

Mobile technology platform - production of rapid deployment with small seriality

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Abstract. In this paper, within the framework of the concept of "Industry 4.0", the need to introduce the concept of "Mobile Technology Platform" for industries with small seriality and rapid deployment, the products of which are: special-purpose products (including aviation), spare parts for durable goods to ensure their prompt maintenance and repair as part of after-sales service.

1 Introduction

To date, a huge number of research and journalistic works are devoted to the concept of Industry 4.0. And as a result, an understanding of the system representing this concept and the interactions of the subjects of this system has been formed. Without considering this concept in detail, we note that Industry 4.0 is formed on the basis of the development of digital and industrial technologies, combining in its essence: artificial intelligence, Internet of things, additive manufacturing, robotics, cloud storage, augmented reality, etc. - to create more flexible, responsive, self-developing and interconnected intelligent enterprises, in which decisions are made on the basis of self-learning data exchange systems, in an automated mode. It would seem that this concept of Industry 4.0, or as it is also called the fourth industrial revolution, brings with it limitless possibilities [1,2]. But as the industry strives for digital transformation, participants in the future reality of Industry 4.0 need to pay attention to a number of issues, we will form some of them for discussion within the framework of this article:

1. What exactly should be transformed and how?
2. In what direction to develop the resources available to the enterprise?
3. What advanced technologies can best meet strategic needs?

And also, to accept that digital transformation does not begin simply with the introduction of new technologies and their launch, and that it cannot happen in a vacuum. In addition, despite the introduction of Industry 4.0 technologies into production, realizing that the result of production will be the final product that meets modern human needs, it is necessary to take into account the type of product, its seriality and life cycle as part of the production process in the transition strategy [4-6]. A participant in the reality of Industry 4.0 does not necessarily have to have gigantic resources for development, but must be integrated into the system of

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determining belonging to modern production processes, through the use of appropriate technologies. In general, the implementation of the concept is simple: figure 1.

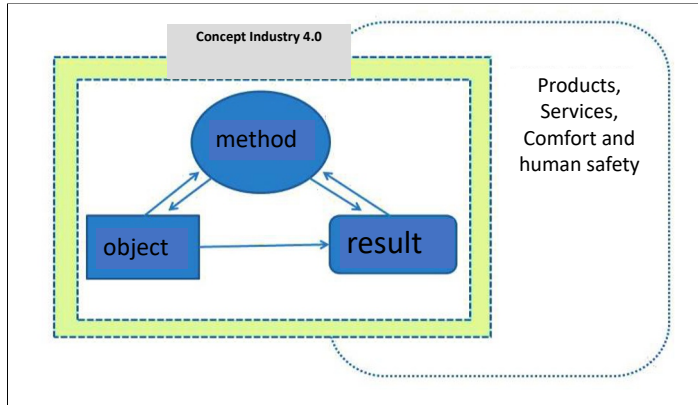


Fig. 1. Interaction of subjects of the concept of industry 4.0

The difficulty lies in the ways of implementing the concept, based on a comprehensive assessment of the conditions under which it is implemented through its constituent entities. In material Objects, technologies through which energy and physical processes are implemented. In the final result of the implementation of the concept - which depends, first of all, on the efficiency of the processes performed [7-10].

2 Materials and methods

Answering the questions posed earlier in the article, we note that the subject of specialization of the authors of this work is the aircraft industry, one of the branches of production of durable goods, taking into account the need to maintain the performance of the product during the after-sales service. At its core, this sector *a priori (lat)* contributes to the introduction and development of new technologies, and, accordingly, the presence of highly qualified specialists in it. The concept and industry 4.0 are defined by *objects* that are a natural development *of the tools* used in the aircraft industry, namely: composite materials, robotics, digital manufacturing, augmented and virtual reality, additive manufacturing, manufacturing control systems, artificial neural networks, and the Internet of things. But at the same time, there are important features that, in the context of Industry 4.0, are not yet taken into account in practice - this is the optimization of design in terms of strict certification criteria with which aviation works. industry, and which require careful consideration of all design variables and limitations of the finished product, such as the integrity of materials and structures, aerodynamics, weight, reliability, manufacturability, maintainability, stability, etc. Due to the mandatory nature of these criteria, even now, aircraft designers often have very little freedom in design, and working outside the norm will invariably lead to the difficulty of implementing the product [11-14]. Designers and engineers tend to compromise based on mandatory, reasonable constraints. Accepting that the product of the aviation industry is a durable product, it must be taken into account that due to strict standards in the aviation industry, the maintenance and repair (MRO) process of aircraft is strictly regulated. MRO organizations must be approved both in Russia, the Federal Air Transport Agency (Rosaviatsiya) and abroad, by such organizations like the Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA). Moreover, personnel and equipment belonging to organizations conducting maintenance and repair must be licensed and certified. And this is quite natural, since the main task of maintenance and repair is to

ensure flight safety. Based on this, the aviation industry sets high requirements for production processes. The complexity of the final product - an aircraft (LA), leads to the fact that aircraft manufacturers are not concentrated in one geographical location, but work in a system of interacting dispersed enterprises, forming a partnership within the production of one final product. The overall operating structure of the aviation industry, as follows from the above, is consolidated in the form of a block diagram shown in Figure 2, which identifies the participants in the process and the typical interactions between them [15-18].

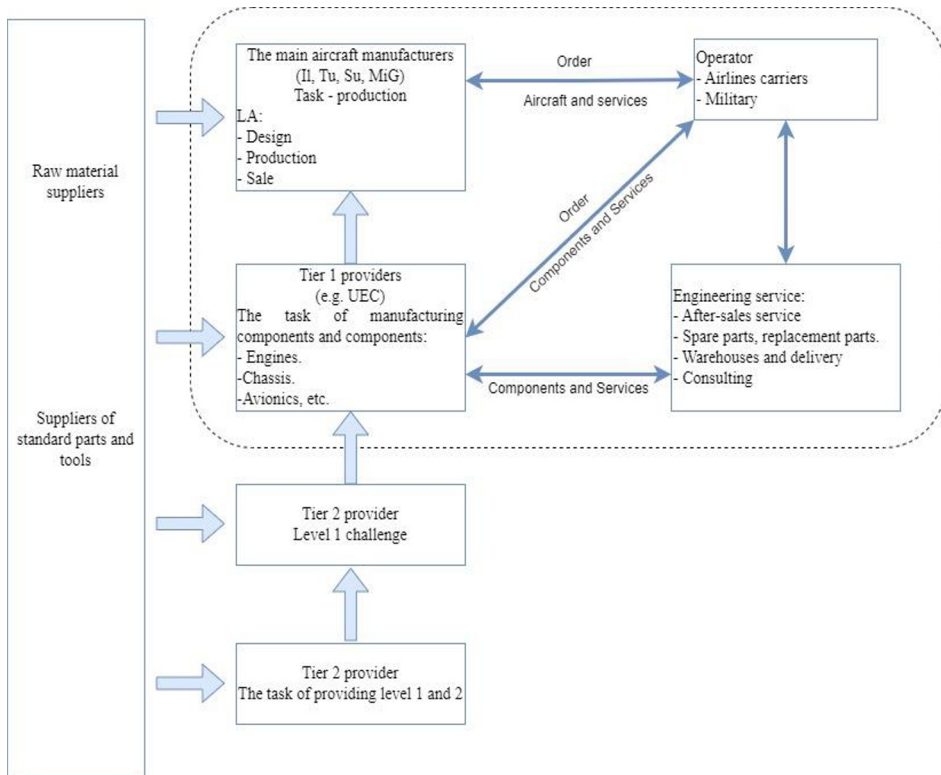


Fig. 2. Model of production and maintenance of aircraft

3 Research and results

Given the wide geography of aircraft operation, modern realities show that in the after-sales service system, more efficient maintenance and repair can be ensured by integrating into this system individual "small players" who can produce parts locally, in a timely manner and in small quantities, needed suddenly or planned. Forming a faster and at the same time no less reliable supply chain system compared to the one shown in Figure 2, located next to the "operator" block in the diagram - and deploying rapid production next to aircraft operators as a production platform in the literal sense.

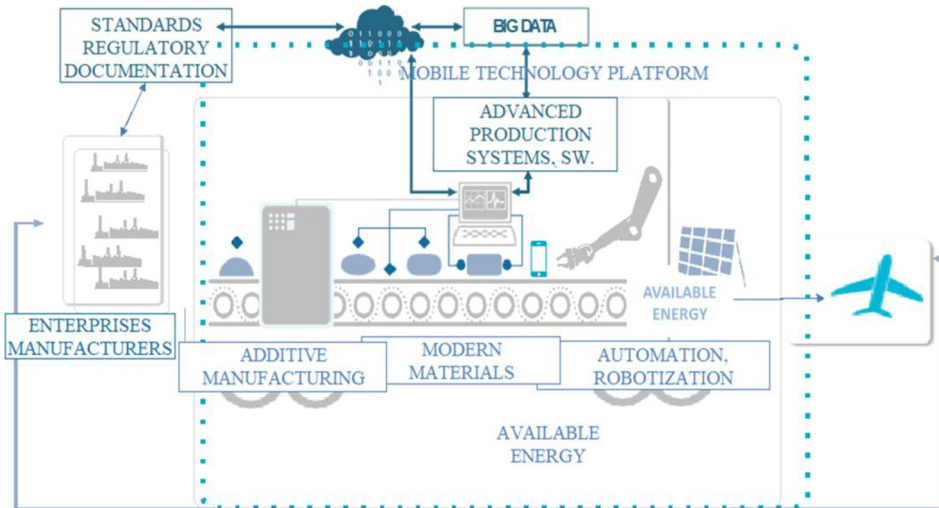


Fig. 3. Tools of the "Mobile Technology Platform"

The undeniable benefits of implementing these platforms will be reduced volumes warehousing, simplification of the inventory management system for parts and components, elimination of long-distance transportation and total time spent on the supply chain, in saving the financial costs of paying for a large number of specialists accompanying these processes due to the rapid deployment of the production of small series products [19-20]. Having decided on the role of this platform, for convenience and unification is necessary to form a new concept for it as a material object, giving it a definition:

"Mobile Technology Platform (MTP)" is a rapidly deployed production of small series near the consumer of products (product operators). MTP products are finished special-purpose products (including aviation), spare parts and components for durable products in order to ensure their prompt maintenance and repair as part of the operation phase.

The tools of "Mobile Technology Platforms" in production activities for economic and technological efficiency are technologies of the Industry 4.0 concept (Figure 3).

The concept of "Mobile Technology Platform" can be used as a universal criterion for the technological production process, taken out of large production sites (enterprises) and used in the conditions of critical rapid design and production of small-scale products, presenting the MTP in the form of a diagram (Fig.4).

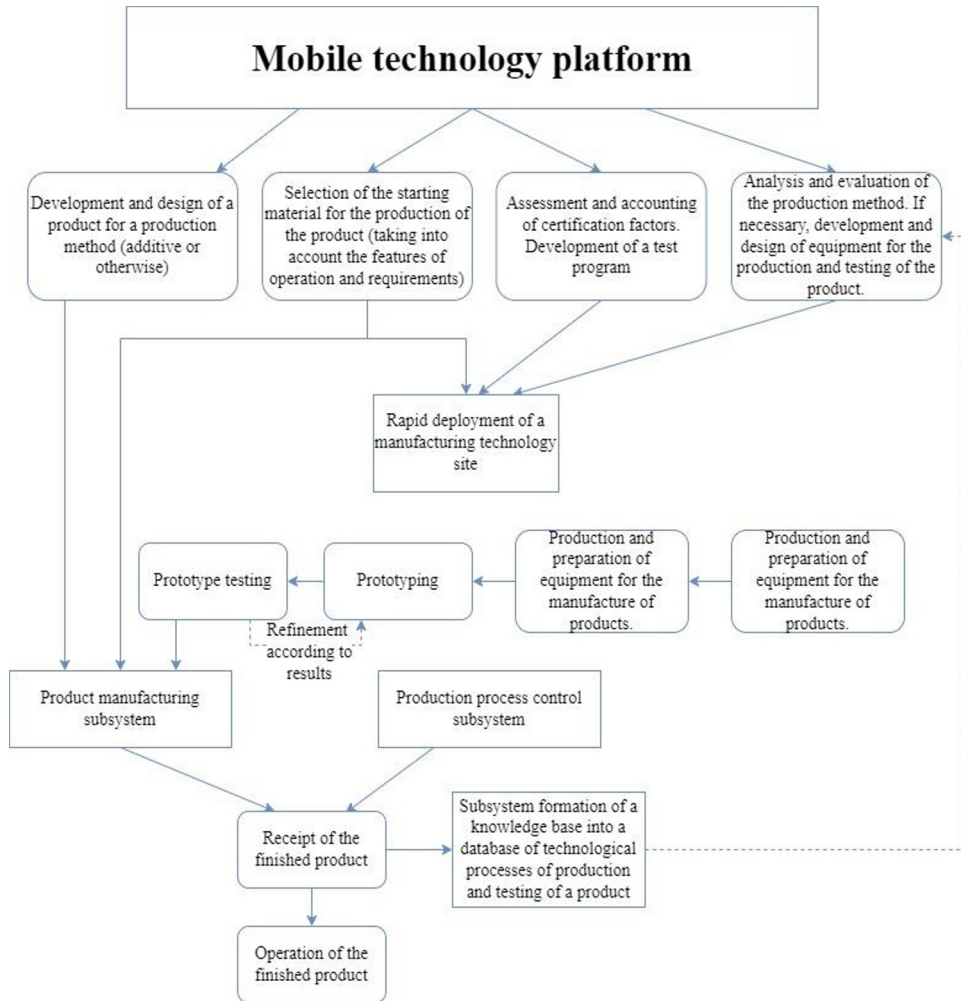


Fig. 4. Scheme of the "Mobile Technology Platform" system

4 Conclusion

In the format of this article, we believe that the presence of ICC as a component of the modern production process and an element of the concept of Industry 4.0 is natural. MTP makes it possible to simplify the production process due to an integrated approach that ensures the optimal speed for the end user to receive a single or small number of finished products, bypassing the logistics schemes for the supply of spare parts by large manufacturers. Based on the accumulated knowledge bases about the tools used in the ICC, this object has the right to exist within the functionality of modern production technological processes. This functionality is autonomous and subsequently integrated into Industry 4.0

The authors plan further work with the ICC, in particular, one of the following studies - obtaining a real function of several variables (temporal, resource) and coefficients that affect the efficiency of using variables to solve an optimization problem that satisfies the condition under which (obtaining maximum results while minimizing costs).

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