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Historical Periodization and *The Age of Moore's Law* (1965-)

At the heart of history is the passing of time and how it affects the world around us. The practice of history involves the study of change; however, historians also seek to capture the spirit or *Zeitgeist* of a certain time; to freeze frame a certain environment, lifestyle or everyday practice and to capture the cultural, economic and political character of a time period. Periodization plays a key role in the study of history as it both illuminates how we look back at the past, while it at the same time shapes our understanding of past events. Periodization embodies a mutually constitutive character. This article seeks to 'unpack' the historical practice of periodization, and in connection to that, argues how the past fifty years can be characterized.

There are several commonly held practices of periodization that immediately surface. For example, we can characterize a period by its dominant material usage, as is done for the Stone Age or Bronze Age (the Plastic Age would be a good addition). However, periods may also refer to technological or scientific developments, such as is the case for the Neolithic, Renaissance, Age of Discovery, Industrial and Scientific Revolution and Information Age. Additionally, we may refer to a period's dominant ruler, as for example is done for the Napoleonic Era. Also, some periodizations make use of metaphors and clearly show how historians have come to view a certain time, as for example, 'enlightening', as for the Enlightenment, or as 'dark', as for the Dark Ages. Historiography is overflowing with noteworthy examples, to name just a few others: Antiquity, the Romantic Era, Fin de Siècle, the Interwar Years and (post)modernity; they all seek to frame a period of time.

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The way in which an age is conceptualized, through phrasing and naming a certain period, says a lot about how historians interpret a particular historical time. This is so, because choices regarding periodization are not only inherent to reasoning and understanding objectively, but are also influenced by our, be it unconsciousness or not, preferences and complex emotional rather than purely analytic motives. For example, an Afro-American historian studying slavery will be more emotionally involved with that particular history than a European scholar. The personal background of an historian and how it determines his or her subject, scope and periodization in history, also touches upon the development of historiography. For example, the position of blacks, women and LGBTQ's in history has been addressed by those historians who felt personally alienated from history and asserted more significance to the neglected and subalterns in history-writing, think for example about the Négritude movement. The subjectivity of periodization is both a strength and a weakness. British historian Ludmilla Jordanova (1949-), Professor of Visual Culture at Durham University, describes this paradoxical situation as a double-bind, as on the one hand labelling periods certainly helps understanding the past, while on the other hand, historical periodization changes over time as it is subject to social, political and cultural backgrounds.[1]

The way a historian tries to capture the past also depends on his or her academic background, and the method they adopt to study the past. An economic historian analysing numeric data to form a picture about the livelihoods of ordinary people, for example, during the Agricultural Revolution, will most likely stipulate different events and developments to divide the past in 'sensible' periods than a cultural historian. In this article, I argue that there is not one ultimate way to periodize history. Distinct periodizations serve different functions, enabling the historian to see the past through multiple lenses. This does not make one periodization better than the other; they simply serve different purposes. How do historians then arrive at a certain periodization? According to Jordanova periodization is about how certain actors, such as politicians, writers, artists, institutions, or key events or cultural products, shaped the past.[2] According to Jordanova's definition of periodization, how can I grasp the last fifty years of existence?

The co-founder of Intel, Gordon E. Moore (1929-), would definitely be a key actor of the last fifty years and his insight can be viewed as a symbol that characterizes his time. In 1965, Moore predicted that the number of transistors per square inch on integrated circuits would double every two

years since the integrated circuit had been invented.[3] He hereby unknowingly proclaimed the mechanism that would explain the rapid pace of technological development that later some would call the Digital Revolution. The observation and prediction made by Moore would become known as Moore's Law. A transistor is a fundamental component of and building block for computers, its main function is to strengthen electronic signals or to switch them on and off. The continuation of Moore's law meant that progress in the computer industry would far exceed development in other industries, leading to significant and fundamental changes in computing, networking, storage and communication.[4] The 'Age of Moore's Law' would be suitable given that the technological developments of the last fifty years have had a great impact on daily life. It speaks to us in the sense that every individual nowadays has been affected by Moore's law and it thus speaks to everybody's imagination.

The Age of Moore's Law as a way to periodize the last fifty years is also compatible with how the American economic historian Paul David (1935-), Professor Emeritus and Senior Fellow of Stanford University's Institute for Economic Policy and Research, has theorized about how certain technologies have prevailed over others since the Industrial Revolution; which he refers to as 'technology regimes'.[5] By this David means that throughout history, certain technological innovations have had the potential to challenge the status-quo and completely overturn the social order, because the particular innovation permeates all layers of society. David argues that, since the Industrial Revolution, three technology regimes can be distinguished, firstly, the age of the steam engine and the development in iron and steel constructions (1750-1900), secondly, the age of the internal-combustion-engine, the electromotor and electricity (1875-) and thirdly, the age of digitalization and automation, computers and ICT technologies (1975-). It can be argued that Moore's law falls into the latter technology regime.

Although there is a difference between periodization, labelling certain periods, and theorizing about how, in this case, dominant technologies in history and their underlying frameworks and effects can be explained and understood, they also touch upon and illuminate an important, before-mentioned tendency. The way a historian understands a certain time depends on his or her background. While David is an economic historian and thus explains the technological and economic changes that underpin historical development since the Industrial Revolution, a cultural historian may seek to analyse the cultural repercussions of the paramount changes that came

with it. It is thus important to keep in mind that more theoretical and specialist classifications can be used by historians laterally, that remain far from the public conception of a certain time and more commonly known periodizations, such as, for example, Antiquity, the Middle Ages or the Cold War era. While Moore's law explains technological development of the last fifty years, in this argument it functions as a metaphor for how we can understand and view the last fifty years as a historical period and how it reflects the prevailing way of life, both culturally, socially and economically.

A form of categorizing periods according to themes is a common way of periodization.[6] Jordanova explains that metaphors and descriptive terms lend themselves well to unify a period. Most descriptions create imagery, but there is a difference between referring to actual events and creating an image without any actual attachments to it. Jordanova illustrates this with the example of the French Revolution, which refers to an actual revolution and The Age of Revolution, which does not refer to any event in particular, but immediately evokes a clear image of revolution. The Age of Moore's Law can be seen as a metaphor for the technological change and the social impact of that change that came with technological innovation. Moore predicted that this apparent trend of transistors doubling every two years would continue in the future. Moore's insight explains a technological development that has had, and continues to have, great social and economic impact. His law can be seen as a driving force of technological and social change. Faster, smaller and cheaper transistors drive our modern technological equipment and tools today.[7]

More efficient transistors have led to changes in the economic, technological, social and cultural arena. Economically speaking, more efficient, smaller and faster transistors meant that processing power increased throughout the market on average, leading to a cheaper product. Existing industries would benefit from this, but it also led to the creation of new industries fuelled by cheap and efficient computing. Think for example about the smartphone, tablet, digital camera, personal computer and personal music players, all of which are the profound product of Moore's law. Technologically speaking, all the underlying and fundamental technology of modern gadgets, tools, equipment and computers can be traced back to Moore's law. Even social media, digital data analytics and the Internet itself can be traced back to his insight.

The most relatable implications of Moore's law can be seen in its social and cultural impact. Affordable new ways of communication rapidly spread

and changed the way in which we work, share news, information, ideas and changed how we socialize and relax. Social media platforms such as Facebook, Twitter and Instagram have created outlets for 'likes', personal opinions that are captured in 280 characters (by both ordinary people and the president of the United States) and have given rise to our dominant visual culture, because we are able to catch each and every moment in picture or film. Computers and artificial intelligence have enabled automation of many services and will continue to do so in the future, greatly affecting the way in which people work and erasing numerous jobs too. Think about the cashier that has been replaced by scan-and-go technology in grocery stores or how self-driving cars will replace truck drivers. The implications of Moore's law have influenced cities, transportation, healthcare, education, economies and thus shaped the world around us. It affected to a significant extent aspects of society, daily life and routine.

In conclusion, the Age of Moore's Law is an appropriate name and characterization for the last five decades because it is hard to imagine a modern world without the implications of Moore's law. Nevertheless, choosing a certain frame, theme or any other kind of encapsulation of time, and that is what is at the heart of periodization as a practice: it leaves things out. As a necessity, periodization leads to a simplification of a past reality, as to enable the construction of a model or theory to depict and understand historical reality. While different kinds of periodizations, based on metaphors, themes, or technological or scientific developments are comprehensive in scope and abundant in number, they will never cover the complex historical realities of the periods they seek to portray. Most importantly, periodizations are not objective labels; they are themselves the products of history and are shaped by the historians' cultural, social and academic background.

Notes

1. Ludmilla Jordanova, History in Practice (London: Arnold, 2000), 114-139.
2. Ludmilla Jordanova, "Chapter 3: Periodization" in: The Look of the Past: Visual and Material Evidence in Historical Practice (Cambridge: Cambridge University Press, 2012).
3. Gordon E. Moore, "Cramming More Components onto Integrated Circuits," Proceedings of the IEEE86, no. 1 (1998), accessed March 10, 2019, https://ieeexplore-ieee-org.proxy-ub.rug.nl/stamp/stamp.jsp?tp=&arnumber=658762.

4. "Moore's Law and Intel Innovation," Intel, Intel Data Center Solutions, IOT and PC Innovation, accessed March 10, 2019, http://www.intel.com/content/www/us/en/history/museum-gordon-moore-law.html.

5. Jan W. Drukker, The Revolution That Bit its Own Tail: How Economic History Changed Our Ideas on Economic Growth (Amsterdam: Aksant, 2006), 212-216.

6. Jordanova, History in Practice, 134-139.

7. "50 years of Moore's Law," Intel, Intel Data Center Solutions, IOT and PC Innovation, accessed March 10, 2019, http://www.intel.com/content/www/us/en/silicon-innovations/moores-law-technology.html.