

Value Chain in Industry 4.0, Concept Development in the Previous Industrial Revolutions

Teodor Emanuel Petreanu
The Bucharest University of Economic Studies
teodor.petreanu@asr2035.ro

Abstract

A value chain means bringing a product from designing (conception) to delivery, and it includes all the stages needed, in a business, to bring something from the producer to client, including marketing and distribution. If a company is focused on production of goods, a value chain contains all the stages and inputs from the raw materials needed to consumer delivery.

This paper aims to illustrates the value chain concept in his entire evolution, in developing business models, in all the four industrial revolutions. After Steam, Electrical power and IT revolutions, now we leave the CPS industrial revolution. Industry 4.0 is a german term used for the new type of industry, that includes services sold by the industry. Growth clusters of high-added activities bring high income into the economy. Interdependence is the future and this trend includes real and financial market interactions.

Key words: business models, value chain, creative industries, Industry 4.0

J.E.L. classification: M20, N10, O11

1. Introduction

In the societal continuum, the last 150 years have brought an accelerate development considering the industry and the anthropology of the urban and rural environments. We have had four industrial revolutions and now we develop the fifth, behind which we have had changes in the dynamics of the rural and urban, with migrations that represent a challenge for the value chain process. We've had a passing from agriculture, guilds to steam for the mechanization of production, electricity that improved productive capacity (factories), emergence of computers that brought changes in all economic branches (IT&C), artificial intelligence or Cyber Physical Systems (CPS) that enable the physical world to merge with virtual leading to an internet of things, data and services. We can bring more value, more income quickly with services, but we have to consolidate the primary base of economy and that is production of goods, agriculture and energy. If we consolidate the levels of economy in the right way, taking all the steps, we can avoid another crisis.

This article focuses on the analysis of the dynamics between rural and urban, in the last 20 years, using also social indicators from every industrial revolution with an emphasis on urbanization, an extremely important aspect in these developments and also the trending topic for 2050, in Sustainable Development Goals – SDG's, United Nations.

2. Literature review

James M.Tien (2012) conducted a research on Industry 4.0, as the present Internet of Things (IoT) and ICT , with a review of the other three. He searched for variables and directions in fast growing technological revolution with systems of systems, data analytics, digital manufacturing, adaptive services. He studied the mass customization as the simultaneous and real-time management of supply and value chain, with the competitive advantage in the industrialized countries where customers are the coproducing producers.

In the studied conducted by Tim Weilkiens (2013) on Industry 4.0, he is studying and explaining the smart factory, with grids and system of systems, communicate the information between the manufacturing machines. This is easy adaptable to last-minute changes, can be implemented in different enviroments, as rural and urban, connecting the levels of economic activities, four main categories, with the future of machine learning, software, electrical and mechanical engineering. This will save time and costs, will have people working on creative industries, and let the machine do the repetitive work.

Mike Mortson makes a parallel between Industry 1.0 and 5.0 (the future) considering the cyber physical systems (CPSs) as value chains involved in the manufacturing process. Supply chain technology develop automatic spply chain functions, can reduce error and manual labor. For this to happen we need specialized providers, that must communicate, integrating all the components of a value chain. Industry 4.0 brings digitalization in the value chain, generate complexity for the manufacturers at lower costs and brings the product faster on the market.

Lionel Fontanea, Pierre Mohnenb and Guntram Wolff (2013) have had an articole related to France’s Industrial development, speaks about clusters, knowledge that is shared between entities with different activities that works together to develop a product more efficiently, in a face-a-face between researchers, business and industry dialogue, better than books and computer codes, also with an input on covering long distances. As they’ll have everything in the same place or connected, as skills, tools and companies, with sectoral subsidies and public procurement, this will generate a more efficient transfer of knowledge, using geography and on-line tools to generate complementarity of the companies skills as technology and competitiveness clusters. In France, 2007, statistics shows that services represent max procent in the current activities, as 87% only sold services, 1/3 mainly sold services, as the value chain is based upon economy of scale.

3. Research methodology

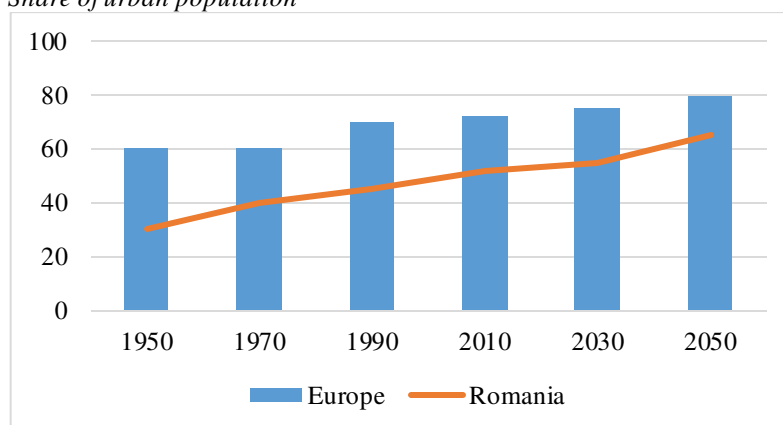
I will use an approach for the third level NUTS regions, considering three steps as typology statistics on the rural an urban studies. Here we have grid shells, with three categories: predominantly urban regions (<20%), intermediate regions (20-50%), predominantly rural regions (>50%). On Eurostat website there is a section City Statistics Illustrated and Statistical Atlas, where the information can be visualized and analysed as territorial data, correlated with the population.

I used also Urban Europe manual, statistics on cities, towns and suburbs, studying Europe from the 1950 to 2017, with an emphasis on Romania, studied conducted by Enache and Holtier in 1980 (for the 1945 and 1977 period) and Enache in 2013 (for the World Bank).

4. Findings

In 2017, three quarters of the European population lived in urban area (Eurostat Urban Europe)

Figure no. 1 Share of urban population



Source: personal calculation, based on Enache and Holtier (1982)

EU's activity is concentrated in predominantly urban regions (53% of the GDP) in 2012, with an increase in population, as migrators from rural, as 72% in 2015 living in the urban comparing to 59 % in 1950. Romania is following the raising trend in urban-rural typology, with an increase from 31% in 1950 to 52% in 2015. Also there is a problem with the growth poles, in the present day we have Bucharest, the capital, that attracts population and developed this sector of IT&C, the third industrial revolution and the industry of services.

Value chains in the rural-urban environment is based on the production of goods, processing, distribution, services and trade, that can be local, national and global, connecting the rural to global consumers, as smallholders, transporters, input suppliers, processors. In developing countries, we have >30% of GDP based on agricultural value chains, where >75% of the population live in the rural areas.

The 1st industrial revolution started in 1760 introduced water and steam in the manufacturing process, with influences in residence use, textiles and transportation; made production more faster. The 2nd revolution, 1840, it is called the technological revolution, in Britain, Germany and America. It was focused on electrical power with sophisticated machines that allowed an increase in production. The increasing usage of IT and automation in the 1970 ties it known as the third industrial revolution, Information and Communications Technologies (ICT). The 4.0 as an industry was the internet of things and cyber physical systems, cloud computing, cognitive computing that employs artificial intelligence, solving the global challenges of our time, the communication of the systems involved in the manufacturing process with each other. The 5.0 industrial revolution emphasizes the passing from human to virtual, machine between machine, factories transformed through the Internet of Things, interconnect cognitive computing with cloud servers.

Industry 4.0 brings data analysis into the supply chain, processing large amounts of data, grow businesses faster. If we have a rural and urban comparison, we can find a new trend in moving to villages, where the entrepreneur can have a smart factory, also can work coding from home, staying in the rural, where the quality of life is better. Manufacturing 5.0 is an upgrade of 4.0 and follows its grids and directions.

5. Conclusions

What is industry for in a world of services? I think industry is now, more than ever, a security issue. If a country wants to have independence it needs to consider to major aspects: agriculture and energy; both of them relates to industry. Industry now undergoing major restructuring – shift from monopolistic to competitive structure – new economic/social pressure. The difference between industry and services is the concentration of qualifications. The authors wrote about the agglomerations of related industries, as „brain hubs” that represent urban areas with high-income employees, industrial capitals, help suburban areas with a declining in jobs and migration of the inhabitants, their jobs generates other 5/1 other jobs. If we only export, if our industry will concentrate only on services, on short term there can be an increase on the income from services, but afterwards we have an import of consuming products that could generate insecurity as a nation, limited independence in decisions, conditioned by the export countries. Industrial companies, at the international level, with a split value chain are classified as services, so we need to redefine the industry as today ICT and CPS where the production of goods don't represent anymore the only way to obtain profit. We can do this first creating clusters. The rapid evolution of the technological innovations from the last 40 years is continuing with a faster pace as today's revolutions last only as long as it takes for industry-wide implementation to complete itself.

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