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An Essay

By

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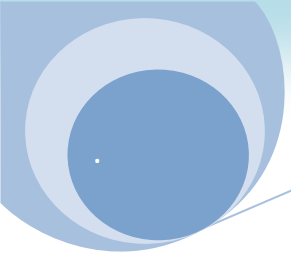
Subject:

„Our Digital Future“

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I remember well how, when I was still a child, I sat in the car with my mother to drive to my aunt's new apartment. We usually got to the old apartment on public transportation, but then my parents had bought a small car. The unnecessary and tiresome waiting at the train station was over and done with. The car was quite practical, and especially during winter, because we were not subject to the mercy of the Railways in the cold. My aunt lived in the far North, in Reinickendorf, while we were living in the South of Berlin. The car as a means of transportation was definitely an advantage, but not the route – my mother often had problems finding the correct way to my aunt's, even if she had driven the route thrice already. Accordingly, I was her personal cartographer leading her through the twists and turns of the city. Even though we occasionally had to stop to check whether we were on the right track, in the end we always arrived safely. It might have taken a little longer, but the journey is the reward, and, to be honest: It really was a lot of fun.

Nowadays, my mother is (unfortunately) not at all dependent on me anymore. My natural place as cartographer has now been taken over by "Google Maps". By now, my mother confidently drives over to visit my aunt in West Germany, picks up my father from the airport. Without "Google Maps" she would be at quite a loss. Even my parents, at an age of 52, have now been able to say farewell to the analogous world, a world without "Google Maps" or "WhatsApp", and, I must say, they did so without much nostalgia. They have now also arrived in the digital world of the 21st century.

And this is also the present, exciting topic of this year's Beuth Language Prize 2016, which deal with the topic of the digital future – an area full of innovation, of exciting possibilities and chances. In the present essay I will introduce the aspects most relevant to the "Digital Future" of the 21st century and shed light on its core developments and their consequences for the individual and for society.

Digitalization of health care:

About 75 years ago, at a time when Konrad Zuse presented the first programmable computer to the world in Berlin, medical reports, findings, and research results were still being noted down on paper, by hand or on a typewriter. Nowadays, most people own smartphones that fit into their pockets, are more powerful than earlier super computers, and with which one can communicate, stream music, or measure one's pulse (Hesse, 2014). And there is no end in sight for this rapid technological evolution. This is also true for the rapidly growing mass of health relevant data. Medical data, such as anamnesis, blood values, or medical findings, are directly recorded onto computer systems at doctor's offices. Complete genomes, such as those of malignant tumors, are sequenced and also saved and processed electronically almost routinely in biomedical research. More and more people also use smartphone apps, wearables, and, prospectively, maybe implanted biosensors, to continuously measure their blood pressure, blood sugar levels, or their pulse. (Lindo, 2015)

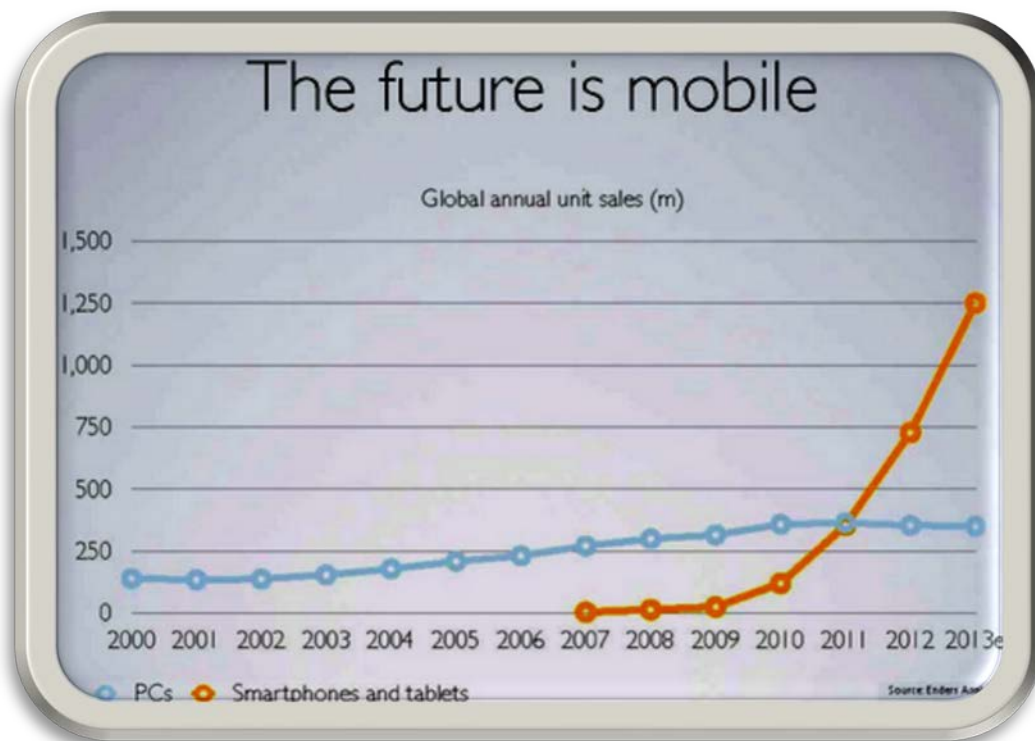



Illustration 1: *The future of mobile communications*



The intelligent linkage between these enormous amounts of various data through increasingly powerful IT systems holds the possibility of drawing a dynamic and holistic picture of the health of every single human. Something that was fully unthinkable 75 years ago.

The increasing digitalization of societal life changes the requirements for modern health care, and, at the same time, offers opportunities for a more efficient health system. In the future, it will be possible more and more often to conceptualize better diagnostic processes and customized individual therapies through the linkage and processing of health data. Further examples for this are telemedical applications (Kim, 2013), for instance in cardiology, that facilitate better treatment for residents of rural areas. Another is the development of novel therapeutic approaches: Online therapies are increasingly being used for the treatment of depression , among other things (Rosenberg, 2015). Data are hence an important resource for future health research and care. Especially concerning sensitive health data, fundamental aspects have to be regarded, in particular who is allowed to decide about the usage of the data gathered.

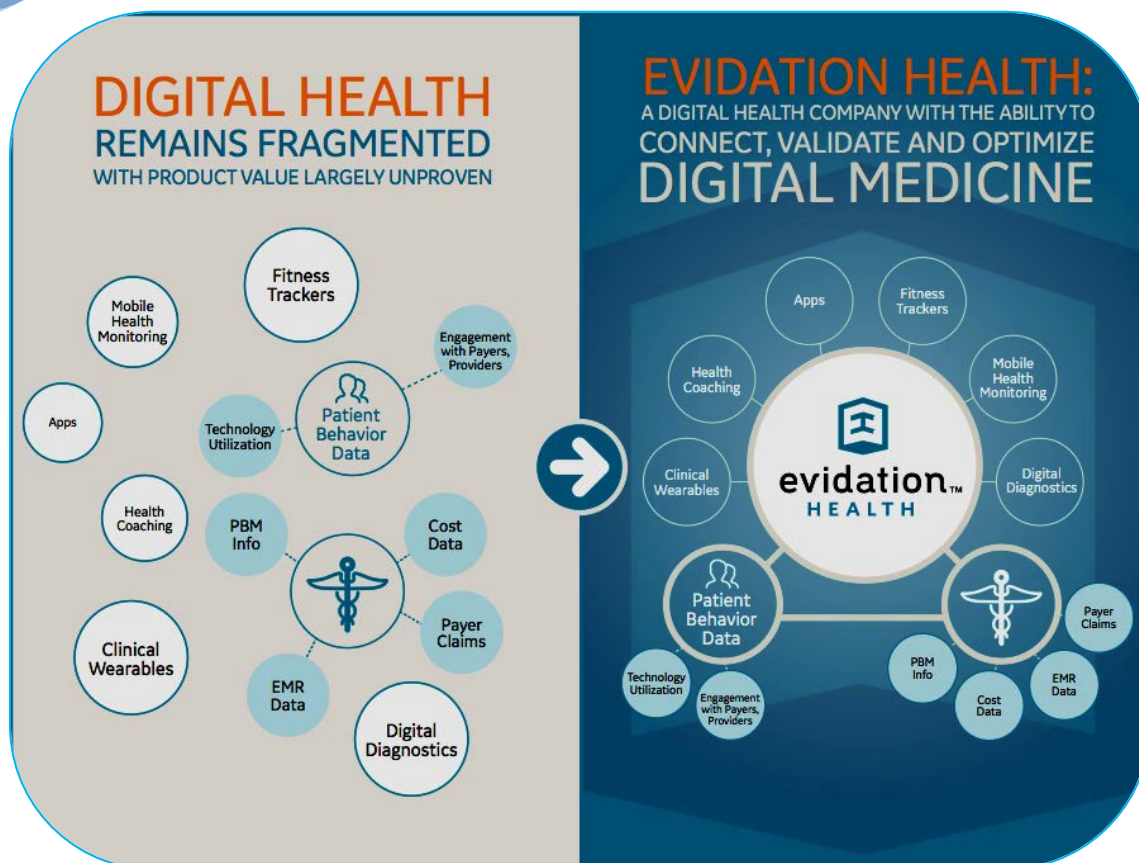


Illustration 2: The health system: Digital Development

Digitalization of work:

Do we need a new model of working, considering the current technological trends, societal developments and changes in the employment market? What could that look like? Ever heard of “Work 4.0”? Work 4.0” does not describe the current normality in companies. Rather, Work 4.0 demonstrates new perspectives and design opportunities of the future (Röhrborn, 2016) . The Title “Work 4.0” intersects with the ongoing discussion about the forth Industrial Revolution (“Industry 4.0”), but centers around types of employment and working conditions – not only in the industrial sector, but in the whole world of employment. Work 4.0, in its core, relates to gainful work, although a wider definition of work needs to encompass other types of work as well (e.g., regarding family) (Bundesministerium für Arbeit und Soziales, 2015)

We are on our way into a digital economy. Increasingly powerful IT systems alongside decreasing production costs, a growth of worldwide internet usage at home and on the go, highly developed robotics and sensor technology, cyberphysical



systems uniting the virtual world with the world of objects, 3D-printing as a new production technology, intelligent software systems, Big Data, and, last but not least, a change in consumer requirements – digital change revolutionizes business models, overturns whole industries, and yields whole new production and logistics chains as well as products and services. The increases in productivity enabled through this change, just like price transparency in online trading, are for the benefit of the consumers, who in addition are increasingly involved in innovation and production processes as “prosumers” (Brynjolfsson, 2014)

How does work change in the digital economy? According to the Census Bureau, 54% of employees in Germany were using a computer with internet access at work in 2014 (Bundesministerium für Arbeit und Soziales, 2015). Digital work is not only becoming a standard in offices, but the use of computerized, interconnected machines is also widely spread in factories. About a quarter of production in Germany is already fully or highly automatized. Digital work further increasingly facilitates work models like tele work, and new types of employment such as crowd working.

Work 4.0 will be more interlinked, more digital, and more flexible. It is still open how in specific the future world of employment will look. Since the turn of the 21st century, we have been facing a fundamental change in the means of production. The growing interconnectedness and the increasing cooperation of men and machine does not only change the way in which we produce – it also creates new products and services. New requirements for work arise through cultural and societal change, as does the demand for products and services. It is still open which impact these developments will have on the organization of work and social security, but this impact can be influenced and designed by the society and by politics.

It is yet undefined what the employment record will like be in the digital economy. New occupations will form; new workplaces will develop, for instance in the 7,000 ICT companies being newly founded each year in Germany. Today already, more than 1 million German workers are employed by the ICT sector. In turn, there is an increase in automatization through software solutions executing complex algorithms and through interconnected production machines with powerful computer technology. (Zilch, 2014)

Employment market researchers assume that specifically medium-qualification tasks with high degrees of routine have seized due to automatization. This has led to a polarization of employment in the form of a relative increase in the low- and high-qualification jobs in many countries, a shift also driven by changed consumer desires and branch structures. In the USA, a polarization of wages can also be observed, while in Germany no polarization of wages comparable to that in the USA has surfaced yet.

Despite the fact that, due to technological innovations tasks have seized on a large scale in the past again and again in the short run new possibilities of employment in the long run have surfaced as well. For future developments, the positive effects on employment are questionable.

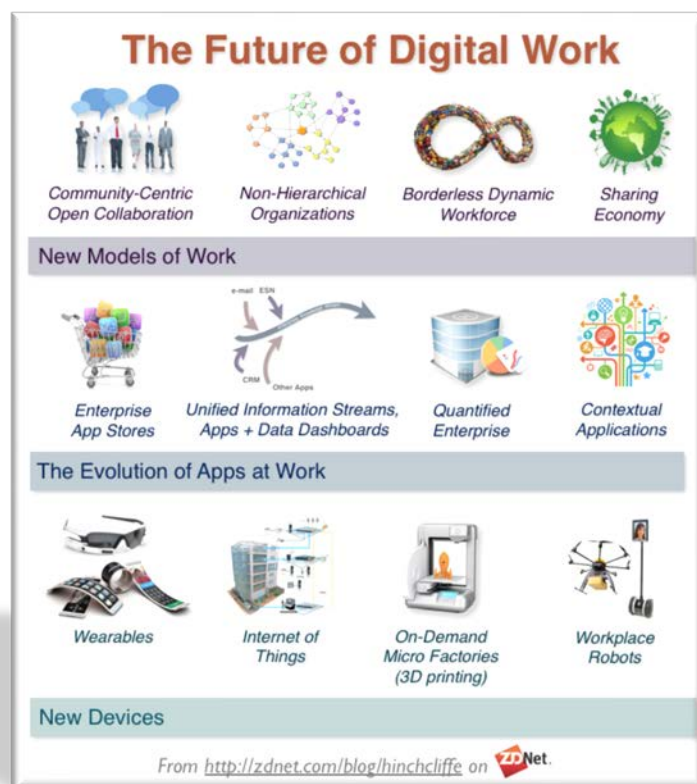


Illustration 3: Future of Digital Work



Augmented Reality:

In the IT scene, much hope is put into “augmented reality”, that is the computer-assisted expansion of reality perception. The display of additional information during soccer match broadcasts is an often used example of this, for instance the digital superimposition of offside lines and goal distances at free kicks for the viewers (IT-Wissen, 2016)

Various market research institutes predict a high market potential for augmented reality (AR) (Deutsche Bank Research, 2015). AR is an important supporting medium and leads to an improvement of communicative processes and structures, e.g. through visualization. This trend should increase strongly over the next years. The combination of modern computer systems with human flexibility, problem solving potential, and creativity is a highly crucial aspect in this.

Various application scenarios clearly show the potentials AR offers. Basically, a fast transmission of content, also called time-2-content, is possible. Alongside the increasing amount of information, the search time for relevant information is increasingly becoming more and more crucial. With the help of AR, a fast transmission of content is possible, which in turn leads to a decrease in search times.

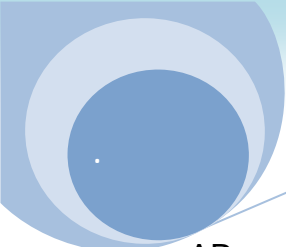
AR also enables addressing different sensual levels. The increase of emotionality, e.g. through moving pictures or music, and the appeal to different senses resulting from this increase supports the communicative process and conveys communicated contents more sustainably (Mehler-Bicher & Reiß, 2011). By keeping in mind the insights from multisensory learning in the development of AR applications, communicative processes and structures can be optimized.



Illustration 4: 4 Ways of Augmented Reality

Another great potential for AR is the enhancement of abilities regarding experience and trust. This would make products and services livable, understandable, and graspable. This is especially true for complex applications in the technical sector.

AR will be part of daily life as informational surplus value, and not only influence our work live but also change everyday behaviors, comparable to the internet. Right now, it cannot be determined how most of society will react to AR. In many cases to date, the fascination this technology exerts on the viewer has been predominant. Up to now, the societal and individual impacts of AR have seldom been evaluated critically. More and more virtual content will be displayed via AR so that there will be a stronger blending of reality and virtuality. This is as much positive as it is negative. Great potentials present themselves, but they also go hand in hand with risks.




AR as a technology is fully developed – most technological developments took place in the 1990s. With the development of computer performance, AR today is usually applicable without specific type of computers.

The application scenarios pointed out above clearly show the potentials AR has to offer. Today already, certain applications are practicable; application context and long term use, however, are decisive. Currently, there is media hype about AR. A number of gimmicks are offered that will wear off quite quickly. Augmented pets and toys are niche products, and their broad application is of low interest. Living environment applications are incomparably more interesting. These are applications analyzing our environment like radars, supporting navigation in this environment or displaying interest-related information. They will gain in influence over the next year and might soon be as much a given the using of Google Maps.

Internet of Things:

The Internet of Things stands for a grand vision in which the internet becomes part of the physical world beyond the screen, and in which every object in the real world can in turn become part of the internet (Andelfinger, 2014). Accordingly, ordinary things can be tagged directly or indirectly with information or serve as physical access points for online services. This opens up far-reaching and to date unknown possibilities

This vision of the Internet of Things will become feasible through the technical progress of the last years, especially through the minimization of electronic parts such as microprocessors, memory modules, sensors, and communication components, and that at simultaneous cost regression (Anderson, Makers, 2013). The production of “mini computers” that are so tiny and cheap and run on such low energy, for instance, allows for random things of the private as well as of the economic life to be integrated without much effort. Everyday things like medication, consumer goods, or even receptacles, can be complemented with a piece of digital logic that expands the physical function of the object by the flexible abilities of a negligibly small microelectronic component and that facilitates the linkage with other objects as well as with the internet.



With the Internet of Things, computers and information system are hence lent eyes and ears, in the truest sense of the words. Where people nowadays still supply the computer elaborately, expensively, and prone to error with information about the physical environment through the use of keyboard or barcode scanning, physical objects could automatically uptake and rely this information in the near future for a fraction of the current costs. This will, where economically advantageous, inevitably lead to a gathering of much more finely grained data, which in turn will facilitate completely new processes, services and products (Anderson, Makers, 2013)

The development of the Internet of Things is of similar importance to the economy as the introduction of imaging processes has been to medicine, which initiated a huge progress for the whole of the discipline. Only technologies, such as magnetic resonance imaging (MRI), which was developed about 30 years ago, make an “anatomy of life” possible and thus have led to a previously unknown precision and abundance of information in diagnostics. The Internet of Things will now overcome the last great hurdle between the real and the digital world. First instances of these information systems are already in development in the form of radio frequency identification-infrastructures (Merschmann, 2008)

The technical development of the Internet of Things is still in its infancy, despite its initial success. The need for research in the areas of hardware (e.g., sensors, communication, energy, actuators), software (e.g., security), and networks (e.g., “Google of Things”, connection to mobile telephony) is immense. Next to work on basic technologies, empirical research also requires enormous efforts. The history of technical developments shows that applications are not predictable – in contrast to mere technical progress. An early or one-sided focus on potential risks under the ignorance of possible benefit effects of a new technology can put a temporal brake on whole classes of applications, and with this on the economic development of whole regions. A balanced and constructive discussion in science, economics, politics, and society is, accordingly, of central importance (Keese, 2014)



My Conclusion:

One thing is for sure: Digital change is happening right now, tight at the moment you as my reader are reading this essay. Digital technologies will continue to sneak into our lives over the following years – be it in the work place, in pharma technology, in education, or even regarding everyday problems we encounter on a daily basis.

Many new jobs and to date unheard of companies will develop that will replace old jobs via “creationist destruction”, as Schumpeter phrased it. The state will have to supply companies with optimal research facilities, or at least reward them discounts, subsidies, and tax reliefs in order to make Germany become highly attractive as a research location to the best and smartest minds in the world.

It is understandable that especially people of the older generation feel overwhelmed by this change because it destroys their familiar, well-normed world. Accordingly, it is important that we take those people with us into this change, for instance through trainings funded federally or by the private economic sector.

The state has to take responsibility for protecting its citizens from complete transparency and openness caused by the cunning and efficient laws of the companies. This transparency has to be specifically held in check in the areas of labor and consumer laws.

This digital change can be nothing but progress for humanity when it is applied correctly. It's all our business, and that is why we all, as citizens, as consumers, as parts of this country, have to co-create our digital future !



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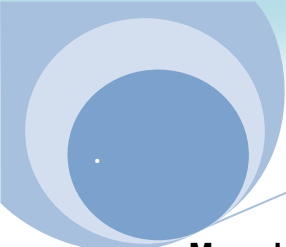
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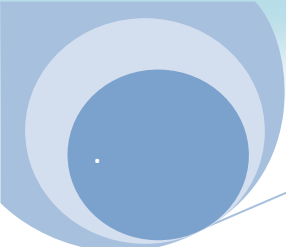
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