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DIGITALIZATION. DUAL-USE TECHNOLOGIES AND MANAGEMENT OF NEW BUSINESS MODELS – WAYS TO RESPOND TO CHALLENGES. USH PRO BUSINESS. WALACHIA HUB AND DUAL-USE CLUSTER CASE STUDY

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Abstract

Dual-use technologies, which mean technologies used for both military and civil applications, are evolving in the context of digitalization.

Even in pre-digital era, at the dawns of the technological progress of mankind, the use of technologies was ambivalent, both for warfare and civil wellbeing.

Now however, we assist to a fast blending of dual use and digital processes which is changing the landscape of the business models. We name this new process interaction as Dual-use Digital Blending (DDB).

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This paper is investigating the trends of evolution of this blended dual-use digital transformation technologies and their impact on the new geo-economic and geopolitical confrontations, on the trade flows and economic balance of power. We analyse the new emerging business models triggered by DDB and the managerial challenges they will require, especially for innovative SMEs and SMEs. Finally, we argue that university led innovation ecosystem, like the case study presented, may offer knowledge hubs for managers, organized in clusters in order to be better prepared for the described DDB process.

Keywords: *dual-use; export; digital transformation; new business models.*

JEL Classification: F50, H56

The Global Technological Context and the Emergence of DDB

Extensively, dual-use goods refer to any item or technology that has both civil and military commercial applications. It can include the components of weapons, but also items used in the manufacture of a component of a weapon as well. The complexity comes from the process of digitalization when not only products can contribute to weapons manufacturing but also IT&C services.

The process within which digital technologies are used is often named digitalization. This process has important consequences on the future warfare. In the global or regional confrontations, digital processes became an important advantage in defence and security. Internet of Things (IoT), Cloud Computing, Big Data, Data Analytics, Artificial Intelligence, Augmented Reality and Blockchain are important technologies not only for civil purposes, but also for cyber confrontations.

The growing trend of digital platforms has led to an increase in military capability to allow a better development of armed forces operations. The level of combat readiness is essentially related to digitalization. The digital transformation also brings new players to the market in the sphere of traditional industries that have been directed for a long time towards well-established business and work processes. Beside big companies specialized in defence and security, many of the contributors with innovation are SMEs or even start-ups non-incumbent in the defence sector before. There is strong growth in services in military structures, which are increasingly adopting aaS (as-a-service) models to be implemented, data monetization services or also “pay as you go”, due to tight defence budgets.

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Important part of that growth is coming from new, innovative players. They are consistently involved in changing the labour processes and traditional services that have effects on the provision of military capabilities. These unicorn tech companies are familiar with dual-use digital technologies such as Internet of Things (IoT), Cloud Computing, Big Data, Data Analytics, Artificial Intelligence, Augmented Reality and Blockchain and they are able to make military missions more efficient.

Even for some new players, the technical maturity of new technologies is missing, but their acceptance on the market will come sooner or later. One of the most important aspects to be considered is the security. That is why the entry of external players may be delayed, especially in the IT sector. Even top companies such as Amazon, Google, Microsoft, IBM, Cisco, etc. may not have formed all the military standards and requirements that need to be verified by military entities from the outset. Social acceptance within these large IT companies is a key factor that can have potential effects on subsequent market penetration. The strength of new technologies in the environments in which they operate is a permanent concern of military entities.

Literature Review

In the literature there is a fairly broad interpretation of dual-use goods covering the chemical, biological and nuclear industries, as well as encryption and navigation, computers, telecommunications, etc. Dual-use goods are advanced technological items that are not freely available on the world market and can be obtained from a limited number of exporters.

According to Fuhrmann "*dual-use commodities are those that can be used in weapons of mass destruction (WMD) programs or in legitimate civilian applications*". He has identified some determinants of dual-use trade related to democracy, alliance and military conflict. Dual-use exports are much more promoted in those countries where there are security guarantees and the default gains will be higher.

Kanetake examines in his study how EU dual-use exports control, in particular those associated with the export of cyber surveillance technologies, falls within the risks of human rights. Markides and Charitou looked at how a company can adopt two different business models in the same market. There are strategic innovative companies on the market that use radically different business models. Consecrated companies can benefit from growth opportunities following the implementation of the business models of innovative companies. At the same time, there is a risk of

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mismanagement if both types of business models are adopted. In another study, Markides and Oyon have identified the differences between the main business model of the established company and the disruptive business model that invaded its market. The authors observed how the established company tried to adopt the disruptive business model and the evolution of the company on the respective market.

Starting from the ambidexterity literature, Winterhalter, Zeschky and Gassmann investigated the problem of how companies integrate or separate business models at the level of value chain activities. Firms can become ambidextrous in their business models by separating domains, more precisely by separating the activities of the value chain in order to address the various additional customer segments in emerging markets.

Methodology

In this article, we analysed statistical data and literature related to production and trade and business models related to dual-use technologies. We also analysed the international norms and regulations related to this sector. In parallel, we analysed and described business models and clusters which are active in dual-use industries. Finally, we investigated best practices and made case studies.

Impact of DDB on Trade Flows

Dual-Use Export Control Regime

Dual-use goods are primarily regulated through an export control regime. Co-ordination of export control measures assist countries to fulfil their obligations under the Chemical Weapons Convention and the Biological Weapons Convention.

In most jurisdictions, including Hong Kong, United Kingdom, Australia, United States and the European Union, there are proscribed dual-use goods that require prior authorisation/licensing to export items outside the jurisdiction. In this way, government can identify and trace the movement of dual-use goods and, to the necessary extent, monitor and restrict the trade of such items.

The global nature of trade necessitates co-ordination and harmonisation of processes and approach

Each country has its own (often complex) set of prohibitions and licensing requirements, with differing scopes and requirements. Appropriate analysis and

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professional advice are often needed to navigate these rules and to assess cross-border implications.

Product Control Lists

Most jurisdictions maintain a control list of dual-use goods. In many cases, these lists are very specific and reflect that, as described above, the devil is often in the detail. Broadly speaking, prescribed control products lists are divided into broad categories, including nuclear materials, electronics, computers, navigation and aerospace. Recently, the EU updated its export list to include laser measuring systems, specified medical supplies and several biological agents. Ultimately, the success of a controls list is dependent on its global adoption, and regular review to ensure the list remains up to date.

Sanctions Enforcement

The effectiveness of any export control or control lists measures is dependent on an effective enforcement and sanctions regime. The enforcement regime often applies to all persons and companies who supply, sell or transfer sanctioned or proscribed goods without a license. Often, dual-use goods form part of sanctioned goods, or are destined for a sanctioned country, which serves an additional means to control the trade or supply of such goods.

The key global sanctions program is realized through the United Nations Security Council and implemented into domestic law. Jurisdictions such as the United States and Europe also impose their own sanctions programs. The lists are dynamic. Monitoring them typically involves using third party service providers and implementing robust compliance plans, as we describe below.

The Wassenaar Arrangement, the most comprehensive international regime for setting export control standards, has emerged to increase accountability in transfers of conventional dual-use weapons and technologies. Its purpose is to contribute to regional and international security and stability and to prevent the acquisition of these items by occult forces.

Obtaining reliable data on the export of dual-use items is very difficult as there is no well-defined economic sector. At European level, the competent institutions collect data with which approximate estimates of exports of dual-use goods can be made. These estimates are based on the number of licenses collected by the authorities and customs statistics for dual-use goods.

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Following the adoption of the EU Regulation from 2018, a checklist (Annex 1 from Regulation 2018/1922) was drawn up comprising 1,846 dual-use items classified into 10 categories comprising 1,000 customs goods (electrical equipment, metals and non-metallic mineral products, machinery, electronic and optical products, vehicles and transport equipment, chemicals, computer etc.).

Export of dual-use goods requires an authorization issued by the competent national authorities except for two situations:

✓ intra-EU transfers of dual-use items are not controlled, except for the strategic items listed in Annex IV which contains 239 items (items for cryptography, elements of secure technology, some items of MTCR technology, some items of Community strategic control);

✓ for Annex 1 items to certain non-EU countries, no authorization is required except for the items listed in Annex II to Regulation 428/2009. These transactions are made on the basis of the Union General Export Authorization (EU GEA) E001, which has the role of facilitating the export of dual-use items when the risk of diversion is low. There are 7 destinations provided in E001, namely Australia, Canada, Japan, New Zealand, Norway, Switzerland and the United States called E001 countries.

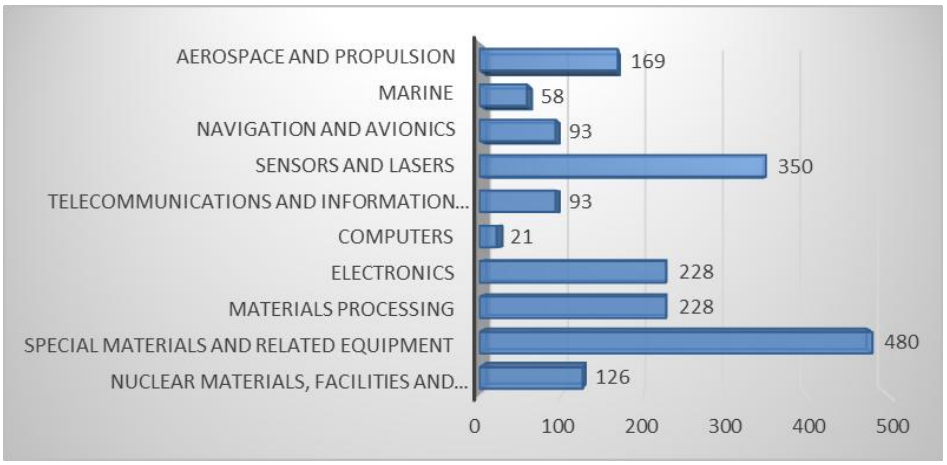

Fig. 1. Number of Dual-Use Items Listed in the 10 Categories
Source: www.ec.europa.eu

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For the Articles listed in Annex I to the Dual-Use Regulation which require export licenses, an export license application shall be submitted by the exporter stating its value. This value is called the Dual-Use Licensed Value (DULV) and is expected to be a lower bound to the real Dual-Use Export Value (DUEV).

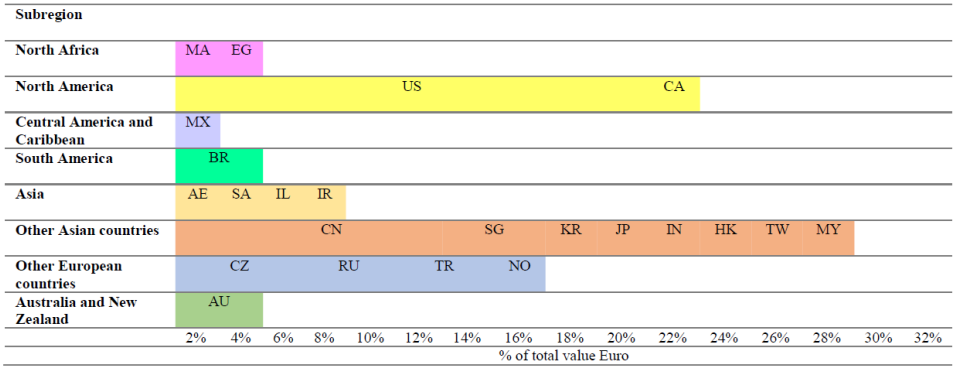

Fig. 2. Destination Countries by Regions of EU Dual-Use Export in 2017
Source: www.ec.europa.eu

There is a merchandise area that includes the dual-use trade as a part called the Dual-Use Export Domain (DUED). DUED is composed by the EU export value (intra and extra-EU) corresponding to the set of goods identified by the Combined Nomenclature and is an upper bound to the real Dual-Use Export Value (DUEV). The relative importance of dual-use trade shows us that dual-use exports represent about 2.3% of EU total exports (intra and extra-EU) within the 'dual-use export domain' of customs commodities.

Most dual-use exports are directed to the countries listed in the Union General Export Authorisations (EUGEA), which give us an idea of the structure of the EU export market in the relevant commodities. In figure 2, we can observe destination countries by sub-regions of EU dual-use export.

From the point of view of dual-use licensed value, the total value of applications reached EUR 50.2 billion and controlled dual-use exports thus represented 2.7% of total extra-EU exports. Authorised dual-use trade amounted to EUR 36.6 billion, representing 2.0% of total extra-EU exports (see figures 3 and 4).

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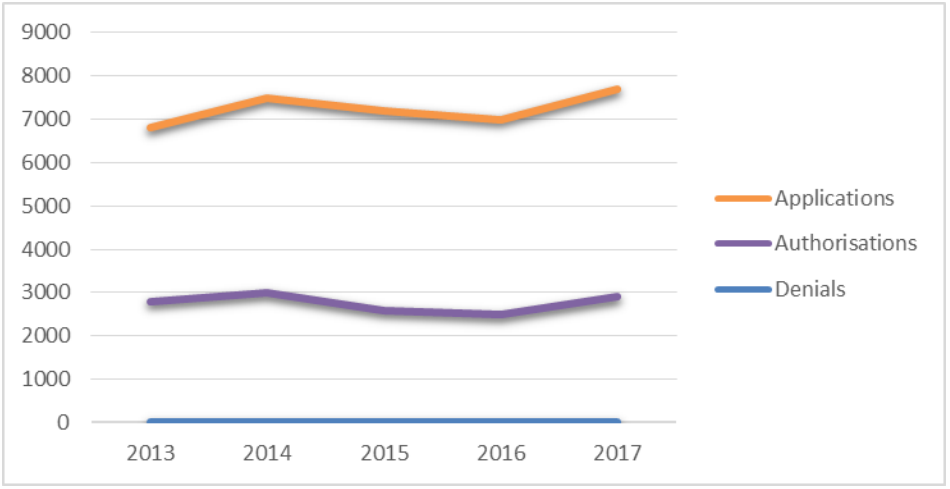

Fig. 3. Controlled Export Volume – Number of Authorisations and Denials in 2013-2017

Source: www.ec.europa.eu

Applications data includes all license applications, thus providing an indication of "controlled exports", *authorisations* data refers to dual-use exports authorised under individual and global licences and *denial* refers to the volume and value of denied exports.

Following tripartite meetings between the European Parliament, the Council of the European Union and the European Commission on the EU Dual-Use Export Control Regulation, a number of key concerns have emerged from the various associations directly involved in the application of this Regulation:

- Avoid diversion from multilateral export control regimes;
- The proposed catch-all controls will not have the desired effect and will hurt EU competitiveness;
- The due diligence clause overbears individual business' competences;
- Business should be consulted when drafting guidelines.

But there are some positive proposals welcomed by these associations such as:

- Introduction of new EU general export authorizations (EUGEA) – beneficial for intra-company software and technology transmissions, encryption;

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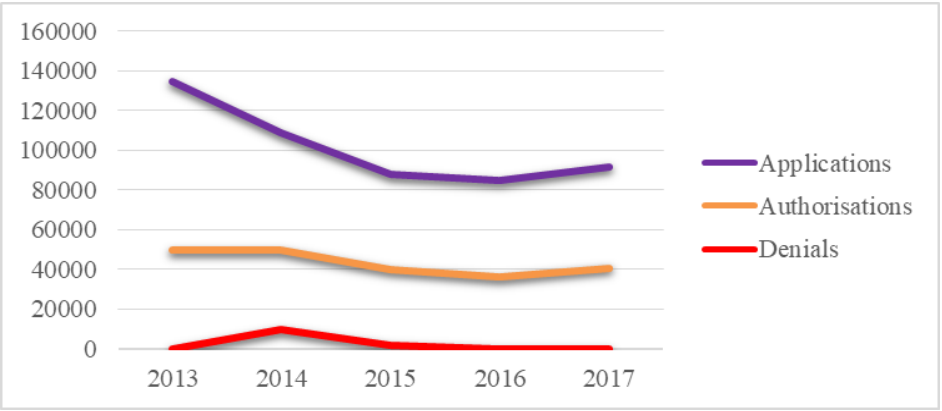

Fig. 4. Controlled Export Value – Value (Mln Euro) of Authorisations and Denials in 2013-2017
Source: www.ec.europa.eu

- Extension of validity period will give companies more security in planning and will stimulate and facilitate enterprises in their operations;
- Intra-EU transfers will facilitate intra-EU trade in dual-use items and reduce the administrative burden for companies.

Difficulties in Regulating Dual-Use Goods

Since DDB products or services can promote technological, human development and strengthen economic ties, it is difficult, in many situations, to introduce rules of control. It is also difficult to clearly measure when these products pose a potential risk to international security objectives and to promote the proliferation of weapons. Many of them have a large variety of industrial civil applications but when they are used for military purposes, they are very dangerous.

In this context, organizations should develop specialized knowledge. Information and advice is often needed to determine the use of the good and its legal and regulatory implications. Training is necessary to enable entrepreneurs to look beyond the peace full appearance of such items and the question is if managers have the necessary skills.

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New Business Models and Managerial Skills

From the point of view of military actors, DDB is seen as a tool that will be used when there are real benefits such as faster deployments, safety, health, operation fluidity, which is a totally different vision from other commercial industries. The state of the military ecosystem in terms of digital transformation will change the global competitive environment and traditional business models. Due to the sensitivity of the military sphere, the outsourcing approach for a newly entered civilian company is the most valid option. According to this model, the IT&C supplier of technology has limited access to the final use of its delivery.

Since the role of dual-use technologies and product or services generated by these technologies is critical and under international scrutiny for geo-political reasons, the managerial question is how a manager should be aware of the possible role in the supply chain – as a researcher, manufacturer, supplier, broker or investor. These value chains may include a variety of organizations, industries, companies, industrial suppliers, shipping, IT&C companies, but also research entities like universities start-ups, incubators or transfer centres. The awareness is even more difficult in the existing DDB, as described in this article. For example, if a start-up in precision agriculture will make a breakthrough invention in blockchain or GIS technologies, when he wants to sell it abroad, how can he be aware of a possible misuse of its inventions?

In various situations related to use of chemical items, terrorist activities or cyber-attacks, reality demonstrates that, despite strict rules and regulations there are important difficulties with regulating such goods especially when we speak about digitization services which may cross boarder much easier and apparently they are not harmful.

In this context, first important action for an entrepreneur is awareness about critical aspect of DDB products, thus contributing to the effort to curb terrorist or mass destruction proliferation weapons.

Knowing how your business could be misused is only one aspect. Controls will be always crucial to avoid even unintentionally proliferation. Entrepreneurs can also look beyond their business line to see if in other places of his business line commercial partners may be engaged intentionally or not in such activities.

According to our assessment, transfer of knowledge to the managers regarding the dual-use context of a certain discovery or product is crucial. Main parts of the training should be:

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✓ understanding the technological landscape of DDB;
✓ understanding the industrial value chains of weapon creation and the possible unknown persons which may enter into a civil transaction for military purpose;
✓ general knowledge about use of digitalization for military purposes;
✓ risk management.

Training of entrepreneurs should be focused on:

✓ risk assessment of the organization in dual-use activities;
✓ appropriate use of digital technologies, which is rapidly developing such as Artificial Intelligence (AI) and others;
✓ capacity to adapt to changes in export control laws and regulations and standardized procedures;
✓ understand early warning of potential misuse;
✓ access to reliable source of information (for example, the European Commission's TARIC database or other official data bases) to assess the risk of the particular dual-use good, or if there is a restriction placed on its export;
✓ promotional events or pre-contractual events training, to check the legitimacy of any transaction;
✓ understanding financial mechanisms. Services that are relevant to dual-use goods include: issuing letters of credit, trust recipients, bank accounts, money laundering etc.

Awareness and Solutions

It is no surprise that trade and money are central elements to every effort to sidestep, subvert measures to obtain military components – it is here that effective regulation can help to minimize the risk and proliferation.

Importantly, if your business is of significant size and scope, you must:

✓ assess your risk exposure;
✓ understand your obligations; and
✓ develop effective tools and programs that are commensurate with those risks.

The Case for Cluster Intervention in the Business Model of Companies

As we have seen, the question of training and coaching regarding dual use is essential. We can look at it from two angles:

✓ protection;
✓ innovation management.

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In the last angle, companies should focus on ways to manage innovation in DDB processes.

In both regards, clusters as alliances of companies are playing a major role. Their involvement is important as knowledge centres for all member managers which will get, through permanent activities, a level of awareness of the issue of compliance but also in promotion of innovation.

There are several good practices in the world that are famous in bringing together technology providers, integrators and the most important, the future customers of security solutions. For example, SAFE cluster in France is offering global security solutions based on the integration of aerospace and defence technologies. Such major clusters may bring together hundreds of affiliates, including companies, training and research organizations related to dual-use technologies and industries.

Clusters invest not only in training, but also on applied research and development capabilities in a constantly changing environment triggered by DDB. Clusters may offer networking, business and growth services, ranging from a project idea to finding technology partners, financiers and international development. The "business to client" type network includes insurance companies, universities, banks, industrial parks, R&D units etc.

Many clusters are organized in thematic areas (or programs) that address several issues related to the security and defence sector. One interesting area developed by SAFE cluster in France is "resiliating territories" (to mitigate the effects of disasters, anticipating disruptions and rehabilitating through surveillance, forecasting, real-time management, adaptation and innovation). From the angle of the COVID-19 crisis, pandemics can be added to the concept of innovation in resilient territories, as such a situation must create a framework for collaboration between institutions, business and research actors to provide innovations in the field of resilience.

Regarding DDB fields on innovations, clusters are targeting a wide variety of topics some of them with clear connection to defence such as safety and security of sensitive areas, support for security and defence forces, satellites, aircrafts, cyber security etc. But there are also areas not necessary so closed like robotics, health, food etc. which often need that managers in DDB should be embedded in a local innovation ecosystem where they can cooperate with other industries.

In this context, we look closer to the way DDB sector may be embedded in a local ecosystem with a study case.

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USH Pro Business and Dual-Use Cluster Case Study

USH Pro Business is specialized in activities dedicated to the entrepreneurial environment such as: research, development, innovation and technology transfer; entrepreneurial development; business education; establishment and development of innovative clusters; internationalization; establishment and development of start-ups. It is a dedicated centre for entrepreneurial activities, designed to support companies and provide solutions to sustain competitiveness throughout the business life cycle. It has been created in 2015 as a university spin off (www.ushprobusiness.ro).

The centre offers support and consultancy services in the formation, development and collaboration of intra and inter-clusters at regional, national and international level in order to promote, revive and develop the cluster members and for interprofessional organizations.

One of the USH Pro Business strength is its capacity to develop clusters and to stimulate smart specialization among them.

USH Pro Business actively contributed to the creation of "Dual-Use Cluster" in order to assist entrepreneurs to better connect to the defence and security sectors. The security and defence sectors represent a vital strategic area in the Euro-Atlantic context regarding national security, but also an important vector of export competitiveness. The cluster is addressing the issues already mentioned in this article such as:

- ✓ complexity and specificity of the international market in the field;
- ✓ the advantages of a national integrator through collective bargaining and marketing power, focused on large importers, directly or indirectly linked to military and defence structures;
- ✓ inclusion of all the components of the sector, including civil or dual use, in the collective offer for large importers.

The sector also needs to be integrated into the national effort to develop innovation and to move the Romanian economy towards an innovation-based economy and to rebuild the industrial base. In this respect, the military sector can enter the national research effort applied for dual-purpose innovations by disseminating applied research from the military to the non-military sector.

Dual Use Cluster (DUC) is a non-governmental, non-profit apolitical body with legal personality, aiming to develop an innovative functional network based on the *multiple helix* model to ensure the stimulation of collaboration between representatives of the economic environment, research and education with the

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direct involvement of funders, whose main and related activities will revolve around the challenge of generating and bringing to the highest level the local industry.

Creating a collaborative platform between these areas to enable the defence industry to benefit from non-military productive innovation and supply on one hand and, on the other hand, military innovation to be applicable in the civil sector, has remained undesired by the economic actors, despite its establishment as a strategic objective.

Biotechnology, Cybersecurity, E-Learning, E-Training, One health Textile industry, Command control systems, Intelligence surveillance reconnaissance systems, Critical infrastructure protection, Special materials/items are major fields of activities.

The cluster is taking action offering the following services meant to upgrade the skills of the managers in DDB: Know-how technology transfer; Financing; Visibility; Matchmaking; Foresight; Security operations centre / cyber security and incident response team.

Following the first meeting of the Dual Use Cluster in July 2019, the DUC concept brought together interested entities and experts in the sector, in order to try to define the concept and vision, to debate the objectives, to harmonize the parts, to analyse the complementarity and to establish the role of each in the management of the cluster. During these meetings, the participants have been presenting concepts such as associative experience in the dual field, dual industry and geopolitics, best practice examples, clusters role and advantages etc.

Dual Use Cluster is embedded on a cluster platform USH Pro Business has developed in the last 5 years as founding member and active promoter. These clusters are related to several economic areas – (Bio Danubius, Prahova Valley Bio Concept), Green Energy (Cermand), IT&C and Engineering (Danube Engineering Hub and Smart Alliance), the Romanian Textile Concept and Construction Industry (CCIO). Due to its activity, USH Pro Business became the specialized part of the managerial unit of the clusters in issues such as internationalization and R&D. The centre takes an active role in promoting smart specialization among companies.

In this context, USH Pro Business and existing clusters above-mentioned will integrate DUC in the smart specialization processes of the southern part of Romania through “Wallachia Hub” consortium.

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Walachia Hub is an ecosystem of innovative clusters comprising different industries such as engineering, GIS and sensors technologies, energy, smart localities, organic and bio technologies. Bringing managers together from civil industries with defence companies or military experts is one important task targeted. During several meetings, the managers are learning about the DDB process and the way to cooperate. One important area of cooperation is considered to be access to European defence programs. Another topic is related to training the managers. Walachia Hub consortium intends also to launch the concept of "resilient territory" for the region.

Conclusion

Dual-Use Digital Blending (DDB) is a new economic phenomenon triggered by digitalization. Companies activating into this sector will have to obey stricter rules of export controls extended to digital research and services apparently with no military implications, but they have to be more active in applied research and development capabilities in a constantly changing environment triggered by technological progress. Digital transformation in dual use sector already impact on trade flows with physical products, but also with IT&C services related to this sector. The new emerging business models triggered by the DDB solutions should be able to access, process and put in work important amount of information. Also, they must learn to cooperate. USH Pro Business provided knowledge in creating DUC, but also the ability to work with other regional players, such as Wallachia Hub, a cluster consortium in which DUC has developed special ties. The cluster aims to harmonize and represent the interests of enterprises, research entities, administrations and catalysts in order to increase economic competitiveness and create skills, sustainable development and sustainability. It's involved in the process of digital transformation and understands that the rapid adoption of new technologies within an organization will improve their long-term performance. Through this interaction, DUC is incorporated with a regional innovation ecosystem and into other areas of smart specialization.

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