Chapter 5
Cloud Based 3D Printing Business Modeling in the Digital Economy

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ABSTRACT

3D printing, also known as additive manufacturing, is becoming the industry standard for manufacturing and prototyping. Although the technology is very old, it gained a huge traction in the past two decades. 3D printing favors unique once-off orders (mass customization) in contrast to mass production. This calls for innovative business models in order to realize economic gains from the technology. Increased product innovations in the global economy also contribute to wide adoption of 3D printing unlike in the old days. A transition in the manufacturing field has brought e-manufacturing and now cloud-based manufacturing. Machines, including 3D printers, in the past were not Internet-enabled but modern designs have the capability of Internet connectivity. Cloud-based 3D printing is a new model of design that has a significant impact on today's entrepreneurs. This article focuses on a business case for a cloud-based approach in consumer product niches. A cloud-based 3D printing business model (3D-Cloud) is developed based on the business model canvas, which promises major breakthroughs in e-entrepreneurship innovation. The model uses a virtual community approach to bring together technocrats, enthusiasts, and shared 3D printer facilities of common interests, whilst promoting an enterprising spirit.

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INTRODUCTION

3D Printing became a sudden Gold rush in the past two decades. This was inspired by rapid innovations in digitization and increased competitiveness among businesses. The pace of innovation across economic sectors also increased rapidly, and this brought a new challenge to enterprises, the need to hit the markets fast. The general consumer population is increasingly becoming more educated as more information becomes readily available through the cloud. Virtual communities and social networks have also led to the advent of new entrepreneurship approaches. Social entrepreneurship has become common in today's modern world. 3D printing (i.e., additive manufacturing) is an old technology that was progressing slowly but became a significant pillar of supporting innovation and quick time-to-market in many enterprises. Products can now be launched faster because the technology eliminates complex stages of product research and development. Where new tooling for new parts design would take several weeks or months to produce, 3D Printing has eliminated those stages. Big companies have gone further to using 3D printing to make ready-to-use parts, which can be used as spare parts replacements. This significantly reduces down time in many industries. However, by nature, 3D printing remains unsuitable for mass production. This calls for innovative business models to sustain the technology, whilst tapping from its unquestionable benefits. There are many proven business applications of 3D printing, which include new-product design/prototyping, spare parts replacement, 3D printed ornaments, children toys, education and many others such as the medical fields. However, business viability factors in many considerations which if not taken into account can result in unsustainable issues and subsequent failure of the initiatives. Adopting appropriate business models bring in viability and promote growth of the 3D printing technologies through proper appreciation and continued innovation.

3D printing is rapidly developing into an important but also disruptive technology with the potential for societal-wide change as witnessed with the introduction of the automobile, personal computer, the Internet and smartphones (Mills, 2015; Petrick & Simpson, 2013). The technology influences many processes in production, supply chain design, logistics, product life-cycle planning, and consumer behavior (Mellor et al., 2014; Berman, 2012; Bogers et al., 2016). Research has argued that this technology not only has profound effects on manufacturing businesses but also on society, which demands new corporate strategies and policies alike (Jiang et al., 2017). The article looks into details of various promising entrepreneurship applications of 3D printing, cloud computing technologies and their disruptions to the traditional business approaches. Innovative entrepreneurship models are then considered with the view of proposing new business models for adoption by the modern e-entrepreneurs in the digital economy. Practical scenarios are considered, and the case studies can be applied in any other 3D printing environment following the proposed template approach.

TRENDS IN 3D PRINTING

3D printing is a manufacturing method based on advanced technology that builds up parts, additively, in layers (Ventola, 2014). The 3D printing process starts with a 3D digital model, created using 3D software such as 3D CAD. After the expiration of the patent for the fused filament fabrication (FFF) technology of additive manufacturing (AM), where a single layer of polymer is deposited after another, there followed the release of the open-source self-REPlicating RAPid prototype 3D printer (RepRap) (Sells et al., 2007; Jones et al., 2011; Bowyer, 2014). The open-source hardware approach led to a rapid