
Life Engineering

This paper is a call for a discipline Life Engineering. For more than fifty years, Business Engineering (initially referred to as systems analysis) has been concerned with the use of information technology for the benefit of companies and other organizations, for example through electronic markets. In the past twenty years, machine intelligence has increasingly changed human life, while science offers little help in controlling change for the good of mankind.

Proactive Digital Services in All Areas of Life

Internet websites evolve to become proactive digital assistants. Route planning on the personal computer at the beginning of the 1990s led to the creation of navigation assistants on the smartphone that independently find the parked car, suggest diversions to avoid traffic jams or alternative means of transport, and point to petrol stations. Increasingly autonomous vehicles assume many of the functions of driving. A future proactive personal assistant will independently recognize mobility requirements and organize the journey or, alternatively, a teleconference.

Proactive digital services are based on huge data collections that provide access to the personal information of people and their environment. The personal data is derived from the internet traffic created by humans, from the documentation of their medical findings, from the sensors in the car, in the home and on the body (wearables), and from surveillance cameras. In addition, there is factual data, i.e. data on companies, products and transactions as well as measured values from sensors such as weather stations. In order to underline the universality of these data collections, some people refer to them as a world database, despite the fact that they only depict small sections of reality and are actually distributed over many databases.

Data analytics, also known by many other terms such as deep learning, derives patterns from the data that describe people's behavior and from which the digital services derive their recommendations.

Facebook, Amazon, Microsoft, Apple, Netflix and Google as well as Baidu, Alibaba and Tencent are dominant consumer platforms (megaportals). They have the highest numbers of users, the biggest databases, the most advanced models of consumer behavior, and are integrating more and more functions for which the consumer previously needed isolated services, in particular apps.

Machine intelligence in the form of personalized, proactive digital services is fundamentally changing people's lives, but we are not prepared for this quantum leap in socio-technical evolution.

Machine Intelligence and Ethics

It is frequently the case that humans can no longer understand how machine intelligence arrives at decisions, be it the search result of a Google query, the approval of a credit application, the treatment of a job application or the personalized selection of news. The providers of products and services analyze our behavior, our preferences and our financial possibilities, provide us with news associated with their offers, control our needs through advertising, and bind us with non-transparent terms and conditions.

We are seeing a massive shift in power, not only between individuals and megaportals, but increasingly also between monopoly-like platforms and governments. Politicians, entrepreneurs and scientists are observing this development with its opportunities and risks, and trying to steer it for the benefit of humans. Since April 2019, the US Justice Department and the US Federal Trade Commission have been preparing antitrust proceedings against Alphabet (Google), Facebook, Amazon and other megaportals[1] order to promote competition.

The OECD [2], the IEEE [3], individual states such as California [4], and the EU [5] are developing ethical principles for the use of machine intelligence, i.e. all types of digital services such as autonomous vehicles, home automation, smart exoskeletons, mobile apps and websites, right through to crime prevention. They postulate human values such as well-being, human rights, transparency, traceability of decisions, work-life balance and human autonomy. While welcome, the ethical guidelines that have emerged so far are difficult to translate into objectively verifiable actions.

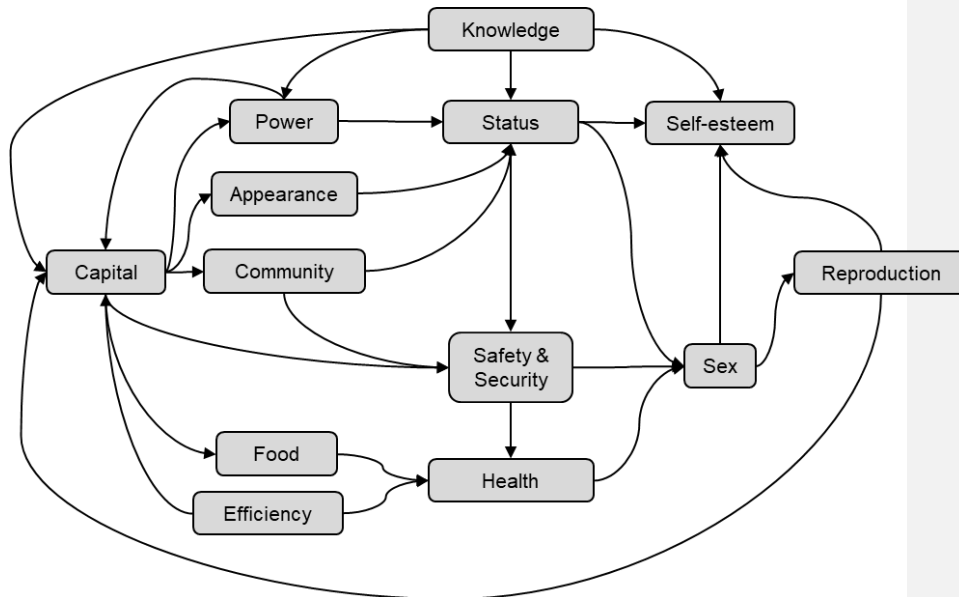
Quality of Life

What is the ultimate goal of ethics? Human well-being. The ultimate goal of humanity is happiness, or, to put it more modestly, quality of life. From Plato and Epicurus to today's happiness research, as documented for example in the annual UN World Happiness Report, psychologists, neuroscientists, political scientists, economists, philosophers and other disciplines have tried to define what makes people happy.

The ethical principles mentioned, such as autonomy, are widely accepted values, but fail to clarify how such values contribute to quality of life. If we really want to control machine intelligence for human benefit, we need to better understand what is good for human beings. If, in addition, we were also able to make the contribution measurable, we would have the instruments for effective, human-centered control of technological progress.

The Quality of Life Model shown in the figure below was created with that goal in mind. It attempts to summarize the findings of the happiness research available today, and represents the factors of

happiness (and unhappiness) as a neural network of 13 needs (for a detailed description see [6] p.48).



The model distinguishes between replication needs, i.e. the needs of self-preservation and preservation of the species, and progress needs, which aid selection of the best genes and increase knowledge. The affluent society of highly developed states can largely satisfy the needs of self-preservation and preservation of the species, and gives us the resources to devote greater effort to the needs of progress. Humans are increasingly using their energy to differentiate themselves from their rivals in the competition to reproduce themselves. In natural evolution, this ensures the selection of the best genes, and, in technological progress, the competition for the best ideas. Psychology observes a hedonic treadmill because, while the satisfaction of selection needs produces hedonia for only a short time, hedonic accommodation ensures that these needs demand ever stronger stimuli. In addition, every improvement is relative because competitors (peers) also give their best. The hedonic treadmill, together with sensory overload and other factors, is held responsible for the fact that the number of working days lost due to mental disorders has almost tripled in the last two decades [7].

Kommentiert [RA1]: to reproduce themselves?

Kommentiert [HÖ2R1]: eh klar

Quality of Life and Evolution

Technological progress has brought humanity material prosperity that was inconceivable just a few years ago. In the market economy, consumers buy what benefits them most, and companies produce what sells best. This should ensure that technological evolution works for the good of human beings.

However, people do not really know what makes them happy, and even if they do, they often fail to act accordingly. The short-term satisfaction of needs such as convenience (efficiency) or pleasure (food) often prevails over sensible behavior for long-term contentment. We renounce privacy in favor of convenience and thus lose autonomy (power). We consume excessive amounts of chocolate and damage our appearance in the long run as a result. We sacrifice our health in order to generate income (capital) so that we can distinguish ourselves from our peers with luxury goods, while our peers do the same. If we were reasonable, there would be no over-indebtedness, no obesity, and no burnout.

Evolution is driving technical and economic progress by means of the hedonic treadmill. Once the basic needs of self-preservation and preservation of the species are covered, we are driven by the needs of self-esteem, knowledge, status and income (capital). We use technology to produce more at lower cost and thus generate capital. We use capital to make technology, in particular machine intelligence, more powerful.

Humans do not know the goal of evolution. But if we observe the history of evolution, in particular that of machine intelligence, we can conclude that intelligence is an important, if not the most important, goal of evolution. Evolution only uses human happiness and unhappiness as an incentive for progress. And it is progress, rather than human happiness, that seems to be the goal of evolution. Or, to express it from another perspective: Evolution does not serve the purpose of humans; instead humans serve the purpose of evolution.

The economy has not yet found a control mechanism that ensures competitiveness in technological progress on the one hand and quality of life on the other. At the moment, we are content with formulating internationally accepted rules that prevent obvious misuse of machine intelligence to the detriment of human beings. Examples include the right to privacy of personal data, the right to explanations of decisions, or the right to equal access to the internet. Both market economy and state control, such as in Chinese social scoring, hold opportunities and risks.

Individuals can use the proposed Quality of Life Model to orient their lives toward sustainable high quality. Companies today use highly differentiated knowledge to encourage people to satisfy their short-term needs (hedonia), but could also aim at long-term satisfaction (eudaimonia), as corporate

social responsibility [8] tries to do. Politicians discuss the symptoms, e.g. broadband connectivity, instead of addressing the consequences of momentous social and economic change.

Tasks of Life Engineering

We need a Life Engineering discipline that covers the following areas [6]:

- Factors and measurement of quality of life
Sensors, e.g. in wearables, will deliver more detailed, accurate, and up-to-date metrics for quality of life.
- Machine intelligence in all areas of life
Machine intelligence will increasingly provide digital services for all areas of human life.
- World database as a collection of all personal and factual data
The large b2b and b2c platforms as well as public databases will digitally represent the real world in a level of detail not yet imaginable today.
- World model as knowledge about human behavior
Data Analytics will use the gigantic data collections to derive more and more patterns (rules) of the behavior of the world.
- Control mechanisms for sustainable quality of life
People, businesses and government organizations must use this knowledge to develop technology and collaboration mechanisms for the benefit of people, not just capital.
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A vision of Life Engineering for the year 2030 and beyond could look like this: Transactional applications, social media and trillions of sensors capture the behavior of humans and their environment (nature and machines). Gigantic B2C and B2B platforms, i.e. world wide electronic markets, will gain an increasingly detailed, up-to-date and accurate digital picture of the world. Life Engineering gains access to all this data and learns how smart services can improve people's quality of life. Humanity is on the brink of the next stage of civilization, Life Engineering should help in the transition.

We can leave the development of machine intelligence to the mechanisms of evolution or take happiness into our own hands. This means choosing either progress at the expense of quality of life or quality of life at the expense of progress.

References

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Kommentiert [RA3]: Hier würde sich ggf anbieten „To conclude, this paper argues that we need ...

Kommentiert [HÖ4R3]: ist mir zu distanziert

Kommentiert [RA5]: Im anschluss an die tasks oder diesen absatz liesse sich auch eine aufforderung an die forschung im bereich „electronic markets“ formulieren

Kommentiert [HÖ6R5]: sollte eh klar sein

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