factory

Magazine for a sustainable economy

Thema

BE(A)WARE

What if...? It works! In theory at least … **Columbus' egg** Well, no one saw THAT coming … **Let's talk turkey!** Growing older 101 **One CAN be too careful**

To be(a)ware Means Shaping the Future

According to John Naisbitt, author of the book Megatrends and inventor of the term 'globalisation', the best way to predict the future is to understand the present.

However, Frederic Vester, biochemist, cyberneticist and author of a best-seller about learning, thinking and forgetting, believes that the answer to our problems will come from the future instead of the past. So which one is it supposed to be? What will help us predict what is coming next? The past, present or future? It won't be just one of them, that's for sure. The fact that we cannot carry on with business as usual or rely either on conventional technology or even on as-of-yet non-existent technical solutions seems just as obvious. In light of cyclical economic and fiscal crises, increasing climate change, unlimited exploitation of natural resources, and an ever-growing gap between the rich and the poor, we lack an alternative. An alternative that will make an ecologically, economically, and socially just utopia become reality; which will protect our natural environment instead of destroying it. Sustainable development is just such an alternative. However, it needs to become more politically charged and more attractive on an emotional level, said futurologist Kar- ▶

lheinz Steinmüller during an interview with factory. Klaus Dosch, Scientific Director of the Kathy Beys-Foundation based in Aachen, explains that scenarios can help people envision several options for development and thus help them to choose one over the other. Ecological innovations alone will not suffice to save the planet, as one can see by consulting statistics: The increasing number of patent applications correlates with the increasing consumption of natural resources. The philosopher Bernd Draser sees social innovations as the key to doing more with less, by which he is referring to the recollection of social traditions. Those could be an option to counter demographic change, as is explained in Growing Older 101 by psychologist Manfred Nedler. The sociologist Ortwin Renn argues in favour of creating new strategies for developing a new society while discussing new technologies and their possible effects. The example of aqua cultures in the article by Bert Beyers also shows that it is possible to work with diminishing resources. Instead of being just reactive, we need to become more proactive and actively shape our future the way we envision it. In order to succeed, we have to ask the right questions. Instead of asking ourselves how we WILL live in the future, we should think about how we WANT to live.

Thus, I hope you will enjoy our be(a)ware edition, which carefully combines our topic range of future-vision-utopia and sustainability.
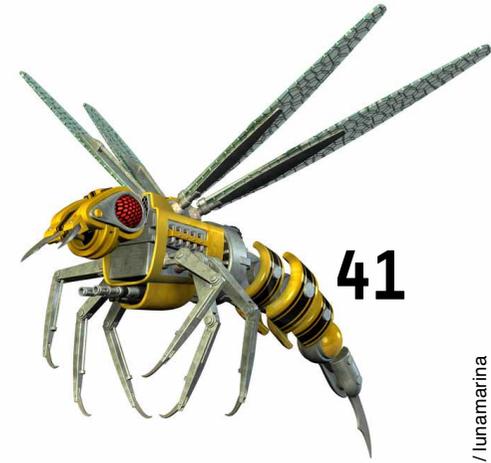
Ralf Bindel
Editor
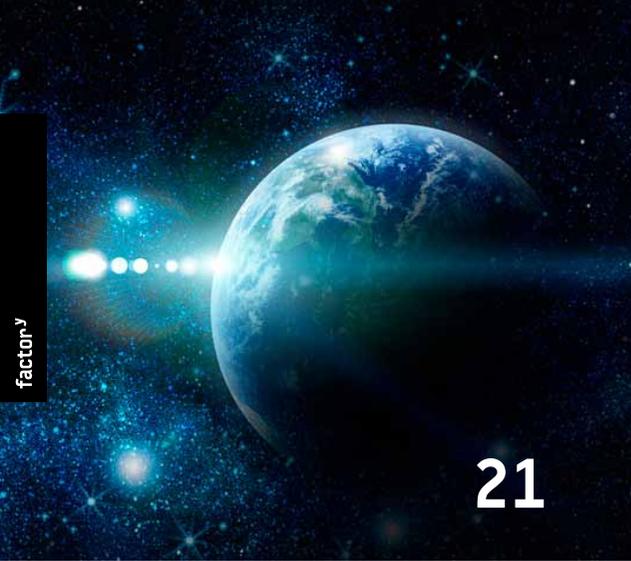
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1877 Alexander Graham Bell, a teacher of deaf-mute students, wants to sell his telephone patent to the cable company Western Union. They turn his offer down and he founds his own company, the predecessor to the media conglomerate AT&T.

1899 The radio has no future, flying machines that are heavier than air will never work, and x-rays will be proven to be a scam, predicts the British scientist William Thompson, known as Lord Kelvin, who introduced the thermodynamic temperature scale when he was 24.

1905 Albert Einstein's special theory of relativity is published. For the first time, concepts like past, present, and future are seen from a new point of view. The general theory of relativity from 1915 becomes the basis for today's definition of the term 'future' in physics. According to this theory, an observer can experience any event in their future by getting on the respective 'world line'.

1927 H. M. Warner, founder of the media conglomerate Warner Brothers, wonders who on earth would possibly want to hear actors talk.

1943 Ossip K. Flechtheim, a lawyer and political scientist, coins the term 'futurology'. He considers futurology to be a synthesis of ideology and utopian thinking, which has not quite reached the level of an academic field.

1943 When asked how many computers will be needed worldwide in the near future, Thomas J. Watson, who was then the CEO of IBM, estimates about four or five. His organisational methods influenced generations of managers to come.

1949 The dystopian novel 1984 by George Orwell is published and depicts a totalitarian state that is obsessed with surveillance and prevention. Ever since then his novel has been cited when similar circumstances arise.

1962 The London record label Decca turns down The Beatles after their audition date, because they don't believe this kind of music will be successful, as guitar-based bands were starting to be considered outdated.

1965 The futurologists Robert Jungk, Rüdiger Lutz, and Norbert R. Müller establish the inspiring idea of the Future Workshop in order to develop new ideas on how to solve society's problems.

1968 The American magazine Business Week predicts that Japanese car companies do not stand a chance as there are already more than fifteen foreign car companies on the market.

1972 The Club of Rome publishes the study Limits of Growth, which shows the conflicting objectives of short-term actions and long-term planning. The main conclusion of the study is that the absolute limits of growth will be reached within the next hundred years – if population growth, industrialisation, environmental pollution, food production, and exploitation of raw materials remain unchanged.

1974 Margaret Thatcher, Prime Minister of the United Kingdom from 1979 until 1990, predicts that it will take years before a woman will hold this office and that she would not live to see it happen.

1977
Ken Olson, founder and CEO of the computer company Digital Equipment, is sure that there is absolutely no reason why anyone would want a computer in their home. By 1990, DEC has 126,000 employees. In 1998, it is taken over by Compaq, which in turn is taken over by Hewlett-Packard in 2002.

1981
Bill Gates, founder of Microsoft and one of the richest men in the world, supposedly says that 640 kilobytes should suffice for personal use.

1982
The book Megatrends by the futurologist John Naisbitt is published and establishes the term 'globalisation'.

1984
The philosopher Frithjof Bergmann founds the first Centre for New Work in Flint, Michigan. He predicts that the majority of production will take place regionally and locally in the future.

2000
Paul Crutzen, a Dutch chemist and meteorologist, proposes the term "Anthropocene" for a new geo-chronologic era, in which humans have become the most important influence on biological and meteorological processes on earth. It is believed to begin in the year 1800 at the onset of the industrial revolution.

2000
Since the 1990s, horrible apocalyptic predictions were made about a millennium computer bug, which is supposed to occur on New Year's Eve 1999-2000. The preparations cause huge investments.

2012
A reality check for the accuracy of the predictions by the Society for the Scientific Research of Parasciences: The euro still exists, the Olympic Games took place peacefully, and Mount Vesuvius has not erupted. These and other predictions had been made by fortune-tellers and prophets. Accurate predictions: none.

2013
The US Department of Homeland Security warns that the distribution of 3D-printing plans for weapons cannot be controlled.

2014
The mini-computer Google Glass, which is worn on the head, becomes available worldwide. Until further notice, Google wants to refrain from displaying commercials.

2052
40 years after the publication of Limits of Growth, the Club of Rome publishes the new study 2052 by Jorgen Randers. According to this study, humanity has begun to adapt to the limitations of the planet. However, man-made greenhouse gas emissions will continue to be so high that the next several generations will have to live with a self-reinforcing, and thus uncontrollable global warming.

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»If we are constantly cautious, will we still be human?«

Alexander Issajewitsch Solschenizyn, Russian author (* 11.12.1918 - † 03.08.2008)

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Vision Risk Futurities
Change Utopia Alarm Planning
Warning Preview Projection Wild Card Crystal Ball Sign
Grim Outlook Assumption Optimism Possible Worlds Balance
Apocalypse Siren Equilibrium Futurology Card Reading Science Fiction
Enlightenment Clairvoyant Telescope Outcome Predictions Fortune Telling Club
Early Warning System Be Future Management Futures Studies
Fire Extinguisher Future Sustainability Technology Assessment
Technological Impact be aware Coffee Cup Reading
Risk Management
Megatrend Speculation Trend Research Limited Growth
Prophet Doomsday Predict Uncertainty beware
Foresee Courage Dystopia Radar
Binoculars Divination Pessimism
ware Trend Resilience
Rome

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»During stable eras, everything has a name and knows its place and we don't have much influence …
During times of change we have more leverage, so these are times of unlimited opportunity …

My God, what a fantastic time to be alive!«

John Naisbitt (*1929), American social forecaster. Megatrends: Ten New Directions Transforming Our Lives. Warner Books, 1982.

What If … ?

Predicting the future by using a crystal ball, reading coffee grounds or other methods rarely yields results. In certain scenarios, however, it is possible to manipulate factors in order to develop a more realistic idea of possible outcomes – and thus gain a better understanding of our present time.

By Klaus Dosch

Translated from the German by Larissa Burkart and Merle Kolmorgen

Knowing what the future holds is an age-old dream of mankind that still provides trend researchers, pollsters, and fortune tellers with work and income. Centuries ago there were several well-known fortune tellers such as Spurinna, who allegedly warned Julius Caesar about his impending assassination; Nostradamus, who is probably one of the most well-known seers in history; and Saint Malachy, who predicted that there would be 276 more popes before Judgement Day; as well as many others.

What all these prophecies have in common is that you can choose to believe them – or not. Those who believed the world was going to end on 21 December 2012 because a cycle of the Mayan calendar ended on this date, were sorely disappointed on the morning of 22 December 2012. The earth was still revolving around the sun, and there was no evidence of the impending apocalyptic doomsday. These types of predictions are rarely a basis for making good decisions. Just as Caesar did not heed Spurinna's prophecy, nobody seriously considered the prophecy about the world's end to come true and thus,

6 months prior to 21 December 2012, nobody considered quitting their job, convert all their possessions into cash, and acting as if there were no tomorrow.

Actually, it is not tempting to know what happens in the future – perhaps with the exception of lottery numbers or stock prices. For those, however, who don't want to stand on the sidelines, the questions of why and what if are vital. Being able to answer these questions means being endowed with the power to change something. The why includes dependencies, causalities, and conditions. The what if means thinking ahead of time with the desired result of being prepared for crucial developments in life, within the region, or in business. This version of risk management, which goes beyond statistics, is required in order to become resilient.

Those who understand the importance of future developments will have a well-functioning early warning system in place. Their system will track how causality affects their particular reality, thereby altering their perception. They can try to have an effect on the causalities in order to modify future develop-

ments. They can do this through various methods such as creating alliances or negotiating with their colleagues and thus change the future. This way, they are able to change their own businesses (or their own lives) so as to avoid undesirable consequences.

Theory and practice

Shell has been trying for several decades to understand how the world changes and what impact these changes have on the Shell company. Since the 1960s, an interdisciplinary team of scientists have worked on predicting future scenarios. The team made its first major appearance in the beginning of the 1970s when contemplating the possibility of an oil crisis in their mock scenarios. At this time, crude oil was mainly extracted in the Arab part of the Near East. After Egypt's and Syria's defeat in the Yom Kippur War in 1973, the oil producing countries in the Near East demonstrated solidarity with their sister Arab nations by turning off the oil tap for the Western nations – the first oil crisis erupted. In

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Germany, a couple of car-free Sundays were organised, but Shell was prepared.

The Shell scientists had described this development before in a mock scenario, so preparations had been made for this possible development and a contingency plan had already been prepared. The rival companies, however, remained paralysed from shock for some time, which provided Shell with a valuable advantage in the market.

Peter Schwartz, who is the former head of Shell's scenario group and has a comprehensive knowledge of predicting future outcomes, accurately describes the dilemma of predicting outcomes. There are so many social and technological advances every year and every decade which arise suddenly and unexpectedly. So how shall people, companies, or other institutions predict outcomes when they simply cannot know what the future holds?

For this purpose, scenarios are considered to be a proven method. They are not just mere stories that plausibly and vividly describe what will happen in the future and why. Good outcome predictions capture the readers' attention, they allow them to immerse themselves into the worlds that are being described, and they allow them to experience what happens in these worlds. They investigate the consequences, search for winners and losers, chances and risks; they kindle the curiosity to explore the obscure worlds of the future conceptually.

Factors for four worlds

How can scenarios be developed? First of all, the question that needs to be answered by using the outcome predictions needs to be defined more precisely. Yes or no questions are not useful for these types of scenarios. Questions which may be used for making predictions on are: How will the wind power industry develop in Germany? or What are the options of a community after the largest employer has moved out of the region? Also, scenarios should be focused on the distant future.

Once the precise questions have been developed, the framework of the scenario has to be built. What are the factors that will influence future events the most and are also particularly un-

certain at the same time? It is useful to consult a number of people in order to detect these influencing factors. The more perspectives that are amassed, the better. To build the framework, the two most important factors, which are also the most uncertain ones, have to be ascertained. Besides, they have to be linearly independent in the mathematical sense. To put it more simply: each factor must not depend on the other one. Figuratively speaking, if one factor is changed or removed, the other factor must not be affected. These factors represent the core of the scenarios and thus are incredibly important; detecting them may take considerable time.

When there is a consensus on the two factors, they form a coordinate grid system. The endpoints of the axes represent the two extreme dimensions of the respective factors. Hence, with that the four worlds in the desired outcome are roughly characterised.

The art of the scenario predictions lies in describing the ways into each of these four worlds. Here it is about cause-and-effect relationships, not about chronological narratives. Anyone ▶

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who deeply reflects upon a scenario must consider the way in which it has been described in order for it to be logical and compelling.

Besides enabling thinking ahead of time, scenarios are an excellent means of communication. They help connect the people who develop it to form a creative team. A team who has the ability to manage strategic issues independently of the daily business operation. There are few better methods which enable team cohesion. Take the next opportunity you have to try it! Or you can take the opportunity to learn from the scenarios already described on our list.

Klaus Dosch is a geologist and the scientific director of the foundation Aachener Stiftung Kathy Beys. His last articles in the factory magazine were ‚Nutzen statt Besitzen, ein neues Geschäftsmodell' (Using instead of owning: a new business model) and ‚Trennen tut gut' (Separating feels good).
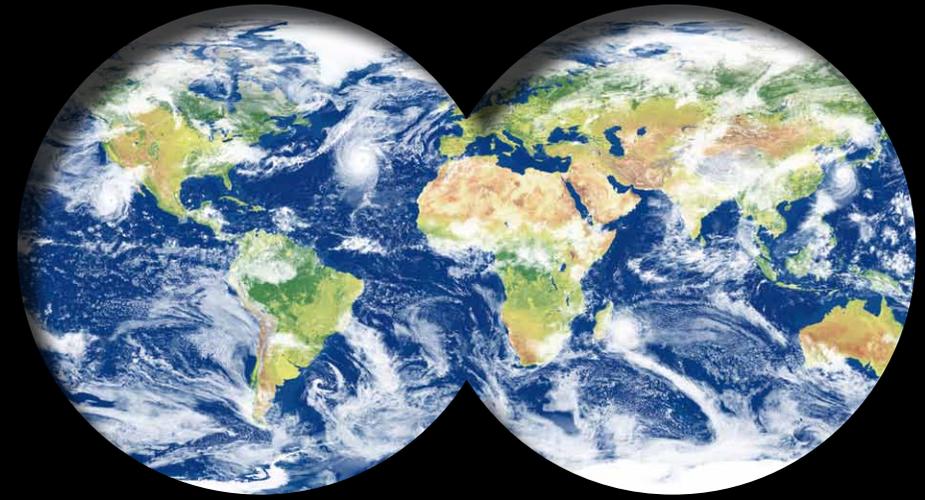
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Models of future outcomes:

Aachener Stiftung Kathy Beys, Indeland 2050 Szenarien, Aachen, 2008 HYPERLINK "http://www.regionalszenarien.de/indel-and-2050/die-szenarien.html"www.regionalszenarien.de/indel-and-2050/die-szenarien.html

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Kees van der Heijden, The Art of Strategic Conversation - 2nd ed., John Wiley & Sons Ltd., Chichester, West Sussex, GB, 2005.

Paul Raskin et al., Great Transition – The Promise and Lure of the Times Ahead, A report of the Global Scenario Group, Boston, 2002 (HYPERLINK "http://tellus.org/documents/Great_Transition.pdf"http://tellus.org/documents/Great_Transition.pdf).

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»The best way to predict the future is by shaping it yourself.«

Willy Brandt (1913 – 1992), German politician of the Social Democratic Party of Germany, chancellor of the Federal Republic of Germany (1969 – 1974), Nobel Peace Price winner (1971)

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It Works!
In Theory at Least …

In a few years time, one in two new cars in Germany will be a heavy off-road vehicle such as a SUV, although 80 percent of the population live in cities. Obviously, sustainable development is only possible if people are willing to change. However, sustainable development does not call for another New Man but for people who tend to look at traditions, both those which are tried and tested as well as at those that have been refuted, with an inquisitive eye.

By Bernd Draser

Translated from the German by Christine Kühn, Alina Junk and Theresa Lupek

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Everything would be fine if humans were better creatures. The world would be a just and happy place, ready for a long future! But what is one to do if people are simply not willing to better themselves? If they choose to sin? If they would rather buy a second car instead of a bicycle and choose long-distance travel over urban transport? Can you lead a horse to water and also make it drink? If not for the sake of people, then at least for the sake of future generations? Should people be educated in order to reach the ideal of a new and improved man? And if they refuse to be educated, would breeding be an option? Do we not need a different world, a utopia? Are we, who only want the best for this world, not obligated to strive for this one goal, using all means available? Especially now, in the face of crisis?

In his 1999 essay Rules for the Human Zoo, Peter Sloterdijk proposed effective procedures of self-taming by means ranging from anthropotechnology to the design of specific characteristics e.g. through optional birth or prenatal screening. This could also be the means

towards ending violence in American schools, given that school education cannot achieve anything when faced with the negative effects of the media. On stage, Sloterdijk turned his witty puns about reading and selection (borrowed from Platon, Nietzsche and Heidegger) into the serious subject of biopower.

Let us continue to play this game with language and extend biopower to biomass, organic matter, to render people themselves 'organic' in order to best achieve sustainable development. If diet and transport are the two major fields for the consumption of resources, would it not be neat to genetically optimise future generations in a way that makes them give up meat and long-distance travel voluntarily (or rather biologically) and prefer a cooperative lifestyle over a competitive one?

Utopia is an island

Ideas and practices of breeding have been popular since the 19th century. The New Man', which was also the title of an exposition at the Hygiene Museum in Dresden (1999), is said to be an obsession of the 20th century, of everyone who wants a different world, whether with regard to architecture, economy, race, politics, or transport. Utopian dreams of a new man were always followed by a rude awakening. This is inherent to utopias, just as the totalitarian claim on the establishment of a new golden age while destroying everything in opposition to it. The reason for evolving utopian concepts lies in the shortcomings of the current society which become hard to bear. To produce a straightforward narration, the present is simplified e.g. by reducing complexity, simplifying answers and overdrawing scenarios. This can be attained by a clear division between good and bad, friend and foe. The narration either depicts a concept of a seemingly better, fairer society or envisions the consequences of

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carrying on as before in a kind of apocalyptic scenario.

Naturally, the dramaturgically smartest solution unites both possibilities in a narration about the soon-to-occur apocalypse followed by a new world that is populated by a new type of people – but to arrive at this point, apocalypse has to be brought upon the world first!

The total break with past and present is an essential device. This is the only way to enforce what is deemed to be 'good', using violence if necessary, as nonconformism needs to be rooted out. And since we always wait for the future for too long just to see it crumble into yet another present, we lose patience and want to see results in the form of small slices of utopia which can be easily digested. These slices are often an alternative and their realisation requires a lot of work as the complexity, which utopia had been meticulously stripped off, now resurfaces. The only means of counteracting this, is to strictly separate utopia from the decadent rest of the world. Therefore, utopias in literature are generally set on islands (Utopia in

Morus' work, Atlantis in Plato's work). In his painting 'Das goldene Zeitalter' ('The Golden Age') Lukas Cranach surrounds his utopia with a veritable wall. Political utopias of the 20th century follow this tradition and emphasize it with barbed wire.

Backwards instead of forwards

Where does this leave us? Do we need to give up in the face of future? Do we have any power over what is yet to come? Indeed, we do. If sustainability were an actual utopian idea, we would be in serious trouble. However, sustainability is not a futuristic but a traditional project. What does this mean? The future is neither predetermined nor unknown to us. It is the result of overly complex interactions which we cannot influence. If we look forward, we see nothing. Our projects for the future are actually projections. Even worse: the great phantasms ▶

of feasibility, utopian societies, are at the root of all the problems we seek to solve with their help. The adventure of subjugating nature through technology was also the beginning of our modern philosophies featuring Bacon and Descartes, and also Rousseau who was strangely critical of civilisation.

It is popular within the environmentalist movement to declare that we are digging our own graves. This metaphor holds more meaning than one would first attribute to it. As the grave we are digging is not nature, nature is the ground surrounding our grave. We are digging because of our traditions, since they influence our behavioural patterns and our relationship to the world. A glance backward is more productive and important than a glance forward because we can learn more from our past than from apocalyptic expectations. Foremost, we can learn that sustainability cannot and does not need to be forced by biopower and genetic engineering. However, sustainability itself plays a major role in our traditions.

Traditional social techniques are innovative

Strategies we want to employ today in order to ensure sustainability are thoroughly old-fashioned and linger under the surface of our industrialised lifestyle. Cyclical thinking is a tribal heirloom. The whole concept of realising one's future is still fresh and superficial, so it only occupies a very short span of time in our predominantly tribal history. Some obvious examples: The boom of today's urban gardening is the echo of old subsistence farming, which has been an everyday reality from the Neolithic Revolution to the post war era, usually expressed by small domestic vegetable patches. Non-regional and -seasonal consumption is quite a new concept anyway. Bartering and sharing is as old as village life and family economy. D.I.Y. and make do and mend had been the norm for a long time. The renunciation of meat finds its thousand-year-old prelude in religious fasting. Even if one only casts back a quick glance, this proves to be more pragmatic than the prophecy of

a new man. Navigation by looking in the rear view mirror is not misleading.

Tradition is an ever-growing resource

If we discarded the conceited goals of utopias, especially with regard to our lifestyle, and decided to tackle things within our immediate reach a bit more efficiently and, thus, more traditionally, we could profit a lot from it. The discussion about sustainability will need to stop focusing on trying to achieve major, global goals and start to become more regional diverse. Then we will be able to deduce that it is neither about individual and technological solutions nor about major changes in economy and politics, which at long last will burn more natural resources, but that it is all about small and gradual changes in the taste and values of individuals.

Furthermore: Is it not wonderful that tradition, as a resource, does not decline as it is used but grows and evolves?

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Traditions in art can teach us that aesthetics can be a part of sustainability. Hopefully, this will diminish the influence of ethics, because as soon as a sustainable lifestyle becomes a moral imperative, people will consider it reluctant and it will be destined to fail. Aesthetics can fulfil the same functions as ethics, only better. A simple example for this phenomenon: Does a piece of art become more or less beautiful when something is added to it? A visit to a museum or a classical concert will do more to foster an economy of modesty and sufficiency than an appeal to ethics or advertising a new more environmentally friendly product as a new must-have. An aesthetical way of life is the best antidote to the hideousness of mass consumption. Nietzsche once said in a different context that now is the time to let our taste guide us, not our reason.

We can talk about exemplary and experimental lifestyles, and we do not need to leave it at that, but we can also work on our lifestyles: taking specific, small steps, without great drafts which only gain importance from the denial of the matter's complexity. These attempts

at first steps would be tackled with relish, without a tendency towards totality, without the will to a last end, without the elimination of humans, just a never-ending happy movement, a lively game …

Bernd Draser is a philosopher and lecturer at the eco-sign-Akademie in Cologne. He wrote for factory about the art of separating and possessing to participate.

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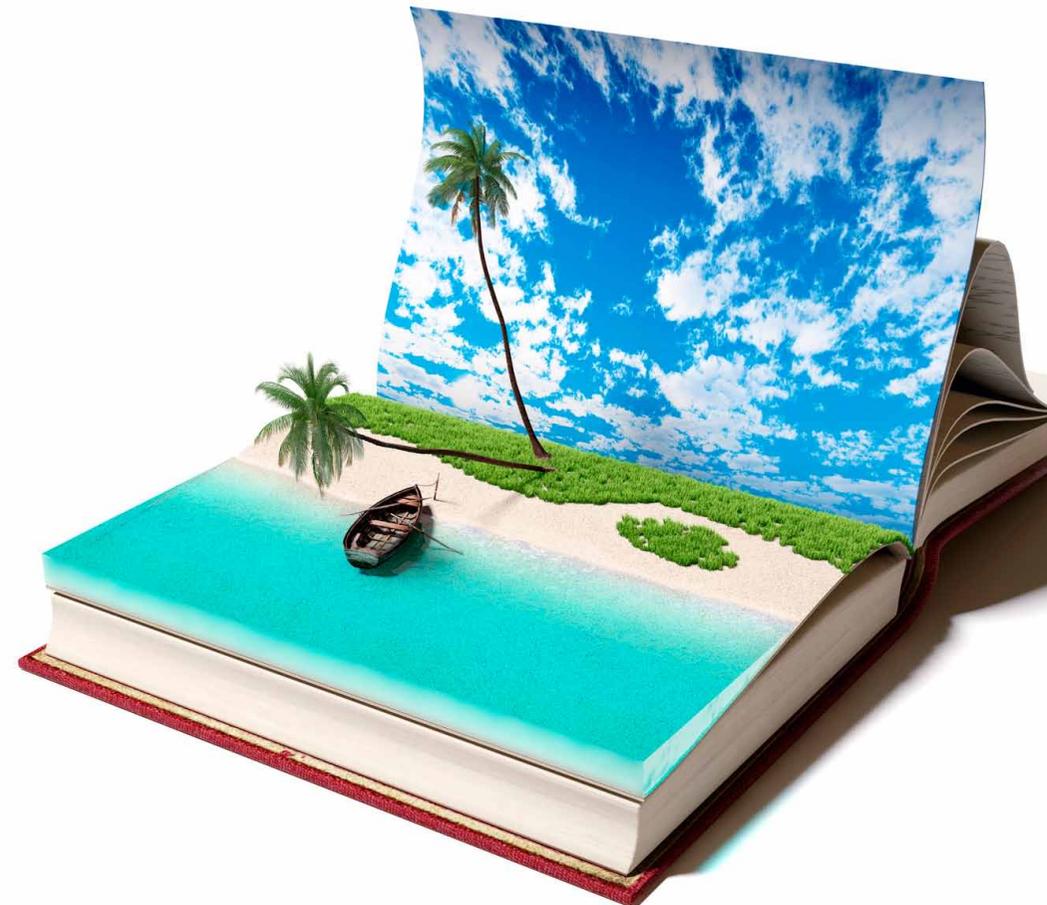
»Progress is the realisation of utopias.«

Oscar Wilde, author (1854 – 1900), The Soul of Man Under Socialism.

Columbus' Egg

Stardate 2013. We are on the journey towards sustainable development. The transition to alternative energy has created the right climate for innovation; there is a sense of pioneer spirit. Excellent concepts have been developed that are so simple that it makes us wonder why no one thought of them before.

By Bert Beyers

Translated by Alina Junk, Lara Nettekoven and Luzie Schmitt

Energy

What if you could have a power plant for your own house? A start-up company, based in Cologne, Germany, wants to make the purchase of a solar electric system as simple as buying a TV. Configuration, order processing and installation are all carried out by the company itself.
→ www.greenergetic.de

The Swiss exhibition platform 'Umweltarena' displays sustainable technologies: renewable energy for your home, construction, renovations and electro mobility. You have the opportunity to try everything out for yourself, where it is all under the same roof.
→ www.umweltarena.ch

Wind turbines do not always have to be large and made of tons of steel and concrete. They also come in smaller sizes – like the handy wind turbine for your own backyard.
→ www.enbreeze.com

Students at the American elite universities MIT and Harvard invented a flying wind turbine. The turbine is suspended in a ring-shaped balloon filled with helium. At 900 feet, the wind is blowing stronger and more constantly. And of course, there is less trouble with the neighbours.
→ www.altaerosenergies.com

The Italian startup company KiteGen is taking a similar path. But instead of airborne wind turbines, they introduce towing kites. These kites go as high as 3000 feet, where their circular movements are being monitored by computers.
→ www.kitegen.com/en/

There are many great ideas in the offshore wind power industry. One example is a vertical rotor with a 600-foot span.
→ www.windpower.ltd.uk

Another idea is a swimming wind power platform. The entire platform is built on shore and is then brought to its destination at sea with tugboats.
→ www.abb.de/cawp/seitp202/82e4882 c0a95e029c12579a00031d7f9.aspx

The most ambitious projects envision fully automated solar islands in the vast oceans. They are covered with solar panels and electricity is saved in hydrogen tanks. The energy vessels created in this process are collected by supply cars and taken to shore. When there are signs of a heavy storm the solar islands are submerged into the water and will continue to operate right after the storm ends. That is how far the idea goes. The concept is already being tested on a smaller scale.
→ www.solar-islands.com

Biomass

The market for wooden construction is booming. The LifeCycle Tower in Dornbirn, Austria has eight floors. The modular construction system is designed to go as high as 30 floors. It is a hybrid building, half of which is built out of wood. Other materials are concrete, metal and

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glass. The LifeCycle Tower weighs about half as much as a conventionally constructed building. The main idea is to create resource-efficient high-rise buildings for the densely populated cities of the future.

→ www.creebyrhomberg.com/de/

The annual world market for natural fibres – cotton, hemp, coconut – amounts to approximately USD 50bn. There is competition for arable land with the food production sector in the production of most plant fibers on land. Seaweed presents an alternative. It can be used instead of polystyrene insulation tiles to insulate outside walls against cold temperatures. It does not rot, has a low degree of flammability and is resistant to mold.

→ www.neptutherm.com/index. php?home

→

Seaweed could also be used as a source of biofuel in the future.

→ www.ba-lab.com

Algae also bring the advantage of not competing for cultivation area with the food production. Algae do not depend on fertile ground: they even grow in deserts, salt water and wastewater. Algae fuel can already be purchased at gas stations in California.

→ www.sapphireenergy.com

→

Another US-American company is investing large sums in Brazil.

→ solazyme.com

Algae production, however, has not yet been fully developed. The plants grow very quickly and therefore need to be harvested constantly. The production also needs to take place at a large scale in order to be profitable.

Wastewater

Each German uses about 130 litres of water a day at home. Wastewater from showers, washing machines and toilets has a temperature of about 20°C in summer and winter.

Heat energy from wastewater can be used in different ways. There is recovery at the house itself, from wastewater pipes or wastewater treatment plants.

The energy can be used for both heating and cooling purposes. The technology has been tested and has a lot of potential. But it still needs partners, especially the utilities that manage sewage systems, which means public administration.

→ www.um.baden-wuerttemberg.de/ servlet/is/103241/Biesalski_Uhrig.pdf

Dean Kamen, the inventor of the self-balancing vehicle called the Segway, has invented something new. It is a device the size of a refrigerator which converts wastewater into drinking water. It can be used anywhere in the world. The wastewater is heated under pressure and as it evaporates, it is collected again – as clean water. In this process, the wastewater's heat energy additionally improves the total energy consumption. At a price of around USD 7,000 to 8,000 it is still quite expensive.

→ www.unionleader.com/ article/20121007/NEWS02/ 710079913&source=RSS

»Over the long run, absolute decoupling, meaning severely reducing the current use of resources, would probably not be compatible with significant economic growth in a country like Germany. We say 'probably not' as we cannot foresee the future and because the complexity of economic, technological and cultural developments always leaves room for surprises. However, a policy dedicated to the principle of making provisions cannot afford to rely on undiminished growth.

It would be foolhardy to simply rely on the unknown potential of decoupling.«

According to chapter 4 of "Zukunftsfähiges Deutschland" by Dr. Fred Luks of the Österreichisches Institut für Nachhaltige Entwicklung in Wachstum und Wohlstand (Austrian Institute for Sustainable Development in Economic Growth and Prosperity), Fischer 2008

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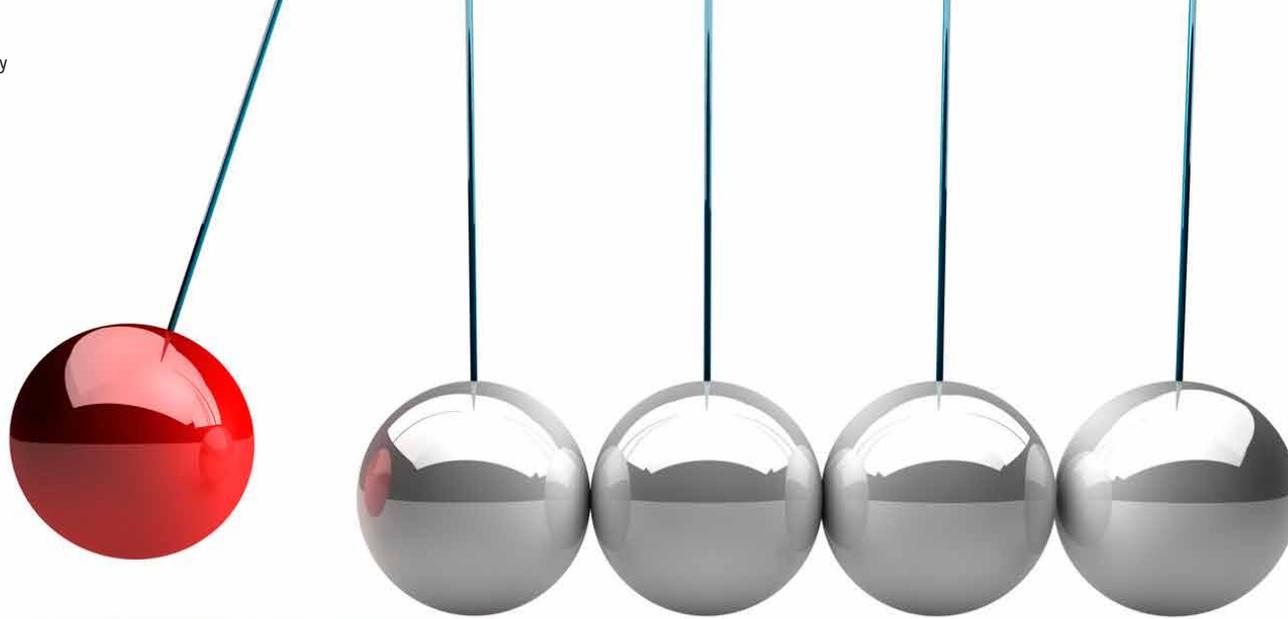
The Effects of Technology

Most of the time, technical and technological advancements promise a better future. After all, they often go different routes than expected, and thus have the potential to cause fear. In order to predict possible effects of technology in advance, technology assessment is needed. Can it really make a difference?

By Ortwin Renn

Translated by Alina Junk, Lara Nettekoven and Luzie Schmitt

It is Saturday night in a large city. People are standing in line at a club. Some get to go inside, seemingly without paying, and apparently they also receive their cocktails and sodas free of charge. But looks can be deceiving. Small RFID chips, normally injected near the guests' biceps, record the accumulated charges.

What might seem like a mere scenario is already happening at a club in Barcelona, thanks to the so-called 'VeriChip'. When visiting this club, those who have a chip implant do not need to bring their ID or wallet. The RFID chip does not only contain relevant personal data; owners can pay a certain amount at the club in order to add to the credit balance of their 'VeriChip'.

The RFID chip, about the size of a grain of rice, is embedded in a sealed eleven-millimeter-long (about half an inch) glass tube. The tube is covered in a porous plastic that is supposed to connect to body tissue. It contains a 16-digit number that allows identification of the RFID's wearer worldwide. Originally, this chip was said to be more secure than an ID since it cannot be forged. But now, instructions on how to read and clone it can be found online. The effects of such a forgery are more severe than the effects of a forged ID, since original and forgery cannot be told apart in a digitalized world.

This example shows that all technology has effects, both positive and negative. Predicting and evaluating effects of technology – this is what all institutions dedicated to technology assessment (TA) do. This assessment covers all areas that can be affected by technology.

The aim of technology assessment is to provide the general population with reliable and impartial information in order to give them insight into the most likely consequences of technological activities. Particular focus is put on recording unintentional effects, both in the determination f risks and opportunities. The more the general population can anticipate the effects of actions related to technology in advance, the less they will suffer finding out about them through trial and error afterwards. However, there is no sure way to avoid the rocky road of learning from mistakes.

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The ambivalence of 'as well as'

Hopes of avoiding negative effects of technology are tricky, since there is not and cannot be any kind of technology that brings only positive effects along with it. This might sound trivial. Is the fact that all technology has its upsides and downsides not obvious? While a chip implant simplifies everyday life, it also makes improper use and forgery easier. Acknowledging this contradiction goes beyond realizing that purchasing a piece of technology does not mean you can buy a slice of heaven or hell. It is a refusal to accept categorical imperatives and regulations aimed at categorizing technology into those that are morally sound and those that are not. Even solar power has its environmental risks, just as nuclear energy has indisputable upsides. Technology's contradictory nature is one of its key features.

It is essential to achieve a balance between these contradictions. There are two important aspects to achieving balance: knowledge and evaluation. Improving knowledge occurs by systematically and methodically collecting data on possible effects of using technology (technology assessment research). Evaluation is performed by assessing alternative options for action based on the level of desirability of the results from each option. This includes results of inactivity, the so-called Zero Option (impact assessment).

For the first element, impact assessment, technology assessment research needs scientific instruments which allow complete, accurate and objective prognoses regarding possible effects. For the second element it needs generally applicable criteria to assess and evaluate these effects intersubjectively. These criteria cannot be derived from science. They need to be identified and developed by society as part of a political process. Assessing possible effects needs to be oriented on criteria of sustainability: is new technology in compliance with ecological, economic and social requirements of a humane society, and can technology be a lasting contribution to sustainable and equitable development? ▶

Discourse for more clarity, not necessarily more agreement

Technology assessment relies on the discursive process of assessing and evaluating knowledge. In order to deal with issues of contradiction in an adequate manner, a discursive or participatory approach seems especially promising. It is not just the fact that having all of the concerned parties meet at a round table and communicate with each other has hardly ever contributed greatly to clarifying circumstances, reaching new insights and resolving possible disagreements. It is much more significant that these discursive procedures clarify factual issues based on comprehensive methodology, discuss matters of assessment and consistently derive options of action. Clarity is usually a result of such debates, which does not necessarily mean agreement.

Technology users and those who are affected by technology need to be aware of the risks linked to all technological applications and the damage they may cause, even with the best in-tentions and precautions. Only active awareness of the risks opens room for new strategies to deal with technology in a creative and precautionary manner. This strategy can also be embedded in aims at sustainable development of economy and society.

Ortwin Renn does research on social studies, macro-economics and sustainability and holds the chair in the Department for Technological and Environmental Social Studies at Stuttgart University. He is also the CEO of Forschungsinstitut Dialogik and head of the Council for Sustainable Development (Nachhaltigkeitsbeirat) of Baden-Württemberg.

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»It is neither high-tech nor the thirst for action that dominate the lives of the majority of the world's citizens, but rather misery and lack of power. However, the future will be held back as long as half of humanity is not welcome to stay on this planet.«

Prof. Dr. Wolfgang Sachs, Wuppertal Institute, in Gastrecht für alle, Chapter 7 in Zukunftsfähiges Deutschland, Fischer 2008

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Let's Talk Turkey

If the vision of sustainable development is to become reality.

By Bert Beyers

Translated from the German by Lara Nettekoven

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Modern utopias rely on progressive and ruthless domination of nature. The question as to whether this takes place with or without the inventor's approval is merely of an academic nature. The consequences are well known. And whoever has visions for the 21st century also has to remember the totalitarian dimension of utopian thinking. Yet without visions – those of a just society and production methods, which will not continue to destroy the livelihoods of future generations – and therefore without a 'responsibility principle', as Hans Jonas calls it, we will not be able to cope with the consequences.

No organisation, no corporation, no city and no society can get by without goals, self-images and models. Yet, if they are not supposed to be based on dreams, wishes or even anxieties, we are in need of sophisticated and democratically legitimised visions.

'Sustainable development' is probably the most well-known vision, which was proclaimed at the UN-Conference in Rio de Janeiro in 1972. However, the challenges are inherent in the subject itself:

Sustainable development aims to reach sufficiently high ecological, economic, and socio-cultural standards within the boundaries of the earth's carrying capacity for people today and future generations; thus establishing intra- and intergenerative principles of justice.

This is the definition of 'strong' sustainability, which can be found in Holger Rogall's Nachhaltige Ökonomie (sustainable economy), Marburg 2012, p. 46. It's a mega-project. Let us go through it quickly. First, the concept of sustainability is ethically motivated, or more precisely: it is based on principles of justice – that's not so easy. Secondly, it applies to all humans, not just to the one billion of the global middle class, but also for the one to two billion people who live in severe poverty and even die of starvation. And it applies to all future humans as well. Thirdly, it not only refers to ecological but also to economic and socio-cultural standards. And finally: the earth's carrying capacity – that is also a challenging question, depending on which resources (biotic, abiotic etc.) and which spheres (water, land, air etc.) are taken into account.

Regulation as a fair solution

As challenging as the doctrine might appear – its realization is even harder. A good example is the future of fish production, extensively described by the World Ocean Review 2013 in The Future of Fish - The Fisheries of the Future, (www.worldoceanreview.com).

In the second half of the 20th century, the amount of wild-caught fish has quintupled. The growth, however, came to a halt a fairly long time ago: The oceans simply cannot produce more. Illegal fishing is a big problem; it amounts to approximately one third of the volume of legal fishing. Currently, more than one fourth of the fishing zones in the oceans are believed to be overfished or depleted. This is a disaster of economic as well as ecological proportions.

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However, not everything is lost. Australia, Canada, New Zealand, the United States and Norway have developed sustainable fishing management – and even monitor it – thus rendering overfishing impossible.

High hopes are also set on aquaculture, the food production sector which has grown the most during the past two decades. The amount of farmed fish that is being produced today amounts to about three fourths of the wild-caught fish.

But even aquaculture is not completely unproblematic. Particularly criticised is the feed: it contains too much wild fish and sometimes excessive quantities of antibiotics. Nevertheless, in regard to the production of protein, fish farming is distinctly superior to animal production ashore, mostly due to the favourable ratio of input to output.

Therefore, chances are high that by 2050, another two to three billion people on this planet could be provided for with animal proteins. If one wanted to. And if the global community can agree on a shared set of guidelines.

The example of fish production puts the Green Economy idea in concrete terms. Scientists know the carrying capacity of the marine ecosystems quite well. With regard to governance, progress is crucial: international contracts, control of the fishing industry by satellite, and much more – all to make sure that the ecological borders are not being crossed. Technological progress contributes to a proper utilisation of resources within given limitations. Especially aquaculture has great potential. Only the future will show which possibilities the innovations open up and what (unintended) effects they may entail; this still has to be worked out. Furthermore, economic and socio-cultural standards need to be established for the many hundred thousand people who work in the fishing industry. Along the way, there are many difficulties and the journey demands a lot of stamina. This is precisely why visions are needed.

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»People who have visions should see a doctor.«

Helmut Schmidt on Willy Brandt's visions, cited in Der Spiegel 44/2002, p. 26

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Growing Older 101

We are growing older, becoming more colourful and fewer. Many people associate the demographic change with shortages of skilled labour, shortages of nursing staff, and stress. Albeit, now is the time to actively design the future world of employment.

By Manfred Nedler

Translated from the German by Christine Kühn, Theresa Lupek, Lara Nettekoven und Luzie Lotta Schmitt

We work until the age of 70, still have fun while doing it, and continuously reduce our working hours between the ages of 50 and 70. Even in our younger years we have treated ourselves to regular time-outs in order to take care of children (not necessarily our own), to continue our studies, to become socially involved or just for fun. Since borders no longer exist, contrary to identical social and environmental standards, comparable salaries and there is (next to the various regional) one universal language, it is common to live and work in different parts of the world during the course of one's life. National states have ceased to exist, just as the notion of belonging to one specific nation or even race. Company profits and personal assets are used to finance a solid subsistence income, exceeding the 'minimum level', as well as a lifelong, free of charge educational and health system. Wealthy people possess no more then a tenfold of what less wealthy people do. Poverty and hunger no longer exist.

For years, scientists worldwide have been working on a strategy to abolish the monetary and financial system altogether. Psychologists have a key role in this endeavour. They establish which social structures and conditions are necessary so that people's intrinsic motivation to become involved and make a social contribution will supersede the previous fixation on extrinsic motivation, the self-disciplining for the prospect of reward and acknowledgement.

Books on topics like burnout and stress management can only be found in antiquarian bookshops. Children learn from an early age to place their personal dignity and integrity above all else. Therefore, even as adults, nothing could be further from their minds than to stress themselves out or beat themselves up at the expense of their health, serenity, and vitality in order to reach questionable goals within deadlines set by others.

If not sooner, Helmut Schmidt would probably call in the doctor now. And yet, such utopias are actually the best medicine to keep one's mind healthy in an economic and social system which considers itself to be the only way, even though it does not have satisfactory answers to various problems.

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From utopia to reality

Let's take a look at the situation at the beginning of the 21st century. Demographic change is a phenomenon that is emerging no less surprisingly than climate change. Now is the time to act, 'to see the crisis as a glass which is half-full', to reorganise working conditions so that we are able to bear and survive work until the age of 67, and also to actively seek out people you originally never wanted to work with. After all, early retirement as well as part-time work for older employees has long been a win-win-win situation: the employee was earlier released from unpleasant drudgery, politicians were able to show presentable employment statistics, and companies profited from 'new blood', meaning young, resilient and still motivated professionals.

These times have passed and this is clearly evident in human resources departments. Creativity has been activated. Early cooperation with schools, intensive public relations, image branding and the orientation on social responsibility as well as the recruitment of highly skilled employees from abroad are more and more integrated in the daily business of companies.

However, it remains a mystery how the working capacity of employees is supposed to be maintained until the age of 67 and beyond. Today, the pressure on profitability and the competitive pressure require a constant crisis management and a drive towards efficiency on the side of the company. Companies behave just like us, normal human beings. When faced with stressful situations, we tend to favour short-term work performance and neglect things that are important in the long run, such as being healthy and building meaningful relationships. Companies also lack the serenity and foresight to deal with long-term situations and develop a strategic course of action despite being faced with current pressure. This is why not only individual employees might be suffering from burnout; even entire companies 'are on their last legs'. Since the external pressure will probably not wane, the new magic word is 'resilience', meaning the ability to deal with pressure, to keep your chin up and to manage crises successfully.

Strengthening resilience

At a personal level, this psychological and emotional stability is less dependent on methodological competences than on the general attitude people have towards themselves, other people, work, and life in general. We develop these attitudes very early in life and they are not easy to change. In order to set a totally new course in life, we firstly need a strong determination and belief that positive changes are actually possible and secondly, constant support and help for at least a year. This new outlook on life is about

- starting to believe again that positive feelings and thus a good life are possible, that it is good to think positively and that in a committed and active life, positive feelings are within reach.
- developing enough inner strength to trust ourselves as well as our feelings and opinions and not to let ourselves be governed by what others do or think.

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- bravely facing the facts: "I decide how I spend my time, but I only have 24 hours. I accept 'what is possible' and 'what is not'. I decide and I live with the consequences."
- self-confident communication, e. g.: "I need help with this task", "I am not able to finish this task today, unless…", "please speak quietly, I really need to concentrate" etc.

New balanced values can be developed neither in one day nor in a seminar room. However, they can be developed over an adequately long period of time during which they are supported by permanent encouragement and based on new, positive experiences which we will increasingly rely on. Therefore, a compact seminar is not as promising as a combination of media-based self-directed learning and personal support in small, moderated groups as well as with individual help via phone and email. Additionally, this concept is much more cost-effective for a company than standard individual coaching.

Enhancing openness and patience

At an organisational level, attitudes play a more fundamental role than formal aspects such as job descriptions or organisational charts. They are mainly characterised and strengthened by communication. Whoever wants to encourage confidence and resilience should start by looking at the internal communication of the company and study it critically:

- Do the employees work together as a team or do they instead work individually?
- How relaxed and open is communication between them?
- What exactly do they say about mistakes and how do they say it?
- Is the communication only based on work or is it also about the contact with each other, e. g. in the form of appreciation or openly expressed criticism?
- Is the communication mainly problem-orientated and pessimistic, and perhaps even cynical, or rather solution-orientated and confident?

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- How often do employees laugh and how is their reaction?
- Is the communication within the company always respectful? Who might be insulted by whom and how?
- Does the management set an example for open, straightforward, and respectful communication?
- Are staff appraisals and meetings lively, interesting, and productive or rather an unpleasant routine that no one expects anything from?

Both positive changes at an organisational level and positive changes at a personal level require a sufficient degree of determination and patience. Management requires the determination to work on its own communication and to act as a 'shining example'. The necessary stimuli can be activated by an event, for example a company theatrical performance that exposes old communication patterns in a humorous, provocative way and that shows how attractive a new corporate culture can be.

Accepting and organising limits

When courage and openness are sufficiently developed at the individual and organisational level, the decisive factor is still missing: the individual and organisational dispute over possible goals and limits. Even strong, resilient employees have, of course, physical and psychological limits that need to be respected and protected. Their stability helps them to respond to pressure in a more relaxed way and to set priorities. But this does not mean that they are what is called an Übermensch and are therefore invulnerable. If a company wants to maintain its employees' motivation and working capacity up until they are 67 and beyond, it has to limit its demands on the employees to a healthy level. That means:

- No new project is started before an old one is terminated, perhaps even prematurely.
- Breaks are 'sacred' and should be used to relax.

- Grey areas between work and free time are eliminated: if someone needs to be available for the company, this must count as working hours.
- Employees, including managers, are explicitly encouraged to indicate personal overload.
- Managers are encouraged to indicate overload within their team.
- All employees know what kind of work takes priority in times of overload and what can be postponed.
- Working hours are reduced successively with increasing age, on a full salary. Experienced companies know that this is economically efficient.
- Companies that no longer repress the problem of work overload gain strength, innovative capability, and resistance. And this becomes more and more important in an economic system with an immanent obligation to grow.

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Culture: the decisive factor for change

Of course there are other very pragmatic starting points for promoting health and working capacity: working hours that are adapted to the employees' private needs, sports and wellness offers, healthy canteen food etc. By taking part in projects like the German DemografieFit project (see box) or Demografie Aktiv, companies are enabled to systematically identify promising measures and to introduce them. However, the fact remains that what is really important is the corporate position, communication, and culture. Therefore, staff appraisals, even if they were well meant, are of no use in a corporate culture that is identified by mistrust. And if the company systematically ignores when employees are overloaded, sport offers just seem cynical.

Manfred Nadles is an industrial psychologist and develops analyses, projects and trainings in the field of stress at work and demographic change. He is a member of staff of the DemografieFit project and a member of the network Demografie Westälisches Ruhrgebiet (Westphalia Ruhr region).

DemografieFit …for a change

"Without taking part in a project, day-to-day business prevents us from thinking about such a topic", says Frank Schröter, manager of Schlatter Deutschland. In Münster, 167 employees produce welding machines as well as machines for special applications and assemble them all over the world. "When an employee's daughter graduates, we pay for the mechanic's flight back from China." It is important for Schröter to know the individual needs of his employees. "This creates loyalty", he says. Schlatter is one of eight companies and organisations in and around Münster that are taking part in the DemografieFit project and in Hessen there are eight more. Lots of different sectors participate in the project: from nursing homes and industrial cleaning companies to mechanical engineers. By taking part in the project they learn from each other. This is why the automation engineers at Blumenbeck want to copy the taster days for trainees from geriatric nursing. "We want to try that too. We want to constantly create interest by implementing projects, and not only on special project days", the manager Harald Golombeck explains.

From his consultations, Dr. Udo Westmann, head of the DemografieFit project in Münster, knows that the topic of demography is not considered important within the day-to-day business of small and medium-sized companies. If companies take part in a project like DemografieFit, resources are reserved for the exchange with other companies, for workshops about situation analyses and for the development of new strategies within the company.

With the moderated demographic check, companies have the possibility to find their own way to change, Westmann explains. The more than 30 questions of the self-assessment check help to work out precisely the company's status quo and wishes. A basis for implementing processes is developed and accepted by all members of staff because employees from all corporate divisions, starting from the mechanic up to management, work together and evaluate problems and develop solutions themselves.

The demographic corporate development can even be measured. This is why Volker Brand, manager of Oerlikon Textile Components, says that his company will only be offering healthy canteen food in its three-shift operation from now on. "You should not just concentrate on the controllers", he advised at a project event with the German Health Minister Daniel Bahr. In the course of a common health promotion, the employees, for example, commit to each other to quit smoking. "I also quit smoking", he expressed with relief.

www.demografiefit.de

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»We need models that do not take a pessimistic view on the future, but that formulate worthwhile goals.

I want human society to re-approach the future in a more optimistic way. The individual should be stimulated in his imagination and encouraged to make even the smallest changes. This is the original concept of the future.«

Hans-Peter Dürr (*1929 - † 2014), German physicist, 1987 Alternative Noble Prize

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One CAN Be Too Careful

Karlheinz Steinmüller is a physicist, philosopher, futurist, science-fiction author, and cofounder of Z_punkt The Foresight Company, a strategy and foresight consultancy. Together with his wife Angela, he has written novels about the surveillance state and was also a member of the Academy of Sciences in the German Democratic Republic (East Germany). In his opinion, books and studies that predict the future in 100 years time should not be trusted. However, utopian novels can be able to change the present. Ralf Bindel talked to the author.

Translated from the German by Luzie Lotta Schmitt and Larissa Katja Burkart

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Dr Steinmüller, you lived in the former German Democratic Republic and were a renowned author and scientist there, and today you are still in reunited Germany. The German Democratic Republic was a tangible utopia. It was a vision of an anti-fascist, anti-racist, communist, socially equitable society that was achieved with barbed wire, a ruling elite and constant surveillance. It failed. Was it an experiment worth trying?

As a big social experiment, the German Democratic Republic was certainly not successful for the greatest part of the population. It failed because it was not built on the right basis and because it was led by people whose main interest was maintaining their power. But the experiment proved one point: how quickly utopian visions can turn into anti-utopian reality. Again, we receive the message that one who believes too strongly in utopian concepts and is far too convinced of their own model of society, while neglecting humanity, is the one who ends up with totalitarianism. The road to hell is paved with ideals; if that was not clear before, Stalin proved it once again.

What do you personally think of utopias?

I think it is unfortunate that they have acquired such a bad reputation. Today, only very basic and homespun utopias exist. The really big visions and the strong utopian impetus got lost. A hundred years ago, we would fight for social utopia and the liberation of labour. Today, we just squabble over working hours and pension schemes. The only thing that comes close to the traditional utopian vision is the concept of sustainability. But it has lost almost all its excitement because it has become a political slogan for everyone to repeat. The big, comprehensive, and also controversial, vision of a sustainable society is missing. A new energy system does not automatically create a better society. We lack palpable emotions behind visions in our current society. Of course we have to realize that this disadvantage has been acquired over time and that in a time of such an immense amount of information, it cannot be overcome.

Today, we have to look at things on a smaller scale to find solutions. It is not about a different society anymore that needs different people. We also know that too much utopian thinking won't work and will eventually end up in totalitarianism. In the present day, we live on much more detailed and scaled down ideals.

Do you have a different opinion on utopias now?

Yes, probably. In 1982, right at the beginning of our writing careers, my wife Angela and I published the book Andymon. A Space Utopia. The novel speaks of a very dynamic utopia. It presents a sketch of a society that is not static but developing itself. It evolves around young people, individuals that have to create their own world. Clearly, it was a very emancipatory approach, as well as a hidden criticism of East Germany, where the government decided what the 'bright' future should look like. That was and continues to be our basis. We cannot work with static concepts. Instead we need to slowly feel our way towards building a new society. How-

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ever, we do have difficulties in agreeing on the actual goals. When I visit workshops about future developments or conferences today, I notice that people have very different goals when it comes to mobility and resources.

Where do you think these differences come from?

They stem from all the different biographies, origins, and social diversity of people. This leads to diversity in goals and visions, rapidly spread by the new media. We have an overload of different opinions in a fragmented society with an endless number of individual interests. Anyone can find people on the Internet to support their opinions, however strange they may be. This is damaging to the basis of common values and goals.

Can literary visions change this kind of society?

Utopian books did indeed produce discourses that went on to change the world. George Orwell's 1984 was a strong force behind the debate about the surveillance state, freedom of infor-

mation, and privacy. A main function of books in this sense is to serve as a warning. Without Aldous Huxley's Brave New World, we would not be having the heated debate we are having about genetic manipulation. Literature creates very strong images that enable a very broad audience to engage in discussions about new challenges early on. Exaggerated visions also have their advantages, regardless of whether or not they materialize. They allow for discussions about problems such as data protection, cloning and so on. Scientific knowledge and technological opportunities are not easily accessible to the layman, that is, most people. Science Fiction, however, enables the layman to get a better idea of such things and discuss them. Moreover, it motivates people to take a stand on such important matters. A colleague from Technology Assessment wants to establish a public 'vision assessment' that allows people to question and assess visions like these.

Do we currently have to fear the future?

Not more so than in other time periods. We do not live in apocalyptic circumstances. It is true that we are facing immense challenges but we also have better options for tackling them. In the days of the Cold War, the ultimate catastrophe was much more realistic. Even climate change is harmless compared to a nuclear war and it may even be easier to overcome than dictatorships. The Second World War was clearly more catastrophic than climate change. But there is never a time in which people do not believe that the world is about to end, because every generation considers themselves to be exceptional.

Why do you think that is?

It comes from the desire to hope for something better, combined with the fascination of fear and terror.

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*So it does not make sense
to fear the future?*

It does make sense to cause fear when it causes actions in turn. Concerning the precautionary principle, fear can even have a cognitive function. It directs the society's attention to previously underestimated problems. For the psychological wellness of the individual, however, fear narrows one's view of things. It is therefore not wise for the individual to give in to fear.

Technology changes the present, but does is also improve the future?

'Technology' and 'future' are words that are too big and generalizing and do not leave room for differentiation. We have to look at concrete issues and consider explicit fields, such as mobility and nutrition, with much attention to detail. Some fields of technology show very rapid development, for example digital technologies. This forces us to continually adapt to the new elements. Other fields develop very slowly, for example research into transmutation. It examines how radioactive isotopes can be transformed into stable elements, which might ease our nuclear waste problem.

The future will still be a future with nuclear issues then?

No, the nuclear waste was only an example for the way of thinking. I am disturbed by the general attitude towards this problem: bury it, sink it, put it in a final resting place, but just get it out of sight. In all other fields we have realized how effective recycling can be, but we ignore this when it comes to nuclear waste. Consequently, there has not been much research conducted in this area and much less than on the issue of finding a final resting place. I would like to see science and technology expand in this area but it is possible that it would not amount to anything; after all, I am no expert on this.

Are there limits to digitalization and miniaturization?

Everything reaches a limit at some point. With digitalization it is just very hard to say. The performance of information and communication technologies has been increasing for the past 200 years, since we invented the electrical telegraph. It is therefore very unlikely that this will stop any time soon. The time is approaching when one individual elementary particle will be able to hold one bit of information, although that is probably still at least a couple of decades away.

The fact that renewable energies and digitalization are competing for resources could change the game though.

There is no doubt that particular resources are becoming scarce, but at the same time we are finding ever new resources or we are returning to old deposits, which were long thought to be finished with. These shortages are pushing research. When the prices are high, the pressure to find a substitute increases. Still, not everything can be substituted. Neodymium, for instance, can be substituted with other materials to create super magnets, but there is no way of bringing back a lost animal or plant species.

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Is there no limit to growth?

It is always hard to determine limits. The entire world is talking about peak oil, but at the same time new fossil energy resources are being found. Tar sands and oil shale have extended the limits, but at high ecological costs, and the CO_2 capture and disposal that is necessary for climate protection would use up a considerable amount of the generated energy.

What can be said about books that describe our world in 20, 50 or 100 years?

That depends on the book in question. Many of those books bore me,

simply because they declare the same old predictions all over again. The more I read those predictions, the more I doubt them. You can also identify different schools of thought. Take Michio Kaku's book 'Physics of the Future' for example. It barely talks about physics of the future, but includes technological predictions instead. These predictions are clearly based on narrow determinism and exclude the fact that societies are able to guide the development of technology towards or away from certain directions.

I find it amusing when authors write in their introduction that it is impossible to predict the future, only to then express their concern about future climate change, demographic development, and to unleash their horror scenarios. Predictions are always bound to certain conditions, the most important condition being human action. You also have to remind yourself that every technology has its own time frame. Concerning some technology fields we do not know what they will look like in five years. Others, such as demographic development, are very easy to foresee. We

can be fairly certain of the size and age structure of the population in the year 2050. Unexpected events – wild cards like a pandemic for example – can of course occur and upset the whole system. It is always worth it to take a closer look.

Do we need more courage to take societal decisions or should we be more cautious in the sense of looking ahead at what's to come?

The precautionary principle does have its merits: one who acts should think about the direct and indirect consequences, effects and side effects to avoid unwanted repercussions. I get the impression that sometimes the principle is interpreted in the sense that not doing anything at all is the best solution. This is a distorted image though: if you are too cautious and see risks and dangers everywhere, you don't really act at all. The important thing is to identify when it is in order to be particularly cautious and when being overly cautious leads to stagnation. Where can we take risks and where would that be fatal? At times this is hard to say, especially because our

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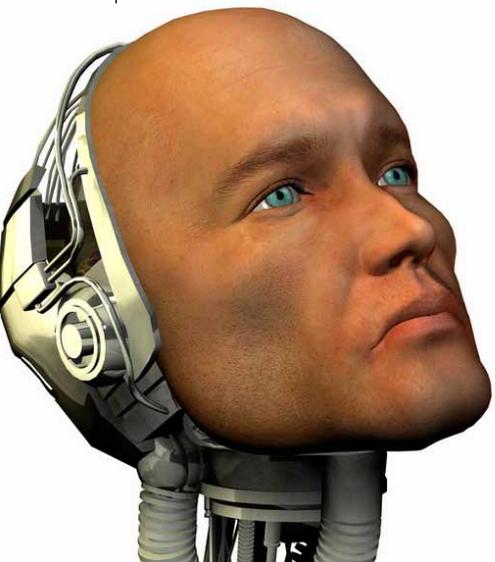
perception of risks often does not correspond to the actual risk itself. Asbestos for example: the removal of asbestos in schools was clearly necessary, but in some cases the students were temporarily relocated to other schools and had a longer way to school. They were therefore exposed to traffic risks that were, statistically speaking, much more dangerous than being exposed to asbestos. We tend to accept certain risks we are more familiar with and to categorically reject unknown risks. The most dangerous part of travelling by plane is the way to the airport, just as well as driving a car is more dangerous than particulate matter.

So is it better to just do nothing? Given the economic crisis, or more specifically, the crisis of the economy, and its dramatic consequences, for many people the risk of doing nothing seems to be much higher.

This crisis can almost be compared to the failed communism in the east. The extreme risk of a collapse of the world economy should be prevented at any cost. But no one really fully described the scenario or did the numbers on it. True, there is a wide selection of horror literature on the crises of the euro, the financial sector, government debt, the economy, and so forth, but it does not really become clear what all of this means. Most of all, there are basically no reflections on the reaction of society. For example, in regions hit by the crisis, we can see that regional currencies are being established, which is basically a bottom-up renewal of the economy. So maybe a collapse of the banking system would enable the development of a new economic system. This just shows that fear blinds us. We do not think beyond the imminent consequences of such a collapse and therefore don't realize what kind of alternatives there are.

More on futurology and literature from Angela and Karlheinz Steinmüller on www.steinmuller.de

Books by Angela and Karlheinz Steinmüller:

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Darwins Welt. Aus dem Leben eines unfreiwilligen Revolutionärs. (Biographie). München 2008: oekom Verlag

Die Zukunft der Technologien. Hamburg 2006: Murmann Verlag

Wild Cards. Wenn das Unwahrscheinliche eintritt. Hamburg 2004: Murmann Verlag

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Although the word 'factory' is mostly associated with the manufacturing industry and industrial production, it can also refer to 'factor Y', the factor by which energy consumption needs to change so that future generations will find themselves living in similar conditions. Such an understanding of sustainability implies that all aspects of economic activity need to be addressed with sustainability in mind, including consumer practices as well as the manufacturing and services sectors.

factorʸ highlights the role of businesses in sustainable development and aims to draw the drivers of the economy into the public debate. Such development entails resource efficient economic practices for both producers and consumers as well as educating and informing them about sustainability issues.

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Editor:
Responsible for contents in accordance with §10 paragraph 3 MDStV:
Ralf Bindel
Am Varenholt 123
44797 Bochum
phone: 0234-9799513
rb@factory-magazin.de

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