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Social and linguistic change in the era of the digital economy (I4.0)

130 - Organisational Response To Globally Driven Institutional Changes

Abstract

This work shall examine the effects of the latest "industrial revolution" on society and language, focusing on whether technological progress in terms of automation leads to [socially disruptive] unemployment. In a literature review, it is our purpose to make students critically aware of **language change as a reflection of institutionally-induced social transformation** – our research question**.** In this context, we draw parallels between the dramatic demographic transformations of previous industrial eras and contemporary developments in both society and business. Furthermore, we have analysed language change as a measure of social transformation. Central in this discussion is the role of English, with its current status as the world's *lingua franca* in the context of the digital economy. Given that the concept of digital or smart manufacturing based on cyber-physical systems was born in Germany and aptly named "*Industrie 4.0*" – the fourth industrial revolution– much of the field-specific technology-based literature is written in German. This amounts to nearly an anomaly in contemporary fields of science and industry. In addition to a socio-linguistic analysis, the authors examine concepts of society and employment within the context of industrial and economic development. Due to the fact that this is a literature review, both qualitative and quantitative, empirically collated data will be required to ascertain the validity of the hypothesis.

Keywords:

Economic history, Industry 4.0, Employment, social and linguistic change

1. Employment issues during the industrial revolutions of the past and present

The late 18th century saw two developments that would alter Western Society. The first was a revolution of the old social order in France and America. This was the main consequence of the philosophical enlightenment. The second major development, intrinsically linked to the former, was the rise of mercantilism and mechanization, which would culminate in the first industrial revolution. Economic growth and the development of new overseas markets led to the rise of new social and economic theories, most notably represented by Adam Smith, John Stuart Mill and Malthus. As industries grew, so did new cities and centres of mining, steel making, manufacturing and commerce, initiating a seismic demographic shift across Western Europe and parts of the New World.

In addition to the ground-breaking philosophical ideas of the enlightenment, industrial and technological progressspawned a new social group: the industrial working classes. During the early period of the first industrial revolution, England's new manufacturing centres witnessed great social unrest (1811-1813) when workers began destroying industrial machinery. The events of 1811-13 would later become known as the Luddite Movement, named after the ring leader 'Ned Lud' (O'Rourke et al., 2011). Those events would later be described as "Trade Unionism and collective bargaining by riot" (Hobsbawm,1952 p.59). Hobsbawm and O'Rourke cite the following as the sources of the uprising: artisanal work subjected to the threat of mechanization, fluctuating pay due to lack of contractual obligations, and the social pressure from new, cheaper unskilled workers from different regions of Britain (O'Rourke et al, 2011). In a Pre-Marxian era devoid of trade unions and institutional workers' rights, machine wrecking was the only means readily available for pressuring factory owners into paying better wages. The threat of unemployment caused by mechanization and cheap labour was, hence, very real.

Fast-forward 200 years and we see parallels between the early 19th century and today. Whilst factories are no longer being wrecked by angry workers, German trade unions fear[1] a further erosion of jobs from the latest developments of digital automation in manufacturing – commonly referred to as *Industrie 4.0*, or *smart manufacturing.* As semi- and unskilled labour was off-shored to the factories of Asia from the 1980s onwards, China witnessed a mass exodus of peasants seeking work in newly industrialized cities and "Free Trade Zones". Faced with cheap competition from China and South-East Asia, German manufacturers sought highly-skilled workers and well-educated managers to improve standards in producing high-quality, sophisticated goods. This whole process led to the label "Made in Germany" becoming a veritable brand in its own right. This was originally a label for inexpensive wares that competed with British products in 1887[2]. A recent study published by the German Institute for Employment Research (IAB) predicts a net loss of 60,000 jobs by 2030, largely in manufacturing (Wolter et al., 2015). The study confirms that the change is already underway with firms such as Bosch and Audi proudly presenting their investments in I4.0 at the 2015 Hannover Trade Fair.

Despite the scepticism, there is great optimism that many new fields of occupation will arise, predominantly in the fields of service engineering, software design and programming, as well as in communications management. 360,000 jobs are predicted to become available in the next 15 years (Wolter et al., 2015). This represents a significant contribution towards sustaining a highly developed economy. Furthermore, this resembles yet another 19th century development, towards the end of the century. Now and then, there was a transition from "skill saving" to "skill using" technologies, coinciding with better living standards, lower birth rates and an improved education system (O'Rourke et al., 2006). Even if – as predicted – significant job losses will occur, will the projected profits from bringing manufacturing closer to European consumer markets offset the cost of managing mass unemployment?

Hardly a new phenomenon, the process of creative destruction, coined by Joseph Schumpeter, follows technological inventions. This process has created enormous wealth, but with it also significant disruption. Therefore, there used to be and remains intact, today an innate social and economic

[1] http://www.euractiv.com/sections/industrial-policy-europe/germanys-industry-40-full-swing-despite-dissent-unions-310334 [viewed 14.12.2015]
[2] http://discovery.nationalarchives.gov.uk/details/r/C3252 [viewed 10.12.2015]

interest in promoting the technical status quo rather than lamenting the lack of innovation from the perspective of workers' representatives–a constraint for economic development. One such example is of the invention of William Lee's knitting machine in 1589, refused a patent by Queen Elizabeth I due to her fear for the job security of England's knitters (Acemoglu and Robinson, 2012, p. 182f). Further examples analogous to the theory of creative destruction are evident in Nefiodow's *The Sixth Kondrattieff* (2014), which analyses cyclical economic developments that come and go in waves. Nefiodow argues that the current IT *Kondrattieff* wave peaked in 2005, a finding the authors of this paper however dispute in light of the current growth in *smart* technologies.

In the further course of history, after electrification, the story of the twentieth century was a struggle between education and technology (Goldin and Katz, 2009). An example would be the U.S. high school movement, which coincided with the first industrial revolution of the bureau (Goldin and Katz, 1995). While the typewriter was conceived in the 1860s, it was not a feature in most offices until the dawn of the twentieth century, when it ultimately became a staple of office life. John Maynard Keynes, in *Economic Possibilities for our Grandchildren* (1930a) wrote that "technical improvements in manufacture and transport […] could lead to a new disease […] technological unemployment […] due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour." Keynes may not have foreseen the quantum leap in digital technology from the 1980s until the present day. Yet he certainly did predict the burgeoning issue of occupying workers who are devoid of work.

Industrial development progressed and initially peaked with the invention and adaptation of the continuous-flow process. Decisive in that pursuit, Ford's new assembly line in 1913 was specifically designed for machinery to be operated by unskilled workers (Hounshell, 1958, p. 239, in Frey, 2013). Moreover, a former one-man job was turned into a 29-man worker operation, with the achievement in reducing the overall work time by 34 percent (Bright, 1958). In contrast to Keynes' scepticism concerning the socio-economic sustainability of technological innovations, these examples show that not only are new forms of employment created, but entire disciplines such as "plant engineering" or "software design" come to life.

2. The direct impact of automation - perception and manipulation of tasks

Tasks which are specifically related to an unstructured work environment are less susceptible to computerisation than those required in, for example, in-line production systems. Whilst duties such as modular health care and in-service teaching can be performance-measured, such tasks rely on the intuition, knowledge and interpersonal skills of the workers in question. However, automated working environments have come to rely on machines instead of humans to perform clearly defined, repetitive tasks. While basic geometric identification is reasonably mature, enabled by sophisticated sensors and lasers, robots still fall short of matching the whole range of human perception.

In the case of in-house transportation, workarounds exist to solve the problem of a cluttered environment. One example would be Kiva Systems, whereby bar-code stickers are simply placed on the floor, informing robots of their precise location for warehouse navigation (Guizzo, 2008). The difficulty of perception nevertheless has ramifications for manipulation tasks, and, in particular, the handling of irregular objects. These difficulties of perception have ramifications manipulation tasks, and, in particular, the handling of irregular objects. The main challenges to robotic automation, perception and progress, thus largely remain and are unlikely to be fully resolved in the next decade or two (Robotics-VO, 2013).

2.1 Creative and Social Intelligence

Are computers able to be creatively intelligent? - The psychological processes amenable to human creativity are both difficult to specify and to replicate. To illustrate, a computer would require a database with a veritable richness of knowledge comparable to the knowledge of all of mankind in its entirety, as well as the methods of benchmarking the algorithm's subtlety – no small feat, to be sure (Frey and Osborne, 2013). According to Boden (2003), creativity is indeed the ability to come up with ideas or artefacts that are novel and valuable—a tall order for a robot so far.

Human social intelligence is important in a wide range of tasks from negotiation to persuasion and caretaking. While computer and robots can reproduce some aspects of human social interaction, the real-time recognition of a human emotion remains a challenging problem, and the ability to respond intelligently to such inputs is even more difficult. It seems implausible that sales jobs, which are likely to require a high degree of social intelligence, will be subject to a wave of computerisation in the near future. Nevertheless, high risk sales workplaces can be seen in such jobs as cashiers, counter and rental clerks, and telemarketers. Although these professions feature interactive activities, they do not necessarily require a great degree of social intelligence. (Frey and Osborne, 2013)

As already mentioned in Chapter 1, for many centuries humans have mastered new capabilities that have rendered global economic rewards and improved standards of living. Yet the trouble is, the most sought-after skills are not particularly easy to acquire. The skills required for understanding and quantifying human interaction are not conducive to classical text-book style learning and require a great degree of intuition. Learning to be more socially sensitive is not like learning algebra, after all (Colvin, 2015).

2.2 Which Jobs are "in danger" due to the new industrial (r)evolution?

Technological trends like Big Data, cloud computing, Industry 4.0 and advanced machine learning techniques, all have the potential to transform industries and the occupations they entail. In particular, the combination of learning machines with the huge amount of data could provide computers with the capacity to replace human workers in their jobs that were until now considered beyond the scope of machines. Low-skilled workers are especially susceptible to these changes and also many middle-skilled workers who perform mainly routine tasks may also be caught up in the technological disruption. People less vulnerable to computerisation work mainly in jobs where perception and manipulation, creative intelligence and/or social intelligence tasks are key elements of their work.

Nevertheless, current trends signal dramatic changes on the horizon. If the benefits are to be maximised and the potential pain minimised, policymakers will need to address these challenges, think creatively, and draw on present trends and future possibilities. (Angus, 2015).

3 Language change as a reflection of organisational and institutionally-induced transformation

A typological feature of both English (and German), is that it has evolved by means of heavy borrowing. One of the driving forces behind socio-linguistic change for centuries, in the case of English, has been institutional and organisational transformation. One example would be the transformation of Old English to Middle English following the Norman Conquest, which introduced thousands of Norman French words and phrases (cf. Crystal, 2005). Given our previous mention of the first industrial revolution, examples of lexical change (i.e. neologisms) from that era would be the rather obvious "steam engine", which in and of itself can be found in analogies and phrases completely unrelated to industrial mechanisation (i.e. athletes having a "*good engine*"). Other lexical items that entered the language – as a direct result of technological innovation and organizational change include: *railway, airport, jet-lag, turbo, servo, laser*[3]. Nowadays one would consider words such as *shampoo*, *chutney* or *bungalow* just as quintessential items of every-day life, used in common parlance. All three, along with plenty others (pundit, bangles...) entered English from Indian languages via colonial administrators and traders. Further words (i.e. *Salwar Kameez*) entered the language following the mid-late 20th century immigration of South Asians to Great Britain.

There has been a strong influence of English on German since the 19th century. During the 19th and early 20th centuries, English terms related to upper class society and fashion such as *fesch* (Viennese, from fashion); *Dressman* (male model); or *Smoking* (dinner suit). More contemporary terms (from the 1980s and '90s), largely pertaining to business and technology include *Handy* (mobile phone); *Controlling* (managerial accounting); *Beamer* (electronic projector). The language of German speaking IT specialists is heavily derived from English: *Laptop*, *Soft*- and *Hardware*, *Motherboard*, *Browser* and *Social Media* to name but a few. However, there are German terms such as *Bildschirm* (monitor), *Schnittstelle* (intersection, interface), *Drucker* (printer), which are still in use.

The discussion surrounding foreign words and loan words in the German language go back a long time. In 1899, Hermann Dunger's article "*Wider die Engländerei in der deutschen Sprache*", (*Against the Englanderness in the German language*), rallied that it was "the duty of all Germans to avoid foreign words in their language" (cf. Kettemann, 2004). Despite the cries of nationalist sentiment, three main reasons figure prominently for using English loanwords in German: terms which do not exist (i.e. *laser*); terms which are internationally conventional in English (i.e. *computer, key account, CEO*);

[3] Acronym: light amplification by stimulated emission of radiation; note The Cambridge English Dictionary no longer cites the original acronym as its standard definition: "a device that utilizes the natural oscillations of atoms or molecules between energy levels for generating a beam of coherent electromagnetic radiation usually in the ultraviolet, visible, or infrared regions of the spectrum".

terms and phrases which appear to have greater sophistication when derived from English (i.e., *last not least*, *just-in-time, state-of-the-art).*

The English language is not used as a monolithic standard around whole world. Just as in other languages, there are various dialects and varieties. Lacking a centralised standard authority like *L'Institut Francais*, it is an organic, multi-centric language. The spread of English can therefore be seen as three concentric circles representing the types of spread, the patterns of acquisition and the functional domains in which English is used across cultures and languages. There is the inner circle, the outer circle and the expanding circle. (Bolton & Kachru, 2006). The inner circle refers to the traditional bases of English – where it is the primary language – the USA, the UK, Canada, Australia, and New Zealand. The outer circle represents regions of the British Commonwealth, where English either has official status (i.e. India), or is widely spoken as a second language. The expanding circle comprises regions where English has become the language of business administration and diplomacy. David Crystal (2003, p. 4-6) also makes the case for the official introduction of several different standard varieties of English which do not neatly correspond to what most would identify as "Standard English".

3.1 How will Smart manufacturing change our language?

It is well-established that English has had an enormous impact on the German language, without German speaking regions ever having been under British rule[4]. Now well-known German engineers and corporations have developed a new standard of manufacturing, connecting plants and machines with each other and with the rest of the world. The concept of smart manufacturing relies on Cyber Physical Systems and the so-called "Internet of Things". It does not matter where the machine stands, goods can be made at the push of a button from anywhere on the planet using an automated supply chain. We predict that this innovation will bring many German words into English. Many of these terms are back-translations, such as controlling (hitherto managerial accounting), a core management tool that has evolved in German corporations and academic institutions. Hence, the anglicised German term *Logistikcontrolling* cannot really be translated effectively back into English, which is why it is often simply left as *logistics controlling*, or the rather cumbersome *logistics performance measurement*.

We conclude by observing a certain class-based use of English borrowing in German is taking place, with the underlying hypothesis being, the higher the level of education/social status, the more borrowing which occurs in an individual's speech. We also question whether exported loan words can return to the source language with a separate meaning from the original. Finally, the authors suggest that technological innovation, economic development, and social change are facilitated by and facilitate linguistic evolution themselves. What remains to be researched both quantitatively (by means of corpus analysis) and qualitatively (by means of interviews and recordings), is whether linguistic change can truly measure the rapid social and economic transformations currently taking place.

[4] Excluding post-WWII allied occupation.

References:

Acemoglu, D. and Robinson, J. (2012). Why nations fail: the origins of power, prosperity, and poverty. Random House Digital, Inc.

Beniger, J.R. (1986). The control revolution: Technological and economic origins of the information society. Harvard University Press.

Cortada, J.W. (2000). Before the Computer: IBM, NCR, Burroughs, and Remington Rand and the Industry They Created, 1865-1956. Princeton UniversityPress.

Colvin, G. (2015). *Humans are Underrated.* New York: Penguin

Crystal, D. (2003). *English as a global language*. 2nd ed. Cambridge: CUP.

Crystal, D. (2005). *The Stories of English*. London: Penguin

Frey,C.B., Osborne, M.A., (2013). *The Future of Employment: How Susceptile are Jobs to Computerisation?* Oxford: Oxford University Press

Goldin, C. and Katz, L.F. (1995). The decline of non-competing groups: Changes in the premium to education, 1890 to 1940. Tech. Rep., NBER Working Paper No. 5202, National Bureau of Economic Research.

Goldin, C. and Katz, L.F. (2009). *The race between education and technology*. Harvard University Press.

Guizzo, E. (2008). Three engineers, hundreds of robots, one warehouse. IEEE Spectrum. http://spectrum.ieee.org/robotics/robotics-software/three-engineers-hundreds-of-robots-one-warehouse.

Kettemann, B. (2004), „Anglizismen allgemein und konkret: Zahlen und Fakten“ Konferenzbeitrag: *EUROSPEAK – der Einfluss des Englischen auf europäische Sprachen zur Jahrtausendwende* (hg. mit Rudolf Muhr) Wien: Peter Lang. 2002. 2. korrigierte Auflage 2004.

Keynes, J. M. (1930a.) “Economic Possibilities for our Grandchildren II,” *The Nation and Athenaeum* 48.3 (October 18): 96–98.

Bolton, K./Kachru, B.N. (2006) *World Englishes: Critical Concepts in Linguistics, 3rd. ed*. London, New York: Routledge

Michaels, G., Rauch, F. and Redding, S.J. (2013). Task specialization in US cities from 1880-2000. Tech. Rep., NBER Working Paper No. 18715, National Bureau of Economic Research.

Nefiodow L, & S. (2014). *Der Sechste Kondrattieff: Die neue, lange Welle der Weltwirtschaft.* St. Augustin: Rhein-Siegen Verlag

O’Rourke, K.H. et al (2011). “Luddites, the Industrial Revolution, and the Demographic Transition“ https://www.researchgate.net/publication/228419886 [Retrieved: 26.01.2016]

Robotics-VO (2013). A Roadmap for US Robotics. From Internet to Robotics. 2013 Edition. Robotics in the United States of America.

Wolter, I. et al. (2015). “Industry 4.0 and the consequences for labour market and economy: Scenario calculations in line with the BIBB-IAB qualifications and occupational field projections”. IAB Working Paper. http://doku.iab.de/forschungsbericht/2015/fb0815_en.pdf [Retrieved: 18.01.2016]