

Emerging New Technologies and Industrial Revolution

E

Rauno Rusko

University of Lapland, Finland

Mika Kosonen

University of Lapland, Finland

INTRODUCTION

The technological innovations potentially have great importance to the industries creating new markets or radically change, or disrupt, the status quo in existing industries and their industry architectures (Bower & Christensen, 1995; Nagy, Schuessler & Dubinsky, 2016). This chapter focuses on one question: when new innovation is so disruptive that it causes the whole new industrial revolution? The contemporary technological invasion provides several technologies and perspectives, which might be disruptive. Industrial revolution is linked with disruption (Walters, 2014). Interesting question is, whether the contemporary new innovations and frameworks are disruptive and especially in the way, which is possible to interpret to be even so affective enabling industrial revolution. Furthermore, disruptions which have effects on technological development are not only innovative, but also the era of Covid-19 has cumulative effects on the invasion of digitizing and AI (artificial intelligence). This chapter introduces several innovative technologies and frameworks, which have claimed to be so innovative that they might have the status of industrial revolution (Table 2).

Chapter exploits blockchain technology, which is one of the latest strong innovations in society and business as an example of the most recent potentially disruptive technologies and their features related to the features of industrial revolution. According to Swan (2015), blockchain is in the position to become the fifth disruptive computing paradigm after mainframes, PCs, the Internet, and mobile/social networking. Technological disruption is possible to be individual organization specific (Nagy et al., 2016) or general all-inclusive. Swan (2015) sees that blockchain is a disruptive technological innovation with wide (all-inclusive) effects though the effects of the technology can vary according to the structure and other features of organization.

Furthermore, cybernetics or cyber-physical systems are important contemporary technology, which many researchers see potential core of the next industrial revolution (Monostori, 2014). Cybernetics is based on controlling systems, which are also necessary in the latest AI innovations (Glanville, 2013). Thus, another tested technology of this chapter for new potential industrial revolution is cybernetics.

This chapter focus on strong underlying features in the development of data science and machinery, namely disruptive technologies, which are linked with old and potential new industrial revolutions, such as blockchain technology and cybernetics.

BACKGROUND

Literature review is based on two parts: systematic literature review and completed contemporary perspectives about literature, which is focused on disruptions, industrial revolutions and their backgrounding (joint) features linked with data science and/or machinery. Systematic literature review has the first 25 most relevant references from EBSCO database with keywords “industrial revolution” (the search including “...”), which were available (full text). This search was on 28th September, 2016. The main results of this search are presented in Appendix 1.

The Systematic Literature Review

Generally, the drivers of the industrial revolutions are based, in addition to technology and innovations, also on societal, political and demographic themes, such as migration, environmentalism, demography, freedom and free trade. Thus, the “real” industrial revolution is not based on only one (or two) separate or disconnected innovation, rather the industrial revolution is based on the series or sequences of phenomenon, actions, innovations and changes in business environment, political and societal circumstances, which together enable *all-inclusive disruption*. This outcome supports the ideas of Mahoney (2000) about the important role of path-dependence and sequential phases in industrial revolution.

According to table in Appendix 1, the most important drives of the first industrial revolution (in Britain) seem to be relatively *high factor prices*, such as wages and price of coal, *rise in international trade, mechanization, incentives to innovate because of patent system, the general rise in new ideas, consumerism, organizational changes in production, working-class households, discontinuous technological change, high profits enabling reinvestments*.

Also, the drives of the industrial revolution among the articles, which focused on the latest or several industrial revolutions were *environmental and energy themes*, such as high carbon and low carbon energy sources, low carbon transition, climate change, steam, steamship, electricity, expansion of energy services, historical decline in the energy cost share and new energy sources to methods of production, *technology* (mass production and mass customizing, mechanization, information technology (IT), Internet of Things (IOT), railroad, telegraph, cable systems, mass production and distribution systems, changes in physical and management technology, modern transportation and communication facilities), *political and societal themes* (weak state, an emphasis upon individual liberty, the right institutions and culture of creativity born of free minds and free markets, “Buy American”, regulation, taxes and movement from centrally planned economies to capitalism) and *themes of business and economics*, such as global competition, open participation in international trade and private economic benefits of adopting new technologies and practices. (Appendix 1)

The Complementary Literature Review

Because most of the articles in the systematic review considered only the first (British) industrial revolution, it is essential to enlarge the population of articles of the literature review. Disruption, which is an important feature in the new large-scale innovations (Holey, 2009) was mentioned only in 7 out of 25 articles in the systematic literature review. Next, we introduce some other studies, which focus on the theme and criterions of industrial revolution mainly with disruption perspective and consider also other features, logics and the drivers of industrial revolution.

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