Секция «Модели и методы управления организационными социально-экономическими системами»

GLOBAL EXPERIENCE OF IMPLEMENTING ADDITIVE MANUFACTURING IN AEROSPACE INDUSTRY. A CASE STUDY OF NIGERIAN AEROSPACE

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Since its emergence in the 80s, additive manufacturing has changed the concept of manufacturing, production and designs around the globe and across various industries using unique techniques to create physical objects, that orthodox manufactures considered time consuming or impossible.

Additive manufacturing popularlyknown as 3D printing, is the construction of a 3-dimensional physical objects from a digital 3D model [3]. Applying layer-by-layer process, 3D printing afford users the opportunity to produce or create "**virtually any shape**" they can possibly imagine.

Additive Manufacturing uses Computer-Aided Design (CAD) software to create digital file which provides the virtual component of a 3D model. CAD software takes the details of structures with regard to shape and complexity, affording users the opportunity to design, redesign or improve objects aimed at specifications and functions.

As the world reels from the industrial challenges caused by the 2019-2020 corona-virus pandemic, more and more industries are turning to additive manufacturing processes. Additive manufacturing reduce costs, minimize waste, and improve the quality of products altogether. The concept of Additive manufacturing has taken a huge limp over time. Currently, there are seven types of Additive Manufacturing these includes:

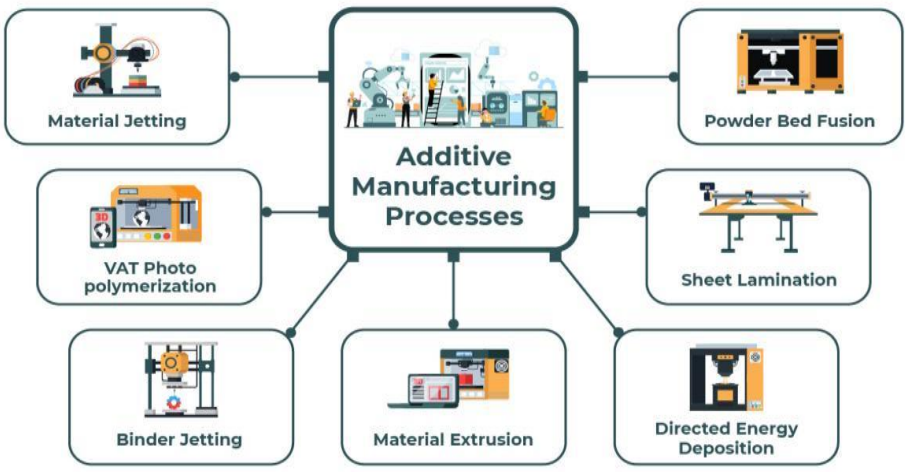

Figure 1 - Types of additive manufacturing

Today, additive manufacturing has largely impacted the overall performance of industrial operation across various business sectors. One of such is the Aerospace Industry. It's only fair to say that Additive Manufacturing has sharpened the aerospace industry. This printing technology makes the construction of small and complex structures more convenient, with low cost and minimum wastage.

Considering the standard of operation in the aerospace industry. component precision is a critical factor in aircraft design, Additive manufacturing is used in the aerospace industry to provide extremely high accuracy in parts and components in other to avoid any individual components from failing which will result to a full system failure of aircraft carrying passengers and cargo [3].

Also, the involvement of additive manufacturing has ushered in a new era of possibilities within the aerospace industry offering many advantages that have reshaped how aircraft and spacecraft are designed and produced. These advantages includes;

- Freedom of Design
- Lowering of cost in Manufacturing
- Rapid prototyping
- Efficient supply chain
- Ability to create unique objects

While the Nigerian aviation sector is considered developing and under-performing, the industry poses great potentials in the nearest future.

As the concept of 3D printing technology is transforming industries across the world. Research has shown that Nigeria as a nation is yet to fully accept or understand the concept of 3D and its application. A research carried out by A.O. Inoma, O.O. Ibhadode and A.A.O. Ibhadode in 2020 revealed the exposure of Nigeria to 3D printing [1].

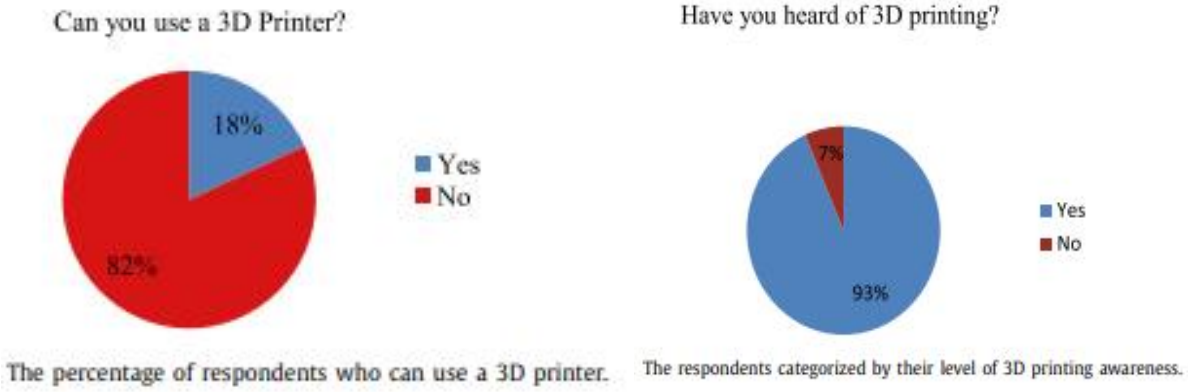

Figure 2 - Chart of Nigerian Exposure to 3D printing

According to the Minister of Nigerian Aviation Mr. Festus Kayamo, The Nigerian Aviation Sector has contributed about 117 billion Naira which is 4% to the National GDP in the first quarter of 2022; the sector supports about 200,000 jobs and pays about 8.5 billion Naira in tax annually [5].

Considering the fact that the Nigerian economy generates most of its revenue from extractions of mineral resources rather than manufacturing, the aviation industry in Nigeria is an important aspect of the national economy as it creates direct employment opportunities and is a catalyst for wealth creation without direct extraction of mineral resources from the Nation's earth.

Currently, the Nigerian Aviation industry has 32 airports, 26 of which are operated by the Federal Airport Authority of Nigeria (F.A.A.N) while 5 are functional international airports. The Nigerian Aviation has been considered developing and under-performing over the years, which had lead to stagnation in the general growth of the industry.Some of the factors limiting the growth of the Nigerian aviation industry are;

- Poor maintenance of Aircraft
- Excessive importation of flight parts.

An efficient and effective management structure is one of the most essential requirements to development or improve the status-quoof an aviation industry. These are the factors the Nigeria's aviation industry has lacked over the years.

The lack of adequate infrastructure, such as airports, runways and air traffic control systems, has negatively impacted the industry's growth. Also, poor maintenance culture of aircraft and facilities has also hindered growth in the sector, resulting in flight delays and cancellations.

In a publication by Business day in August 2019, it was revealed that the absence of aircraft maintenance (MRO) facilities in Nigeria have cost the country over $170 billion in the last 10 years. Also, data wheel developed by The Observatory of Economic Complexity (OEC) revealed that Nigerian Aviation has imported 188 thousand dollars in fixed wing aircraft [4].

Experts has projected that the importations of aircraft parts by Nigerian Aviation is set to reach $117 Million by 2026 at a raise of 3% yearly.

Although the current state of Nigerian Aviation is not encouraging, experts has projected a huge surge in the operational and financial growth, should the industry invest more in 3D printing technologies.

Expert in the field has predicted a future projection of an estimated economical value of $600 to $900 billion to the country GDP in the next 10 years. projecting that the involvement Additive Manufacturing in the Nigerian Aviation could improve the industry's revenue turnover by 42% [2].

Additive Manufacturing can be used to produce aircraft maintenance facilities (MRO) which will improve the life-span of aircraft and lower the cost of maintenance over the years. Also, Additive Manufacturing has the potential of lowering the barrier of entry in the world of aircraft manufacturing, therefore boosting the GDP of Nigeria.

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MANAGEMENT OF OIL EXPLORATION IN NIGERIA

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Nigeria is the second largest oil and gas producer in Africa. Crude oil from the Niger Delta basin comes in two types: Light - the lighter has around 36 gravity; comparatively heavy –