Chapter 4
3D Printing and Supply Chain Management

ABSTRACT

Modern production is based on dislocation and decentralization. Production will be closer to the end-consumer in decentralized production and distribution structures. Workers (machinists) are no longer required as the machines can run unattended for a long period of time. Since Charles Hull invented additive manufacturing, 3PD got more and more attention by practitioners, especially in the field of mechanical engineering. 3D printing has accelerated strongly in recent years. As it was stated in chapter 2, the technology has come a long way from simple prototyping to fully integrated utilizations in direct manufacturing and because of its many forms of application, 3D printing is said to be one of the most significant industrial developments of this decade.

BACKGROUND

As it was mentioned in Introduction chapter, the first industrial revolution in the second half of the 18th century, new technologies disrupt entire supply chains and affect especially the manufacturing of products as well as the logistics activities. However, there is no unique solution for coping with new arising technologies as every innovation is different. New disruptive technologies that will have a huge impact on the global economy in the near future are the automation of knowledge work, advanced robotics, autonomous and near-autonomous vehicles as well as 3DP to mention just a few (3D Printing: The

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Next Revolution in Industrial Manufacturing, 2015) (Richard Dobbs, James Manyika at all, 2013).

In the late 18th century the first industrial revolution started in Great Britain and was spread out all over Europe in the 19th century. The mechanization of production - especially by the use of the steam-engine and trains as means of transportation – took place from an agrarian, handicraft economy to one dominated by industry and machine manufacture.

In the beginning of the 20th century the second industrial revolution took place. It was mainly initiated by Henry Ford and his new organizational structure. Ford introduced the standardized mass production and assembly lines to increase productivity by producing a large amount of cars at the lowest costs (see Chapter Introduction, Magneto Line, Figure 6). Both revolutions increased the production speed and the efficiency of production dramatically but the social and working life of the people was also negatively affected, e.g. loss of jobs.

The third industrial revolution takes place right now, but in most industrialized countries we still have fourth industrial revolution (another name is Industry 4.0). By introducing technologies like 3DP or advanced robotics 'manufacturing is going digital'. As in the two revolutions before, the way of producing goods will change but also the place of production will be affected by these technologies. Production will be closer to the end-consumer in decentralized production and distribution structures. Workers (machinists) are no longer required as the machines can run unattended for a long period of time. A shift in the types of work will be one important consequence of the third industrial revolution. But one of the most revolutionary aspects of the new technology is that everyone can be a developer and a producer at once. 3DP can enhance individual mass production.

Since Charles Hull invented additive manufacturing, 3PD got more and more attention by practitioners, especially in the field of mechanical engineering. As only 10% of executives in the manufacturing industry see the technology as highly relevant for them today, one can state that 3DP is still in its infancy. But one third anticipate that the technology will become highly relevant within the next few years. Adopting 3DP in an early stage can bring tremendous advantages. Hence, it should be considered by all affected parties as early as possible.

Prototyping, product development, and innovation are the most common uses of 3DP today. Especially in the medicine sector 3DP is indispensable as