizations document, consider, evaluate, and mitigate risk to the requirements. AS&D organizations ensure product safety so risky business does not put lives at risk. The AS9100 series quality model (QM) has additional requirements beyond ISO 9001, shown in Table 3.

Table 3. ISO 9001 & AS9100 differences

ISO 9001:2015		AS9100D	
8	Operation	8	Operation
8.1.	Operational planning and control	8.1.	Operational planning and control
-	-	8.1.1	Operational Risk Management
-	-	8.1.2	Configuration Management
-	-	8.1.3	Product Safety
-	-	8.1.4	Prevention of Counterfeit Parts

The question of importance is: why do AS&D companies have a separate QMS standard? Many reasons for that, some of them are [14]:

- High risk products,
- High cost products,
- Tightly controlled industry requirements (Statutory, Regulatory, Customer),

- Safety is a must,
- Quality is required,
- Failure is not an option

More than one QMS (Quality Management System) is called a "Combined" QMS, which is different than an Integrated Management System (IMS). IMS integrates two or more standards from different disciplines into one. (example: ISO 9001, ISO 14001, ISO 50001). A Combined Management System combines two more standards from the same discipline into one. (example: ISO 9001, AS9100)

IMS Implementation in PLM System

The standards allow "paper" implementation of the System Management, but in the present time it is inconceivable to manage any business processes without the help and use of the computer. If QMS is just a bunch of papers with the aim of formally meeting the requirements of the standard, it is clear that its purpose and goal is only to improve the image of the company and nothing more. If the management systems are not embedded in the management and business processes of the company, but only rigidly and bureaucratically follow the requirements of the standards, at their ultimate goal serve only for marketing purposes.

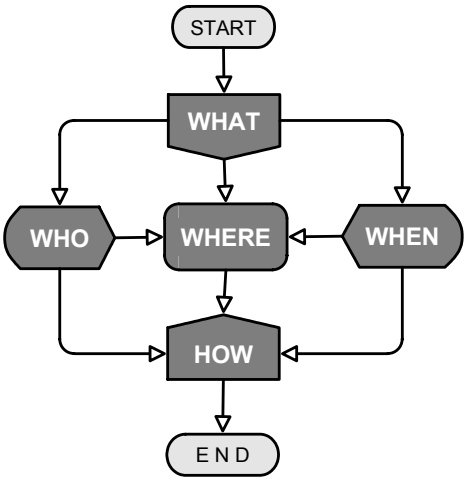

Figure 5. The dilemmas before the implementation of the Information System [13]

Some analysis [11] shows that most companies get the certificate as a way of improving their image. The results indicate that the level of perceived corruption and the weight of exports to Europe have a relationship with the national diffusion of ISO 9001 certificates.

In order for the implementation of the integral solution to be successful and comprehensive, it is necessary to get answers to the questions: WHAT, WHO, WHERE, WHEN and HOW, Fig. 5.

- What: Identify data that enters the IT system
- Who: Who has access to data in the IT system
- Where: Identify groups or categories for storing relevant data
- When: To determine the stage of readiness of the data for use
- How: Determine how to use data

During the analysis, business processes and activities must be systematically broken down and described so that all the requirements and data that are necessary for managing the product life cycle can be considered [13]. If the system of consistent processes is not understood and established in the organizational units and in the enterprise as a whole, it is not possible to implement a productive Information system.

It is clear that an integral IT solution is needed, a PLM (Product Life-cycle Management) system that will include employees, processes, products or services, depending on the company's activity. It is necessary to implement the new generation of PLM systems, prepared to monitor the network integration of products, i.e. IIoT (Industrial Internet of Things).

Phases of the Information System Design

The traditional methodology for the development of information systems [8] consists of the following phases:

1. Strategy: Defining the strategy and goals of the development of PLM in accordance with the strategy and goals of the company; Examining the possibilities of modern IS; Defining the PLM development plan
2. Analysis: Analysis of the requirements of the users obtained from the interview and on the basis of the existing documents; Structural system analysis, which in a precise formal way describes the requirements of users
3. Design: Logical & Physical design
4. Implementation: Installation and physical connection of equipment; Installing software; Training course
5. Maintenance.

The development process was not completed when the PLM system was introduced. The development continues with the addition of new software modules, by modernizing existing functionalities. The development of the system takes place while the system is "alive".

In general, the analysis process is distinguished by the fact that the observed phenomenon, or the problem, is broken down into the components that are individually considered. The concept of system analysis in the field of informatics is the first phase in the development of the information system [8]. Within this phase, it is necessary to specify what one (software) system should provide in terms of functionality, but not how it will be implemented. Clear separation of the "what" and "how" issues makes it easier on the one hand the process of system analysis, and on the other hand leaves the possibility for more alternative system implementation.

There are several common techniques for collecting information relevant to development:

1. Examining the documentation
2. Interview
3. Observing work in an environment for which PLM needs to be developed.
4. Research
5. Questionnaires.

The first step is to interview employees, using prepared questionnaires. The next mandatory step, prior to the implementation of PLM, is a detailed overview of all the activities and business processes, as well as the documents generated and used in these processes. This analysis must be much more detailed and complete [13]. This step has to be done in a more formal way from the interview. It represents the most important and indispensable phase for the implementation of the PLM system.

The two most well-known methods used for detailed analysis of the process and activity of business systems are SSA (Structural Systems Analysis) and BPMN (Business Process Modeling Notation).

Structural Systems Analysis

SSA is implemented in phases and well-defined methodology. Essentially, the system is analyzed in different ways. It can be with an accent on:

- Business functions (functional decomposition),
- Data flows (decomposition of data flow diagrams),
- Defining the dictionary of data,
- Defining links between entities in the system (drawing diagrams objects ↔ connections).

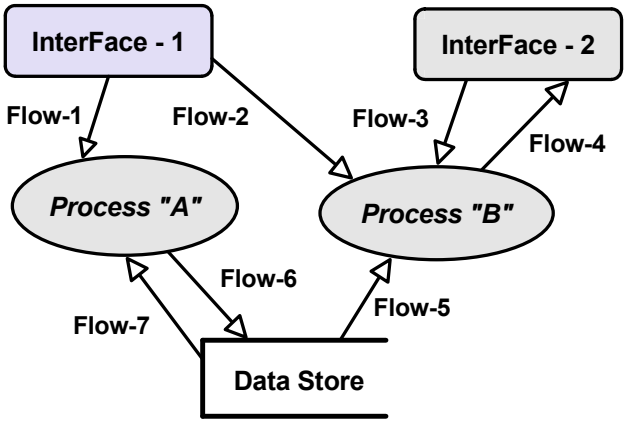

Figure 6. Jackson's diagram [8]

Functional decomposition diagrams are used in determining the basic system functions and decomposing them. These functions usually correspond to the fully represented processes in the flowchart diagrams [8]. Diagrams of functional decomposition are also called, according to their creator, Jackson's diagrams, Fig.6. The top-level functional diagram represents the basic business functions of the organization.

Business Process Modeling Notation

The Object Management Group (OMG) has developed a standard Business Process Model and Notation (BPMN). The primary goal of BPMN is to provide a notation that is readily understandable by all business users, from the business analysts that create the initial drafts of the processes, to the technical developers responsible for implementing the technology that will perform those processes, and finally, to the business people who will manage and monitor those processes. Thus, BPMN creates a standardized bridge for the gap between the business process design and process implementation [9].

Another goal, but no less important, is to ensure that XML languages designed for the execution of business processes, such as WSBPEL (Web Services Business Process Execution Language), can be visualized with a business-oriented notation.

BPMN is designed to be readily understandable by all business stakeholders. These include the business analysts who create and refine the processes, the technical developers responsible for implementing them, and the business managers who monitor and manage them, Fig.7.

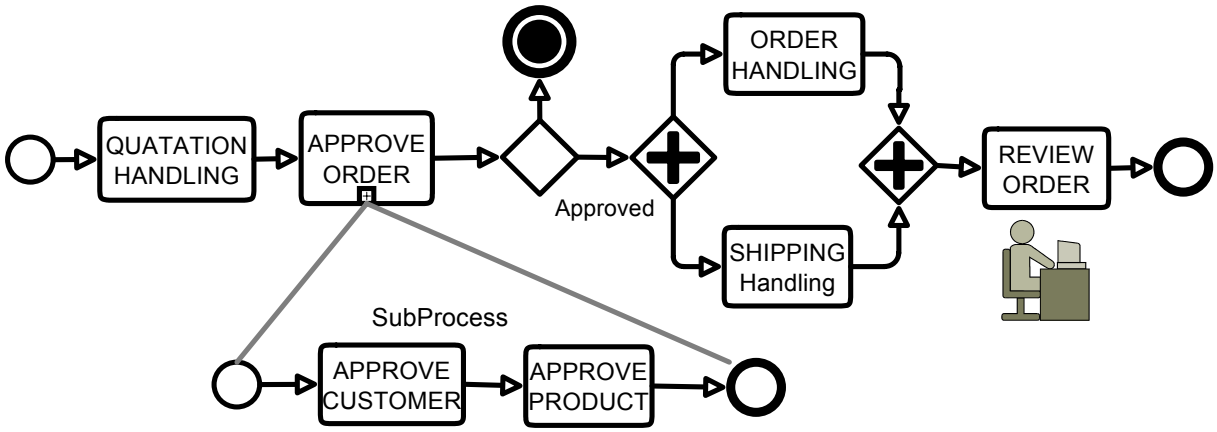

Figure 7. BPMN diagram [9]

Implementation of IMS in VTI – Case Study

Military Technical Institute (VTI) is the largest military research and development institution in Serbia, and it is an integral part of the Ministry of Defense of the Republic of Serbia [12]. It is certificated at the Ministry of Science and Technological Development as a scientific and research institution of the Republic of Serbia. VTI has 24 modern laboratories at its disposal. Some of them are of international importance, some of them are unique in the Balkan region, and most of them exceed military importance and can be regarded as a national resource of the Republic of Serbia.

At the very beginning of the implementation of the management system, VTI was simultaneously certified for QMS and CTCL. A large number of laboratory capacities conditioned this approach. Since compliance with CTCL means that the QMS was introduced, the overall issue is not considered IMS. QMS certification and CTCL accreditation were the beginning of the introduction of IMS. Additionally, VTI has "Design Organization Approval Certificate ", the license assigned by the Civil Aviation Directorate of the Republic of Serbia [12].

Further certification according to EnvMS, OHSMS & ISMS is required to completely change the approach and all management systems approach in an integra manner. The changes of ISO 9001:2008 in the new version of 2015 were an opportunity for the full reconstruction of Quality Manual, which would cover all 5 management systems (QMS, CTCL, EnvMS, OHSMS & ISMS).

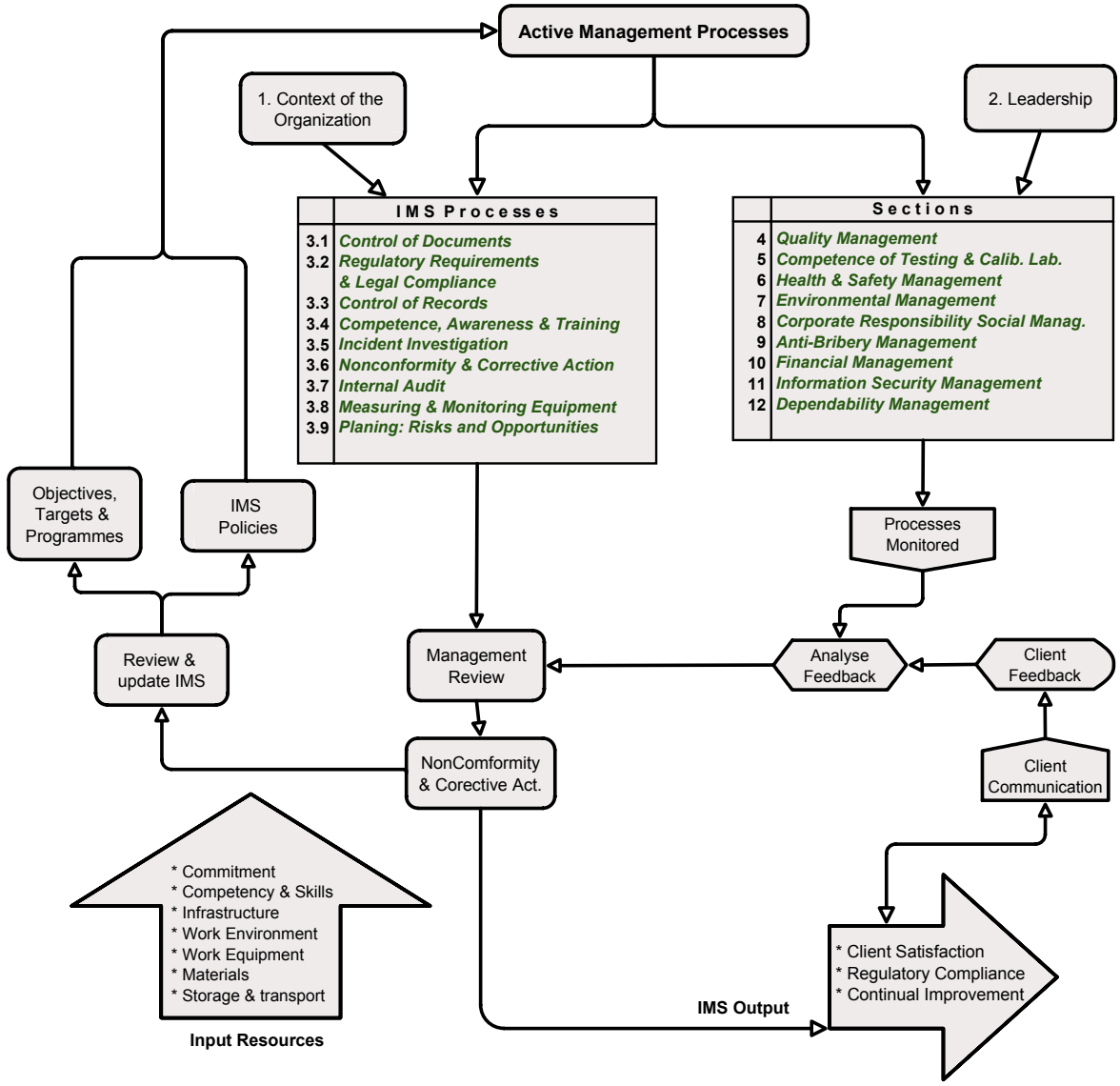

Figure 8. IMS Management System Process Map [15]

All processes are broken down to basic activities in accordance with the principles explained in 3.1. Support by the Information System defended responses on five key issues: *What, Who, Where, When* and *How*.

The complexity of integration is best illustrated by the fact that the total number of documents to integrate is 560. The IMS quality manual has been completely reconstructed. Extremely large number of documents conditioned the use of e-paper. All documents are connected using hyperlinks, starting from IMS Manual to documents which define records. The new IMS Manual structure is shown in Fig. 8. Chapter 1 defines the context of VTI, and chapter 2 defines the leadership. Chapter 3 defines common IMS processes. Other chapters define certified management systems, but also leave space for the integration of new ones. IMS Manual is the top document linking quality manuals to each of the laboratories. Separate quality manuals of the laboratories are linked to appropriate procedures and instructions. For each of the supervised and measured processes, the corresponding records are in an electronic and paper form.

A large number of existing documents in the quality system conditioned that access to integration was a combination of the methods described in chapter "*Approaches to the Design and Implementation of IMS*". For the purposes of this integration, the services of specialized consulting agencies were not used. All the work was done by a team of employees from each of the 24 laboratories.

Conclusion

Business, as well as life itself, is risky and therefore it is quite logical that risk management is a key factor in IMS. Taking into account that VTI is primarily a R&D company for armament and military equipment (AME), as well as the fact that it has 24 laboratories, risks management are necessary in the focus. All areas of defense technologies are risky not only for users of AME, but also for engineers and technicians working on research and development. The information integration of all IMS documents (procedures, instructions, records) enables all employees easy and quick insight into all aspects of quality management. The presented structure of the IMS enables a relatively simple extension with the requirements of the new standards that are planned for implementation in the future.

Further improvements of IMS are in the introduction of an integral PLM solution. Integrated PLM solution will simplify monitoring and management of R&D processes. This is extremely important because of the connections with Serbian

Defense Industry. Risk management should include the entire life cycle of products, including: design and development, process planning, procurement, production, verification, packaging and storage, sales and distribution, market research.

As it has been highlighted several times, quality management must be in the service of business processes and not for itself.

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Ključna uloga menadžmenta rizicima u integrisanim menadžment sistemima

Početkom 21. veka integrisani menadžment sistemi (IMS) su ključni za upravljanje kvalitetom, kako bi se zadovoljile potrebe kupca, restruktuiranje organizacije, snizili troškovi, povećao profit i produktivnost, čime bi se obezbedio dugoročni održivi razvoj kompanije. ISO 9001 je kičma IMS, jer uspostavlja sistematski pristup razmatranju rizika u poslovanju. Sastavni deo procesnog pristupa je razmišljanje bazirano na rizicima. Ovakav pristup uspostavlja vezu između verovatnoće određenog rizika i težine posledica. U ovom članku predstavljen je menadžment rizicima koji je inkorporiran u Vojnotehničkom institutu. Specifičnost razvoja naoružanja i vojne opreme zahteva integralni pristup menadžmentu rizicima. Predstavljena struktura IMS omogućava jednostavno dopunjavanje zahtevima novih standarda čije se usvajanje planira u budućnosti.

Ključne reči: **rizik, integrisani menadžment sistemi, upravljanje životnim ciklusom proizvoda.**