ADDITIVE TECHNOLOGY AND SECURITY 4.0

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Abstract: *The capabilities of additive technologies are particularly applicable in the security field, which opposes their use by criminal organizations and foreign special services.*

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1. Introduction

Additive production and multidimensional printing

The growth trend of 3D printing[1] shows that it is able to reverse the entire production system, including manufacturing, armaments, transportation, logistics, infrastructure, construction, aerospace, shipbuilding, etc., companies and have a huge impact on governments , economies, the labor market of both developing and developed countries. It follows that the impact on security in a general and narrow sense will also be enormous. In practice, this means mass custom production – from fashion items to weapons and human organs printed.

Live tissue printing or bioprinting is developing very quickly. It is likely that whole organs will be able to print in the near future. Ethical and social problems are inevitable, as in the beginning this technology will be accessible only to the rich minority, which will increase inequalities in health and life expectancy. In addition, it is likely that the human genome may be hacked and exploited by users or abusers, which requires a comprehensive study and regulatory framework. This has a direct impact on security insofar as life expectancy, security of normal life, living with a healthy body are all elements of security, albeit in a broad aspect. If there is a monopoly and restrictions on the use of a product, it may be subject to criminal production, acquisition and distribution.

3D printing will transform production and consumption systems, as well as global value chains

2. Analysis

One of the serious problems that requires the joint work of all concerned, as well as regulatory changes, is the safety problem. The ability to 3D-print a weapon will facilitate its distribution and make control difficult. Individuals and non-state actors – criminal, terrorist organizations – will be able to easily circulate digital templates with the help of which to print rather than distribute the weapon itself. The logistics of arming criminal structures will be facilitated, ie. the weak contact and delivery point will be optimized. This will make it very difficult for the special services and the police to counter successfully.[1] Individual enthusiasts are still trying to print weapons. As technology develops, they will be able to import complex materials, including biological tissues, cells, and chemical compounds, into the construction of "printed" weapons.

One of the most important problems in the development of the additive manufacturing industries is the problem of qualification and education. If not resolved, then solving other problems cannot be successful. In order to be successful, it is necessary to immediately upgrade the skills of existing staff. [2] Of course, senior management awareness programs need to be developed first, as they need to develop a new strategy for the respective security structures.

Particularly important for achieving the pro-activeness that must underpin crime counteraction and security for citizens is a dramatic change in the management culture of senior and middle-level leaders in security systems. We have repeatedly talked about the adaptability and lack of organizational barriers to organized crime structures that change and work flexibly to maximize profits from their criminal activity. Flexibility and adaptability are the opposite of slow administrative procedures and gradual, step-by-step decision-making in the hierarchical structures of state power. Certainly criminal organizations have an advantage in this regard. The training of modern leaders must be such that they are ready for conceptual change, overcome quickly and successfully bureaucratic obstacles to anticipate changes that are operationally appropriate, be forward-thinking, so that the preparation and practical work of the staff is in tune with new technologies, their potential for both criminal use and counteraction to criminal activity.

Using existing computer-aided design systems to create complex parts often results in huge files, so software and hardware can block or run slowly. Even when the workpiece creation is successful, the volume of the files causes a communication problem, and therefore a security problem.

3D printing technology and additive manufacturing make it possible to create parts and products that are impossible with traditional manufacturing technologies. The development of technology over the last 25 years allows the creation of objects from different starting materials with integrated circuits, as well as organic tissues. This approach eliminates the producer-logistical (seller) chain, turning the user into a producer. This allows the production to be as discreet as possible, which complicates the process of detecting, preventing and interrupting criminal activity. Investigative bodies concentrate on one of the units in the chain – either monitoring manufacturers or knowing logistics and merchants. The lack of these units makes it difficult the work against crime.

3D printing has an impact on most industries, from the food to the aerospace, offering unique products and services. Additive Manufacturing (AP) technology makes it feasible and cost effective to produce small series products, rapid prototyping, decentralization and capacity allocation. The growth curve of these technologies is expected to jump sharply in the near decade. This will in all likelihood lead to an adequate increase in the crime curve. The development of technical security aids, given their delicate nature and the current lack of economic impact, will be overcome in 3D printing. It will allow special services to use the latest technological developments in a highly confidential environment, the relevant technical units of the services will simply become a manufacturer of devices and spare parts for them. This will be especially appropriate in the production of technical intelligence and special intelligence tools. [3].

One of the important economic outcomes of the widespread adoption of AP technology may be the return of production to developed countries, as technology will replace cheap labor. Of course, this can lead to unemployment problems in these countries. This result will be a global security challenge because it can generate large-scale migration processes from poor to rich countries, from developing to developed, accompanied by all the

[1] In 2012, about 40% of 3D printing systems were located in North America, 30% in Europe, 26% in Asia and Oceania and only 4% elsewhere.

security and safety issues that characterize migration, human trafficking and smuggling, penetration, the gray economy, the threat to social systems in developed countries, the powerful impetus and reserve for the development of organized crime.

Use of additive technology by criminals

3D printing and drugs

Undoubtedly one of the most worrying possibilities is the facilitation of the production of synthetic drugs. But printing of natural products is not excluded. For example, experts in the cannabis industry for pharmacological needs have created „Potent Rope" [4] – fully usable 3D cannabis thread. In practice, this means that 3D printer owners will be able to determine the characteristics of the marijuana they need, i. e., to create their own variety without the use of slow and complex selection.

3D printers and skimmers

Banking operations at external terminals also offer opportunities for criminal offenses. 3D printers can reproduce indistinguishable inputs of ATMs so that they are replaced with a carefully printed pin-copying device of any ATM card used.

Most likely, such crimes will result in an obligation for printer manufacturers to enter a hidden code affixed to each product in order to identify the manufacturer.

3D printing of weapons

Weapons have already been printed – Defense Distributed [5] has been licensed and has demonstrated a 3D Ghost Gunner printer with parts production software for the AR-15 rifle. The Ghost Gunner 2 modification can produce parts compatible with the Glock 19 and M1911 semi-automatic weapons. The value of the device with the schemes for printing weapons is about $ 1700.

There are fully plastic weapons that can be produced through 3D printing. Such models – WashBear [6], Songbird are available on the web.

3D printed silencer [5]

DD Wave manufactures metal silencers for rifles. Unlike classic silencers, the print will be monolithic. Selective laser powder baking technology for metallic powder is used. Approximate price is $ 1100.

Explosives

The Armed Forces have developed and tested 3D printers that are indispensable for continuous fighting in difficult logistics areas. Explosives are prepared in less than 24 hours, complete with printed shells for grenades. The opportunities for supplying criminal organizations with military weapons should not be underestimated. And this possibility of 3D printing is invaluable for terrorist organizations because it facilitates providing them with explosives and eliminates the risk of early detection of special services.

3D printing of grenade launcher

3D printing of grenade launcher [8] with 40 mm caliber "Rambo" is about to be successfully produced. Tests have been carried out and the product quality results are positive. There is hardly any difference between the original and the printed weapon. So far, it takes several hours for the overall production of a grenade launcher.

3D printing of a submarine

At the request of the military, a project has been completed [9] that allows a submarine to be printed for four weeks. Big Area Additive Manufacturing was used for printing. The prototype is made of six carbon fiber parts. Трябва да се отбележи че стандартното производство трае от 3 до 5 месеца. The printed boat costs about $ 80,000 and standard production costs $ 600-800,000. Undoubtedly, if the security of the production of such submarines is underestimated, they will become an indispensable means of transport for drug traffickers with excellent funding [10].

The list of possible 3D-printed objects to commit a crime is endless. This includes weapons, credit cards, keys, burglary tools, counterfeit art, scanners capable of duplicating any patented item, and more.

Counterfeiting of art objects

There are already 3D- printers OSE and Canon, who can create exact copies of famous paintings. [11] These systems can digitize high resolution pictures and store data of even the smallest details of the pictures, including texture, paints, embossing and paint method. Owning this information may result in a model indistinguishable from the original. Undoubtedly, such technology will be of interest to criminals, given the prices of works of art.

Illegal distribution of files

There are sites created on the Internet for sharing 3D printing files, which are now over 85,000. These sites allow you to search and add new content. In essence, in many cases, the contents of the files violate local and international legislation related to the distribution of weapons and dual-use products.

Sex toys

Without going deeper into this topic, 3D-printing creates an opportunity for serious criminal business. [12]

Burglary of security systems

Using 3D printers, a wide range of hacking tools can be created – from physically unlocking devices – copies of originals, to printed copies of biological components, such as fingerprints.

3. Conclusion

It is clear that criminals will find every way to use 3D printing for their own purposes. Therefore, from a safety point of view, every project should be considered before its practical launch so that its criminal use can be made as difficult as possible.

AP technologies require additional attention to issues of ownership and responsibility for print production, given the redistributive nature of its digital development and physical production, as well as the revision and completion of the regulatory framework for special production – military, dual-use objects and digital templates. Licensing policy for the production of hazardous devices and those with dual use should be optimized, detailed and secured by guarantees of compliance.

Combining 3D printing with other Industry 4.0 technologies – new materials, Internet of Things, distributed registry technologies (blockchain), opens up new prospects for innovation, but also multiplies security threats, so it requires multilateral discussions on issues of strategy and security among stakeholders.

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