Abstract

Government organizations in each country play a fundamental role in a wide range of issues. As a result, a large portion of the national resources is dedicated to them. A part of such expenses is related to using high-tech industries. Moreover, since governmental organizations are in relentless competition with other organizations and also due to the fact that they need to handle important responsibilities and face management complexities, using high technologies seems vital for them. Doing so necessitates a constant relationship with high-tech industries. Therefore, an increase in the interoperability of such organizations can result in both a decline in expenses and a development in the quality of their relationship. The field of high-tech organizations is very widespread, so this study focuses on aviation industry organizations and the main subject matter is their interoperability with governmental organizations. In the present study, first some of the major interoperability models of organizations and governments are reviewed. Then, considering different dimensions of the proposed model, three main layers are identified whose concepts are thoroughly explained regarding the aimed industries. Finally, a framework for the interoperability of aviation industry organization with governmental organizations is proposed.

Keywords: Interoperability, Interoperability frameworks, High technology, Governmental organizations, Framework

1. Introduction

Technology defines as manufacturing goods, provision of services and improvement in the use of limited and valuable resources. High technology firms are those “that emphasize invention and innovation in their business strategy, deploy a significant percentage of their financial resources to R&D, employ a relatively high percentage of scientists and engineers in their workforce, and compete in worldwide, short-life-cycle product markets” (Milkovich, 1987). Vernadat (1996) defines interoperability as “the ability to communicate with pier systems and access the functionality of the pier systems” (VERDANAT, 1996). Aviation industry is seen as one of the high-tech industries. Aviation industries' activities covers a wide range and some of their main services are mentioned in different literatures (LIBANET, 2015), (CAPA, 2015), (CAPA, 2015). In table 1, these activities are categorized.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing and Production</td>
<td>Manufacturing aircraft engine, its related systems and parts, Production of metallic and non-metallic parts, Production of airplane sandwich panels and assembling them, Patrolling aircraft production, Two-seater light aircraft production, light and ultralight airplane manufacturing, Drone production, Production of unmanned and manned aircraft and its related tools and subsystems</td>
</tr>
<tr>
<td>Health</td>
<td>Medical and rescue services</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Pilot training, Research in the field of air production technology, Documentation and standardization of air products, Short and long term training courses, Development of design offices and laboratories in the field of aviation</td>
</tr>
</tbody>
</table>
Maintenance, Repair & Overhaul (MRO)

| Maintenance, Repair & Overhaul (MRO) | Overhaul and maintenance of warplane, transport aircraft, passenger plane and also aircraft engines and industrial engines, Overhaul of some industrial engines, Overhaul and repair of helicopters |
| Testing services | Flight test facilities, Aerodynamic, construct and systems testing services using laboratories and wind tunnel |

So far, no general definition of the term "Interoperability" has been presented. By the definition of IEEE, interoperability is the ability of two or more systems or components to exchange information and use the information that has been exchanged (Geraci et al., 1991). Vernadat (1996) defines interoperability as the ability to communicate with pier systems and access the functionality of the pier systems (VERDANAT, 1996). To be interoperable in Miller's view, one should actively be engaged in the ongoing process of ensuring that the systems, procedures and culture of an organization are managed in such a way as to maximize opportunities for exchange and re-use of information, whether internally or externally (Miller, 2000). Minimizing the expenses facilitates organizations' goal achievement. Interoperability plays an important role in decreasing costs and increasing service quality in organizations (Choi & Whinston, 2000). Aviation industry is one of the organizations that cooperates with governmental organizations in most countries. Aviation industry, as a high-tech industry, fulfills governmental organizations needs by offering useful services. Therefore, a suitable interoperability framework for aviation industry and governmental organizations seems important and necessary.

2. Interoperability Frameworks

By 1990s, studies on interoperability loomed up. Most of these studies tried to come up with an enterprise/government interoperability framework. Generally, the main purpose of a framework is to provide an organization mechanism in which concepts, problems and enterprise interoperability are shown in a more systematic way.

2.1. ATHENA Interoperability Framework

The ATHENA interoperability framework (AIF) is comprised of three levels (Fig. 1): Conceptual integration which concentrates on concepts, metamodels, languages and model relationships, offers several aspects of interoperability in order to model system's foundation. Applicative integration which focuses on standards, methodologies, and domain models, affords guidelines, principles and patterns that can be used to solve interoperability issues. Technical integration which emphasises on the technical progress and ICT environments, offers ICT tools and platforms in order to develop and run enterprise applications and software systems (Berre et al., 2007).

Interoperability at the enterprise/business layer is the organizational and operational ability of an organization to cooperate with others. POP* metamodel supports cooperative organization modelling. Process interoperability's
goal is to make numerous processes work together. A process describes the sequence of the functions in line with some evident requirements of a company. CBP (cross-organizational business process) metamodel supports process interoperability modelling. Interoperability of services is related to identifying, composing and performing various applications. PIM4SOA (platform independent model for service-oriented architecture) metamodel could support modelling such services. Interoperability of information/data is described as exchanging, managing and processing of diverse messages, documents, and structures using various cooperating entities (Berre et al., 2007).

2.2. IDEAS interoperability framework

The IDEAS interoperability framework (see Fig. 2) was developed by IDEAS project on the basis of ECMA/NIST Toaster Model, ISO 19101, and ISO 19119 and improved through the Quality Attributes (IDEAS, 2003). Based on this framework, interoperability is attained on multiple levels: enterprise coordination, business process integration, semantic application integration, syntactical application integration, and physical integration (Chen & Doumeingts, 2003).

![IDEAS framework structure](image)

Fig. 2 IDEAS framework structure (Chen & Doumeingts, 2003)

Business layer is related to issues which concern organization and management of an enterprise. This layer includes the decisional model, the business model, and business processes. The decisional model determines decision makers and decision processes and the level of their position, role and responsibility. The business model describes profitable interactions between an enterprise and the way it offers services. Activities that deliver value to service receiver are named as business processes. The Knowledge layer is focused on structuring, acquiring, and representing both collective and personal knowledge of an enterprise. It contains not only the knowledge of internal aspects (e.g. products, administration operating and controlling method, personnel management way), but also the knowledge of external aspects (e.g. partners and suppliers, legal obligations, laws and regulations, and relationships with public institutions). The ICT layer pertains to the ICT solutions that permit an enterprise to make decisions, operate, and exchange information within and outside its boundaries. The ICT layer contains various fields (e.g. solution management, workplace interaction, application logic, process logic, and data logic). The semantic dimension cuts across the business, knowledge and ICT layers. It is concerned with capturing and representing the real meaning of concepts and hence, reinforce understanding. Considering semantics on each layer of an enterprise is necessary for understanding the general perspective of interoperability (Chen & Doumeingts, 2003).

2.3. INTEROP-NOE Interoperability Framework

This framework deals with three approaches of integration, uniformity and federation in order to remove barriers (i.e. conceptual, technological, and organizational one) to create interoperability in business, process, service and data layers (INTEROP, 2006) (Fig. 3).
Fig. 3. INTEROP-NoE Framework (Chen, Dassisti, & Elvesaeter, 2006)

The proposed framework is based on two-dimensional Enterprise Interoperability Framework (EIF) and its extended mode that is three-dimensional EIF (Fig. 4).

Interoperability barriers are identified as conceptual barriers (syntactic and semantic differences), Technological barriers (architecture, platform, infrastructure, etc.), and Organizational barriers (definition of responsibility, authority, and incapability). Interoperability concerns are known as the interoperability of data (making data models and query language work together), service (identifying, composing, and making various applications function together), process (make various business processes work together), and business (working in a harmonized way). Interoperability approaches are classified as integrated (common format for all models), unified (common format only at meta-level), and federated (no common format) (Chen, Doumeingts, & Vernadat, 2008).

2.4. European Interoperability Framework

European Interoperability Framework shows how government services and systems link reciprocally in order to present, complete and enrich. So it is necessary for national interoperability frameworks to evolve as a multilateral framework (IDA, 2004) (Fig. 5).
From the EIF's standpoint, three main aspects should be addressed: Organizational interoperability which focuses on integrating business processes and meeting user requirements by making services accessible, readily recognizable, reachable and user-focused. Semantic interoperability which ensures that despite the different linguistic, cultural, legal, and administrative environments in the EU, the accurate meaning and formats of exchanged information is comprehended. Technical interoperability institutionalizes technical specifications.

2.5. E-health Interoperability Framework

E-health interoperability framework (see Fig. 6) which was developed by NETHA (National E-Health Transition Authority), documents approaches, policies, information and tools that are common in the health sector to provide an interoperable e-health environment. This framework provides a unified guidance source for healthcare society to achieve consensus so they can use them as a basis for business and system integrity (NEHTA, 2005).

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**Fig. 5. European Interoperability Framework (IDA, 2004)**

**Fig. 6. E-Health Interoperability Framework (NEHTA, 2005)***
A shared policy and process framework across the E-Health interoperability programme which includes each NEHTA initiative will be provided by the Organizational Interoperability. When new technologies appear in the market, information interoperability undergoes changes in terms of technology and solution. Technical Interoperability deals with the specification of technical standards which empowers solution delivery.

2.6. e-Government framework

The e-Government Interoperability Framework (e-GIF) includes the government’s technical policies and specifications (Fig. 7). Its main goal is to achieve interoperability and ICT systems coherence across the public sector. The vital fundamentals for joined-up and web-enabled government is defined by e-GIF (e-GIF, 2004). Matriculating the Internet and World Wide Web characteristics for all government systems is the main thrust of the e-GIF (e-GIF, 2005).

![Fig. 7. e-GIF architecture (e-GIF, 2005)](image)

As said by e-Government unit, the main policy decisions which have formed the e-GIF are as follows:

- Alignment with the Internet
- adoption of XML as the primary standard for data integration and data management for all public sector systems
- adoption of the browser as the key interface
- the addition of metadata to government information resources
- the development and adoption of the e-GMS
- the development and maintenance of the GCL
- adherence to the e-GIF is mandated throughout the public sector
- conforming to the standards in the eGIF using interfaces between government information systems and intermediaries providing e-Government services (e-GIF, 2004, 2005)

3. Interoperability layers

Presented interoperability frameworks in previous parts of this article, covers different layers of interoperability. Table. 2 shows the comparison of interoperability framework based on their overlying layers.

<table>
<thead>
<tr>
<th>Type</th>
<th>Enterprise/Business</th>
<th>Technical</th>
<th>Conceptual</th>
<th>Functional</th>
<th>Informational</th>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDEAS</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>ATHENA</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>EIF</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>e-GIF</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>INTEROP</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>NEHTA</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
</tbody>
</table>
Selection and classification of interoperability layers are two fundamental factors in enterprise interoperability. Based on research by the United Nations Development Program (UNDP) three interoperability layers are proposed as the main layers: business layer, conceptual layer and technical layer (UNDP, 2007). Based on the nature and concept of these layers, they can be seen as covering all the other interoperability layers.

### Table 3 The concepts of Interoperability layers

<table>
<thead>
<tr>
<th>Business Interoperability</th>
<th>Functional</th>
<th>Information</th>
<th>Knowledge</th>
<th>Conceptual</th>
<th>Business</th>
<th>Technical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual Interoperability</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td></td>
<td>■</td>
</tr>
<tr>
<td>Technical Interoperability</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td></td>
<td>■</td>
</tr>
</tbody>
</table>

### 3.1. Business Interoperability

Legner and Wende define business interoperability as “the organizational and operational ability of an enterprise to cooperate with its business partners and to efficiently establish, conduct and develop IT supported business relationships with the objective to create value” (Legner & Wende, 2006).

### Table 4 Business Interoperability Framework (Legner & Wende, 2006)

<table>
<thead>
<tr>
<th>Business Interoperability (= Organizational design of the external business relationships)</th>
<th>Category</th>
<th>Perspective</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of external relationships</td>
<td>&quot;How do we manage and control external relationships?&quot;</td>
<td>Interoperable organizations manage and monitor their external business relationships.</td>
<td></td>
</tr>
<tr>
<td>Collaborative business processes</td>
<td>&quot;How do we collaborate with business partners?&quot;</td>
<td>Interoperable organizations can quickly and inexpensively establish and conduct electronic collaboration with business partners.</td>
<td></td>
</tr>
<tr>
<td>Employees &amp; Culture</td>
<td>&quot;How do we behave towards our external business partners?&quot;</td>
<td>Interoperable organizations promote relationships with business partners at an individual, team-based and organizational level.</td>
<td></td>
</tr>
<tr>
<td>Information Systems</td>
<td>&quot;How do we connect with business partners?&quot;</td>
<td>Interoperable ICT systems can be linked up to other ICT systems quickly and inexpensively and support the cooperation strategy of the organization.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contingencies (= Factors which impact the organizational design)</th>
<th>Category</th>
<th>Perspective</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperation model (internal)</td>
<td>&quot;What is the strategic intent of cooperating with external partners?&quot;</td>
<td>Business strategy and cooperation model impact the required level of business interoperability.</td>
<td></td>
</tr>
<tr>
<td>Collaboration Space (external)</td>
<td>&quot;Which baseline exists for collaborating with business partners?&quot;</td>
<td>The collaboration space comprises proven cooperation models, processes and infrastructure which are available in the specific context.</td>
<td></td>
</tr>
<tr>
<td>Industry and general environment (external)</td>
<td>&quot;Which environmental factors affect the external business relationships?&quot;</td>
<td>Industry dynamics, legislation and other environmental factors determine requirements to business interoperability.</td>
<td></td>
</tr>
</tbody>
</table>

The layer of Management of External Relationships initiates with planning and defining the cooperation, (e.g. choosing partners and contractual agreements), and covers all features of substantiation, cooperation implementation and monitoring.
In Collaborative Business Processes layer, organizations collaborate in business processes. It covers three main sub-layers: Public process in which business partners can depend on a rich and well documented public cooperation process that is applied and reflects industry standards. Process visibility in which business partners achieve a specified view of the corresponding business processes which permits them to improve the plan and alignment of their private processes. Business semantics in which the semantics main activities, messages, documents, and master data are defined.

The Employees and Culture emphasize that the organizations under study don’t have to have a mutual collaboration. So, if these organizations decide to perform an interoperable engagement, they should schedule their processes based on trust and right management.

Information Systems layer generally cover 3 main sub-levels: Interaction type which defines the level of technical process integration (human-to-human, human-to-machine or machine-to-machine). Connectivity which covers a wide range area starting from individual connections (1:1) to (m:n) connections. Security and Trust which is the capability to direct transactions over the internet considering business partner’s privacy and security requirements along with existing e-business legislation.

The Cooperation Model layer specifies coordination requirements and interaction intensity also the related network of business partners such as: cooperation scenario (e.g. Collaborative Product Design), cooperation target (for instance externalize resources e.g. aircraft technician), cooperation partner type (customer, supplier, service provider, and competitor), number and size of partners, cooperation dynamics (Stable – dynamic), network configuration (Hierarchic – heterarchic), initiator (Internal – external – consortium), interdependence among cooperation partners (Pooled interdependence – sequential interdependence (e.g. in supply chains) – reciprocal interdependency), product complexity /customization (Low – middle – high)

Industry and General Environment relates to two sub-layers: the first one is checking legislation adaptation with national (including city, state, federal) and international laws and legislation, and the second one is checking regulation existence of industry-specific, national or international regulation and standards and industry dynamics (High – middle – low)

The collaboration space relates to the existing baseline for electronic collaboration in the specific context of the networked enterprise. Public process checks the existence of frequently accepted public processes. Business semantics relates to accessibility of standards and their nobility regarding semantic definition of particular domain. Sociocultural aspects relates to the degree to which electronic communication and partnerships are tolerated or postulated by partners and organizations. The dominant interaction type depends on the accessibility of platforms that provide for m:n scalability. Technical infrastructure relates to availability of communication foundation (e.g. Internet, private networks) (Legner & Wende, 2006).

### 3.2. Conceptual Interoperability

Conceptual Interoperability defines as enterprise ability in public, private, and voluntary sections and their information systems for discovering and describing data concepts and sharing them with other organizations and then, processing received information.

The Conceptual Interoperability includes Information Interoperability and Semantic Interoperability.

#### 3.2.1. Information interoperability

Information Interoperability, is the ability of transferring and using information in a unified and efficient way among a variety of information systems (finance, 2006). The proposed Information Interoperability framework based on Australian's IIF displays as Fig. 8.
The importance of information is not just because they pertain to governmental issues. The information should be seen as a strategic resource. For expedition and improvement of process, information standardizing should be managed properly. Information should be shared with others accurately, relevantly, and timely. They should be reliable also and duplication of them should be minimized. Assurance in re-usability of information is a crucial issue. Information management rules should be clear and comprehensive.

At first, the potential uses of new information collection is identified considering any potential barriers. After that, information is created, collected, captured and accessed in a variety ways from a variety of sources. Monitoring and managing the quality of information is vital in this stage. Following that, information needs to be organized and stored. In this stage, information should be accessible efficiently and appropriate metadata should be defined. Afterwards, information may be accessed and used. Accessing legislations as well as limitations, are the basic elements of this stage. Finally, regarding the effectiveness of information maintenance as well as reviewing of security, quality and accessibility in this stage is considered.

Implanting Information Interoperability needs the empowerment of its factors. Partnership and Collaboration level necessitates the collaboration and sharing information among the organizations with similar business needs. Establishing Agreed Authoritative Sources of Information means needs for responses about information, identifying and registering quality data, agreement on ownership. Adopting Common Business Language and Standards means metadata and reformation storage founding, determining standards for informational targets, and linking information interoperability framework to business interoperability framework. Establishing Appropriate Government Structure means defining and agreeing on responsibilities and different roles in information management among systems, setting up and developing a strategy to achieve mutual goals, determining measures to achieve those goals, and finally determining the aroused model from the best practical experiences related to subject. Understanding the Legal and Policy Framework means respecting information sharing and exchanging constitutional limits, monitoring the security of sharing considering privacy. Developing Tools to Support Internet Sharing means collecting the best practical guidelines and information sharing protocols and linking information interoperability framework to technical interoperability framework (finance, 2006).

3.2.2. Semantic interoperability

NATO's research group defined Semantic Interoperability as "the ability of two or more computerized systems to exchange information for a specific task and have the meaning of that information accurately and
automatically interpreted by the receiving system, in light of the task to be performed" (IST, 2008). Fig. 9 shows the semantic interoperability framework.

Facilitating information exchange using correct components is the main functionality of SIF. This is orchestrated into a number of stages, which Mojtahed et al (2011) have defined as the Semantic Interoperability Development and Execution Process (SIDEP). (Fig. 0)

The Preparation counts as an off-line phase, where organizations adjust their systems to new capabilities required for knowledge based SI consistent with SIF. The configuration phase commences after specifying the certain operation and its goal in order to coordinate the semantic descriptions of the heterogeneous participating systems in the operation. When it comes to high-level security, the operation phase is the only online phase where the configuration is accomplished and the SI tasks are performed according to SIF comprehending the exchanged massages between the engaged systems. Post-Operation is the last phase in which analysis and evaluation of the results take place (Mojtahed et al., 2011).

### 3.3. Technical interoperability

Technical interoperability layer relates to technical issues of computer system connections for data transferring. It refers to the standards and specifications that provide information exchange between computers and include principles, standards, guidelines for common transmission mechanism and development of metadata standards using a common language.

Since high-tech businesses use IS for technological innovations and rapid response to this partners, information confidentiality and efficiency are absolutely important to them. For these businesses it is very important to
make sure that business secrets are not disclosed. Network, data, personnel and software are among the major threats so such businesses.

![Fig. 11. Perceived IS threat and computerization level among the four industries (Yeh & Chang, 2007)](image)

Since the focus of this article is on the interoperability of high-level security and technology, security plays a special and important role in this framework. Among the proposed technical frameworks in literature, the framework proposed by Australian Government is chosen (IFWG, 2005 #13). This framework covers all the layers enumerated as a comprehensive criteria by UNDP (i.e. Interconnection, Data integration, data and metadata management, Information access and present, Business services, Web services, Security). Moreover, in this framework, Security level is the most important level whose appropriate overlapping with other levels is definitive. (Fig. 12)

<table>
<thead>
<tr>
<th>Interconnection</th>
<th>Data exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
</tr>
<tr>
<td>Metadata for Process and Data Description</td>
<td></td>
</tr>
<tr>
<td>Naming</td>
<td>Security</td>
</tr>
</tbody>
</table>

![Fig. 12. Technical Interoperability Framework (IFWG, 2005)](image)

Security includes standards and technologies in order to support safe interoperation (e.g. encryption of data, public and private encryption and decryption keys, digital signatures, and secure transmission protocols such as IPSEC). Interconnection contains standards and technologies which relate to connecting systems (e.g. basic connection protocols such as HTTP and FTP, the Web Services message exchange protocol SOAP and the service description language WSDL). Data Exchange relies on standards and technologies for structure description and data encoding (e.g. email protocols SMTP and X. 400, resource syndication protocols like RSS, and data markup languages such as XML and SGML). Discovery contains standards and technologies covering the detection and location of resources (e.g. metadata standards, thesaurus, directory standards such as LDAP and X.500). Presentation contains standards consistent information presentation (e.g. presentation standards include HTML and XHTML, image and streaming media formats, document encoding format RTF, and specialized markup languages). These standards are pertain to the sequencing of operations and their execution dependencies (e.g. workflow definition and description languages, the emerging Web Services coordination and choreography languages such as BPEL4WS) (IFWG, 2005).

4. Proposed framework

In earlier sections, newer and more thorough frameworks for interoperability were explained. Base on their application, each framework covers especial layers and emphasizes on especial points. The general layers in these frameworks are business, technical, conceptual, functional, informational and knowledge layer. Due to the overlap of these layers, the business interoperability, conceptual and technical layers are considered as the
inclusive ones. Then, the structures of each layer regarding the industry under study, were scrutinized and explained.

In business interoperability layer, organizations try to manage their external relationship and establish good cooperation dynamics. A culture of trust and establishing appropriate information systems can pave the way for the interoperability of the two organizations. Moreover, organizations should set up an internal cooperation and interoperability model in their business.

In information interoperability layer, rules and regulations of relationship management, whose most important aspect is organization information life cycle, should be obeyed. In order to develop interoperability in these layers, defining appropriate cooperation space, and setting the necessary rules, policies and standards are needed then, by enabling it, organizations interoperability will be achieved in the layer.

In the technical layer, the necessary standards and techniques for establishing a common relational-informational mechanism is described. The major structures of this layer include developing a common layer and metadata standards, methods of discovering and presenting information, data exchange models and interconnection models. The main reason why this framework was chosen this that it is complete and also security plays an important role in it. Considering the fact that in this interoperability framework, we need to exchange secret and top secret information, it is very important to describe an appropriate security system and utilize it properly in order to set up this framework successfully. As a result, not only do we need to describe a complete and efficient security system which covers all the layers in the organization, but also there is a need for the description of a common security system in order to transfer information safely between organizations.

The semantic aspect of this framework, cuts across business, informational and technical layers which brings about identification and assigns meaning to concepts and therefore enhances identification. Adopting a holistic view in interoperability requires consideration of semantics of each layer. For organizations which want interoperability and need it in special layers, real identification is one of the important priorities. In order to make sure that concepts are well transferred and there is a mutual understanding, we can use anthology and identical definitions.

Considering what was said above, the proposed framework for interoperability of aviation industry organization with governmental organizations is put forth.
Fig. 13. The Interoperability Framework
5. Conclusion

In the present study, a framework for the interoperability of aviation industry organization as a high-tech organization with governmental organizations was proposed. First, the main interoperability framework of organizations and governments was introduced, and then, considering the identified layers, business, conceptual and technical layers were chosen as the main and inclusive ones. Having defined these layers, the subsections of each layer were scrutinized. Next, considering the industries under study in this paper, these aspects were described.

The proposed framework is not only complete, but it also highlights the role of security which is very important in confidential connection systems. Examining the details of the layers, as well as the suitable aspects for them can enhance the quality and inclusiveness of the proposed framework. Moreover, examining the degree of the proposed interoperability framework for the organizations under study, here can be a topic of interest for further research.

References


