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Surveillance capitalism – a new techno-economic paradigm?

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ABSTRACT

***Abstract*—This paper look at surveillance capitalism as described in the book by Shoshana Zubof, and discuss whether surveillance capitalism represents a new stage of capitalist development. This is done by using the theory of techno-economic paradigms as a theoretical framework.**

Keywords—Surveillance Capitalism, Techno-economic paradigm, artificial intelligence, big data

I. INTRODUCTION

With the publication of her book The age of Surveillance Capitalism, Shoshana Zuboff introduced a new term for describing the present stage of capitalist development (Zuboff, 2019). It is however not clear whether the age of surveillance capitalism whether the surveillance capitalism describes certain distinctive traits of the information society or whether presents an entirely new stage in the capitalist development. Zuboff provides a clear analysis of the functioning of the surveillance capitalism, but she does not situate this explicitly in a taxonomy of the phases of capitalist development, and there are only few references to literature describing various stages of development. Zuboff refers in her book to Castells and his book Networked society (Castells, 2011) and criticizes him for underestimating the impact of ICT, when he claims that information capitalism is not a structural shift comparable to the shift from agriculture to industrial society. According to Zuboff, Castells sees digital technology as a way to perform the functions of the industrial society faster, while Zuboff claims that the functions performed in the digital society are fundamentally different. But you may wonder if Zuboff refers to the same society as the one Castells describing. Castells analyses the impact of ICT based on observations, from the 1980s and onwards, while Zuboff is concerned with developments taking place after 2010.

Does the surveillance economy represent a new stage of capitalist development or is the surveillance economy just a new expanding sector of in the information economy? This is the topic

for this paper. Acknowledging the thorough analysis of how the surveillance economy works, the paper will look at the claim that this represents an entirely new type of capitalist accumulation. In this context, the paper will apply the concept of techno-economic paradigm to define how a new stage of capitalism should be characterised.

II. THEORIES ON STAGES OF CAPITALIST DEVELOPMENT

The art of defining different stages of development of the society has been exercised by scholars from many different disciplines. Some economists have focused on trends in economic indicators, such as economic growth and levels of employment, while others have applied a more interdisciplinary approach, where technology, social, political or cultural factors are included in the analysis.

One of the most prominent is probable the prediction made by Karl Marx on the emergence of a communist society once the capitalist society has developed the means of production to a certain level. This prediction was inspired by Hegel. Both Hegel and Marx believed that the evolution of the human societies were not open ended (Fukuyama, 2006). However Hegel saw the ultimate goal as the liberal state, and the driving force being search for recognition (thymos). While Marx saw the communist society as the ultimate goal, the struggle between classes being the driving force.

Rostow's Stages of economic growth – a non communist manifesto published in 1960 was formulated as response to the Marxian theory of capitalist developments towards a communist society. He argued that the Marx had a too narrow focus on profit-maximation, as a key driver for development of the society, without paying attention to cultural values in mature societies, such as democracy and social security.

Following the break of the Berlin Wall and the collapse of the Soviet Union Fukuyama predicted with inspiration from Hegel the end of history. He claims that "the logic of modern science would seem to dictate a universal evolution in the direction of capitalism." However he admits that "there is no economically necessary reason why advanced industrialization should produce political liberty." (Fukuyama, 2006) (p. xv). Using Hegels' search for recognition as an argument, he is still optimistic about capability of the liberal democracy to become the universal model for the society.

In economic theory studies of stages of economic development is often linked to the study of cyclical fluctuations in economic activity. Cyclical analysis dates back to the 19th century (Maddison,

1991). It is however, the study of long waves introduced by Kondratief in the 1920's and taken up by Kuznets and Schumpeter, which are relevant in this context. In the period 1780-1920 Kondratieff identified three long waves of high levels of economic growth in two to three decades followed by a decline of another two to three decades (Maddison, 1991). Although the discussion of long waves dates back to the 1920's, their existence is generally accepted among all economists.

Schumpeter identified similar waves and suggested technological development, as an explanation of the fluctuations identified. He named the three long waves as (Maddison, 1991):

1. Industrial revolution Kondratieff (cotton textiles, iron and steam power)
2. Bourgeois Kondratieff (railroadization)
3. Neomercantilist Kondratieff (electrical, automobiles, chemicals)

The framework provided by Schumpeter is later further developed Carlotta Perez and Christopher Freeman by introducing the concept of the techno-economic paradigm.

III. TECHNO-ECONOMIC PARADIGM

Inspired by Schumpeter, the theory of techno-economic paradigms was developed in the 1980's and 90's by a group of economic and non-economic researchers centered around Science Policy Unit (SPRU) in Sussex, UK and Maastricht Economic Research Institute on Innovation and Technology MERIT in Netherlands. They felt a growing dissatisfaction with how technical change was treated in mainstream economics, where the study of technical change was seen as completely separate the the study of cyclical fluctuations in the economy (Freeman, Introduction, 1988).

The concept of techno-economic paradigms was introduced first in (Perez, Microelectronics, long waves and world structural change: New perspectives for developing countries, 1985)and further developed in (Freeman & Perez, Structural crises of adjustment: business cycles. Technical change and economic theory, 1988) in order to analyze the relationship between technological development and long waves in economic growth.

Freeman & Perez establish a taxonomy of innovations including four different types:

1) Incremental innovations

2) Radical innovations
3) Changes of innovation systems
4) Techno-economic paradigms

The different types are described in table 1. While incremental innovations are minor innovations in a specific product or process. Changes in techno-economic paradigms imply major changes in the society.

TABLE 1 TAXONOMY OF INNOVATIONS

Type of innovation	***Categorisation***	***Examples***	***Economic impact***
Incremental innovations	Minor innovations taking place continuously in one specific product or process.	Improved organization of a specific working process on the factory floor.	Minor impact from each innovation, but in total important for productivity gains over time.
Radical innovations	Discontinuous events, often results of deliberate research	Nylon, the contraceptive pill	May lead to structural change, but the impact is limited to a single sector
Changes of technology system	Far reaching changes in technology combined with organization and managerial innovations in more than one firm	Synthetic materials Petro-chemical innovations	Affect several branches of the economy and creation of entirely new industries
Techno-economic paradigms	Changes in technology system, which affect almost all sectors.	See below	Pervasive effects throughout the economy.

Source: Based on information from (Freeman & Perez, 1988)

Freeman & Perez define a techno-economic paradigm as a technical change that ”have such widespread consequences for all sectors of the economy that their diffusion is accompanied by a major structural crisis of adjustment, in which social and institutional changes are necessary to bring a better ‘match’ between the technology and the system of social management of the economy” (Freeman & Perez, Structural crises of adjustment: business cycles. Technical change and economic theory, 1988).

A techno-economic paradigm includes more than just a key technology or a technology cluster. It includes a combination of “interrelated Process, technical, organizational and managerial innovation”. It implies both technical and economic advantages and opens up for new investment opportunities across several sectors in the economy.

The realization of each techno-economic paradigm involves utilization of a key input or a set of key inputs, which are necessary for the paradigm to unfold. Such inputs must meet following conditions:

1) Low and rapidly falling costs
2) Almost unlimited availability of supply over long periods.
3) Clear potential for application in many different products and processes in all parts of the economy.

According to Freeman & Perez five different techno-economic paradigms can be observed since the industrial development (Table 2). The emergence of these paradigms coincide with the so-called long waves in economic growth observed by Kondratieff. Each paradigm is accompanied by an economic upswing followed by stagnation, when the full potential is realized. Furthermore the techno-economic paradigm is accommodated by different institutional forms. Thus the IT paradigm is characterized by networking companies and just in time production. In this way the framework links technological, economic and institutional development together in a manner that fits well with the analysis provided by Zuboff.

TABLE II TECHNO-ECONOMIC PARADIGMS

	Name for period	***Main Carrier***	***Key Input***
1770 - 1840	Industiral Revolution	Textiles	Cotton
1840 - 1890	Age of Steam and	Railways	Coal
1890 - 1940	Electrical and Heavy engineering	Steel, Ships, Chemicals	Steel
1940 - 1980	Fordist mass production	Automobile	Energy and oil
1980	Information and Communication	Computers	Microchips

Source: Based on information from (Freeman & Perez, 1988) and (Perez, Technological revolutions and techno-economic paradigms, 2010)

Manuel Castells' network society can be seen as an extension of the techno-economic paradigm, as he takes the IT technology paradigm as a point of departure for describing the network society characterizing the present stage of capitalist development (in 1997). Castell is however more explicit about the role of culture factors shaping this stage of the society. According to Castells, the network society differed from industrial capitalism and was the result of three independent processes:

- The information technology paradigm constituted in the 1970's
- The restructuring of capitalism and statism overcoming current contradictions
- The cultural social movements from 1960s and 1970s (feminism, ecologism etc.)

In this way it formed through a combination technological, economic and cultural developments. The network society is not a service economy, but information plays a key role in all sectors.

Production is globalized, the network enterprise is the dominant form of organisation. The labour market becomes more flexible with subcontracting and individualization of the labour force.

IV. Surveillance Capitalism

”The Age of Surveillance Capitalism” combines different scientific disciplines. An analysis of certain economic trends in the production of ICT services is combined with an analysis of broader socio-economic trends related to democracy and privacy for citizens. The book also raises fundamental philosophic questions, such as whether human actions are based on free will or if they can be predicted through a detailed data analysis. In this way the book contributes to a long standing debate on the interplay between technology, economy and the institutions of the society.

Shoshana Zuboff describes surveillance capitalism by using Google as the most prominent example of a company using surveillance technology as an integrated part of their business model. The success of the google search engine relies on its ability to optimize research results by the use of data collected on user behavior. It took however a while before Google developed a profitable business model, which could make this business profitable. The problem was how to attract funds from advertisers without compromising the quality of search results. Google collected behavioral data on each user and developed algorithms, which could be used for predicting future user behavior. The solution was to use this knowledge to post exactly those advertisements, which were considered to be most relevant for the user. In this way they could improve the response rate on their ads, as ads were shown only to those, who were considered to become potential customers. The science of targeting the right customers with your advertisements is not new, but Google could do this better that anybody else, partly because the algorithms developed and the amount of data they could access. Similar models are applied by Facebook and other social media, and predictions of consumer behavior are sold to other companies as well. Zuboff describes the surveillance capitalism be characterization of four different elements:

1) The logic: A search engine like google can be seen as a multisided platform connecting users with relevant websites, but according to Zuboff it is more than that. By using the search engine, users generate a “behavioural surplus”. This raw material consists of data on human behavior, which can be used for predicting future consumer behavior. This knowledge is transformed into a prediction product, which can be sold on the market to other companies. The technologies applied in this process relies on big data analysis and artificial intelligence. Zuboff compares this with the logic of the

industrial capitalism, where raw materials extracted from the environment are processed and turned into industrial products. In the surveillance capitalism, the raw material is human behavior, which is transformed in knowledge products.

2) The means of production: Zuboff denotes the means of production as "machine intelligence". This seems to include development of artificial intelligence built on analysis of big data extracted from the behavioural surplus. The official purpose of collecting user data is to optimize the search engine or other services offered by Google. However, the data are also used for optimizing the advertising on Google. Machine intelligence is used as a tool for predicting the kinds of advertisements the user will click on. Higher click-through rates improve both the profit and the competitiveness of the advertising platform.

3) The products: The products are predictions created by the use of machine intelligence. The algorithms for making these predictions are kept secret. In 2016 89% of the revenues in Alphabet came from advertisement programmes (Zuboff, 2019 p. 117).

4) The market place: The predictions on behavior are sold on a new type of market for "behavioural futures. The primary target group was originally advertisers, but once this knowledge on how to create predictions on human behavior is created, it can be used in many other contexts. Zuboff sees this as a system of mass production like the one created by Ford in the last century.

According to Zuboff the difference between surveillance capitalism and previous stages of capitalist development can be summarized in following three points:

1) Freedom and knowledge
2) After reciprocity
3) New collectivism and its masters of Radical indifference

As in previous stages of capitalism, the ideology of the "free market" is maintained. The difference is that the invisible hand of the market mechanism is not completely invisible in the surveillance economy. Artificial intelligence and big data can be used to predict consumer behaviour even better than the users themselves are able to.

The reciprocity relates to the social contract developed under the Fordist paradigm, where there was a mutual dependence between labours and factory owners. The factory owners secured an income for the labours by offering them jobs, and this created a consumer market securing an income for the

companies. However, the IT companies do not create a lot of jobs, and their markets are even more globalized than the mass production companies in the Fordist era.

The last point is probably the key message of the book: Information and news are increasingly managed by algorithms and not by human beings. This has led to a situation, where fake news and hate speech have flourished at the cost of objective information.

Looking at these points, it is not clear, whether Zuboff sees surveillance capitalism as a stage of capitalism, which is distinct from the information or the network society. The second point and the subsequent increase in economic inequality have been discussed for decades. The two other points are however specific for the surveillance capitalism, and very different from the previous optimistic visions made by Castells and Fukuyama.

V. Discussion: Surveillance Capitalism as a Techno-economic Paradigm

IMF has published one of the few studies on the macroeconomic impact of big data (Carrière-Swallow & Haksar, 2019). Their study focuses on the financial sector, but their conclusions relate to the total economy. They point at three different factors: Growth, equity, and stability. It is concluded that data "has the potential to contribute to economic growth". First data can as an input in the production function improve productivity. Second data improve the efficiency of the market. However, use of data in artificial intelligence applications creates increasing return to scale, and lead to market concentration and increase inequality. In addition stability in the financial sector can be threadened.

Let us return to the theory of techno-economic paradigms, and see how it fits with the concept of surveillance capitalism. First we consider, whether a new long wave can be observed. It should be noted that in contrast to short wave business cycles, long waves may be difficult to identify in economic data. For this reason, the theory of long waves has been controversial among economists. It is in particular difficult to identify patterns in current economic growth, as only history can show, whether recent changes represent short-term fluctuations or a new trend.

NBER uses US employment data for their business cycle dating (fig, xx). According to NBER the most recent peak occurred in February 2020 ending a record long expansion period, which began in 2009 (NBER - National Bureau of Economic Research, 2021). This expansion period began with the recovery in the aftermath of the financial crisis 2009-10 and concluded with the corona lock-down.

This illustrates well that the impacts of external shocks are highly visible in economic data (it can be argued that the financial crises was not purely external). These shocks may not be rooted in economic developments; still they may trigger a reverse in long-term economic trends. This was for instance the case with the first oil crisis, which initiated a down-turn, which in Europe lasted for 20 years. The unemployed figures depicted in figure xx open up for at least two different interpretations: Two waves since 1980's with expansion periods 1985-2002 and 2010-2020, or one long wave with an expansion period 1985-2020. A tempting conclusion would be that the paradigm based on information and communication technology created the expansion period 1985-2002. The second expansion period started with a recovery after the financial crisis, but continued due the creation of a new techno-economic paradigm led by the big tech companies.

Figure 1 Fluctuations in US Unemployment Rate

Note: NBER-dated recessions in gray.

Source: Bureau of Labor Statistics via the Federal Reserve Bank of St. Louis. Quoted from [*https://www.nber.org/research/business-cycle-dating*](https://www.nber.org/research/business-cycle-dating) *quoted from* (NBER - National Bureau of Economic Research, 2021)

In this section we will consider four parameters related to a shift in techno-economic paradigm. As described above a techno-economic paradigm can be characterized as a set of technologies which:

1) Is based on one or more key inputs

a) Low and rapidly falling costs

b) Almost unlimited availability of supply over long periods.

c) Clear potential for application in many different products and processes in all parts of the economy.

2) Affect all sectors of the economy

3) Create new investment opportunities
4) May demand institutional changes to be unfold i full

The key companies in the surveillance capitalism as described by Zuboof are platform providers, which collect behavioral data and which revenues mainly comes from advertisements. The key players in this context are Google and Facebook. As noted above 89% of Google's revenues come from advertisements.

Google and Facebook are among the most valuable companies in the world and they dominate the market for digital ad spending. The two companies combined maintain a market share of around 55% of the US digital ad spending (Liberto, 2019). They are however not the only ones. 75% of the revenues on digital ads are shared among only ten companies.

It is therefore obvious to see behavioural data, as the new key input in the emerging techno-economic paradigm. Due to rapid advances in artificial intelligence and big data, behavioural data can be acquired at low and rapidly falling costs, and they are widely available. Compared to other techno-economic paradigms, it is the first time we have a key input, which is intangible. It can however be argued that the key input remains to be the microchip. Microchips are necessary components an input to the production of the necessary hardware, and it still has a strategic importance. This is reflected in recent restrictions in exports of microchips to China imposed by the US Government (Karner, 2020). So far the digital ad spending has grown year after year, and in 2017, it amounted 107 bill. $, more than four times the revenue 10 years earlier. It should however be noted that the growth has taken place at the expense of revenues earned by other media, which have experienced stagnating or declining revenues. Especially marketing in printed media has declined. The revenue on the total ad market has according to some sources fluctuated around 1% of GDP and without a clear trend of positive growth (Taylor, 2018). This indicates that despite current growth rates there are limits of this source of revenue.

Google and Facebook are however not the only platform providers using behavioural data. Behavioural data can be used by all kinds of platform providers, as well as by other sectors of the economy.

The dominating IT companies of today differ in profile and business models, but they all have behavioural data as an important input, and can be seen as a part of the surveillance economy.

The surveillance economy is dominated by a limited number of US based companies the so-called GAFAM companies, which all rank as the most valuable companies in the world (table). Outside US, it is only a few Chinese companies (the so-called BATH companies), which can compete with the US giants.

TABLE 3 MARKET VALUE OF GAFAM AND BATH COMPANIES

Market value world ranking	***Market value Billion US Dollar***
No 2. Apple	1,305
No 3. Microsoft	1,203
No 4. Alphabet (Google)	923
No 5. Amazon	916
No 6. Facebook	585
No 7. Alibaba	569
No 9. Tencent	461
Baidu	43.7
Huawei	n.a.

Source: (Lundvall, 2020)

When it comes to the impact on other sectors and the economy as a whole, it should be noted that the center of the business model, which characterize surveillance capitalism is the provision of a digital platform. This strategic asset enables harvesting of data on personal behavior, but the platform itself can create revenues from other sources than digital ads. Amazon and Alibaba are important providers e-commerce services in retail. Apple and Tencent provide digital services on a subscription basis.

Artificial intelligence and big data provide the technological foundation for the surveillance economy. These technologies are essential for innovation for innovations also in other sectors, where data are collected and analysed. These data might not be data on personal behavior on a specific platform, but include data collected from digital sensors. Smart homes optimizing the use energy resources and self driving cars are examples on this. Not all of these applications have implications for

privacy, and the data collected might not be on personal behavior, but the technologies applied are the same.

When it comes to offering new investment opportunities the picture is less clear. The GAFAM companies and their Chinese counterparts are all major investors in research and development. They also invest heavily in infrastructure facilities supporting the surveillance economy such as communication networks and cloud computing. It is however not clear, whether these investments differ from those made in the previous information and communication paradigm. According to Freeman and Perez, the creation of a new paradigm takes place after investment and growth opportunities of the previous paradigm are exhausted. It is not clear whether this is the case. Fluctuations in investments and economic growth have taken place since the information and communication paradigm emerged in 1980-1990. For instance the dot-com bubble in 1999-2002 and the financial crisis in 2010, but these events do not indicate the emergence of a new long wave.

TABLE 4 GAFAM & BATH ARE AMONG WORLD LEADERS IN RESEARCH AND TECHNOLOGY

World ranking in terms of company spending on R&D	***R&D Billion US Dollar***	***R&D Share of income %***
1. Amazon.com	22.6	12.7
2. Alphabet (Google)	18.3	15.3
4. Microsoft	14.7	13.4
7. Apple	12.4	5.4
12. Facebook	9.0	18.4
6. Huawei	12.7	13.9
29. Alibaba	4.8	9.9
54. Tencent	2.9	7.3
74. Baidu	2.0	15.4

Source: (Lundvall, 2020)

When it comes to the final point, the need for institutional reforms, Zuboff points out that the mechanisms created as part of the surveillance capitalism is a challenge to the liberal democracy, as we know it today in the Western hemisphere. This point is probably the key message in her book, and it has been discussed elsewhere. An important question in this context is whether democracy will constitute an institutional barrier towards a full realization of a new techno-economic paradigm. Will China become the global leader due to a better fit between technology and institutional structure?

VI. Conclusion

The results indicate that the surveillance economy in many aspects share the characteristics of the ICT techno-economic paradigm, but that that important differences can be found. The surveillance economy is based on a combination of technologies such as big data, machine learning, Internet of Things and cloud computing. These technologies are all based on IT, but can also be seen as an independent technology cluster, which forms the basis for either a new phase of the ICT techno-economic paradigm as claimed by (Knell, 2021) – or an entirely new paradigm, which includes the surveillance economy as well as a wide range of other applications.

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