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Management in Singularity

From linear to exponential management

With a foreword by Rowan Gibson, Global Innovation Leader: 'It is a very impressive and valuable work.'

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Foreword by Rowan Gibson

This book on Singularity is extremely well researched and written. Kudos!

There's a part in Chapter 3 'Reset Your Mental Model' that caught my attention. It reminded me of my first book *Rethinking the Future* from 1996. Here's an excerpt:

For a long time we have known deep down that the future will be different from the past. Every science fiction writer, from Jules Verne to William Gibson, has reminded us of that. But what we have stubbornly refused to believe is that the future will be different than we expect it to be. Most of us still behave as if the future will be a linear extrapolation of the present, like a long straight road that stretches into the horizon. This erroneous attitude towards the future is rooted in our culturally ingrained notions of predictability and control.

In their book *The Great Reckoning*, James Dale Davidson and William Rees–Mogg talk about 'false conclusions programmed into our lives like a computer virus'. They argue that our world view has been shaped for centuries by a Newtonian perception of reality, in which change appears to be linear, continuous and, to some extent, predictable. Where A leads to B leads to C leads to D. Chaos theory tells us that the opposite is true. As Michael Crichton writes in Jurassic Park: 'Chaos theory teaches us that straight linearity, which we have come to take for granted in everything from physics to fiction, simply does not exist. Linearity is an artificial way of viewing the world. Real life isn't a series of interconnected events occurring one after another like beads strung on a necklace. Life is actually a series of encounters in which one event may change those that follow in a wholly unpredictable, even devastating way.'

As our world becomes more complex and interdependent, change becomes increasingly non–linear, discontinuous and unpredictable. Therefore the future becomes less like the past. And less like we expected it to be. We find that A might lead to E, then on to K and suddenly to Z! This realization calls for an entirely new way of looking at the future in our corporations,

in our societies and in our personal lives. We have to make an intellectual leap from the linear to the nonlinear.

Rethinking the Future is about replacing the old mindset, the idea that we could to some extent control, order and predict the future, with a new mindset based on discontinuous change. It is about accepting aberration as the norm.

The fact is that the future will not be a continuation of the past. It will be a series of discontinuities. And only by accepting these discontinuities and doing something about them will we stand any chance of success and survival in the twenty-first century. The exciting thing about discontinuity is that it breeds opportunity. It means that nobody owns the twenty-first century. But in order to grab hold of the future we have to let go of the past. We have to challenge and, in many cases, unlearn the old models, the old paradigms, the old rules, the old strategies, the old assumptions, the old success recipes.

Actually, I think the most outstanding line in the entire book was this one:

'Linear thinking is useless in a non-linear world.'

Anyway, the authors have produced a very impressive and valuable work.

Rowan Gibson
World known innovation leader and author of many bestselling books on innovation, like 'The four lenses of Innovation: A power tool for creative thinking' (Wiley, 2015)

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We do know now that there is a lot more we do not know than we do know

Soon we will enter a stage wherein we all will be intensively 'guided' by visible and invisible robots. E.g., the self-driving car is already taking over the steering wheel. In manufacturing, robots take over dangerous and labor-intensive jobs. In healthcare robots become smart assistants, e.g., help dressing patients, distribute pills, perform standards tests, and clean up beds and rooms. In logistics, drones will take care of the delivery of packages. As singularity may become near, the question is: How do you as a manager anticipate this? Hiding or burying your head in the sand is no longer an option. Therefore, let us try to build up some contours of a future wherein Singularity develops.

Science is the discovery of the unknown. Despite our state of the art high-tech measurement systems, we know the actual energy density in the universe must deviate some 10^{118} from what our current measurement systems tell us (CERN, 2015). Our current knowledge about all the mass surrounding us is likely a low 5% of what there is to know; the proverbial 'Known Unknown'. Some people do not like to open this window of their mind; they prefer to continue life in a state of blessed ignorance. However, many scientists, researchers and practitioners are undauntedly trying to take away the cover from the enormous area of 'known unknowns', the vast white spots in our knowledge base. Big Data environments and supercomputers programmed with smart algorithms and artificial intelligence (AI) are committed to explore and exploit that vast unknown field. The development of the 'Internet of Things' may be a big help here. Machines, robots, satellites, drones, people, ani-

mals, many things, are all connected by using embedded software and digital sensors. This makes real-time processing and real-time exchange of data possible: 24 hours a day, 7 days a

We enter a stage where we as humans do no longer understand how robots really operate. That stage is called 'singularity' or 'transcendence'.

week and 365 days a year. Whether in business or at home, smart tablets and phones are used as platforms to receive those data and pave the way for real-time decision making and its successive actions. The use of AI to program robots will make the robots 'self-learning and self-adjusting'. Ultimately this will lead to a stage where a robot writes its own next improved program. Along this way, we may enter a stage where we as humans do no longer understand how robots really operate. That stage is called 'singularity' or 'transcendence'. Some researchers claim we will already enter that stage around 2030–2035, some 15–20 years to go![2]

But what will happen on the way to Singularity. What will be the consequences for our personal life, management, and business?

2   See e.g. Kurzweil (2013), Brynjolfsson & McAfee (2014) and Hawking et al. (2014).

But what will happen along the way, and what will be the consequences for our personal life, management, and business? Let us try to create some perspectives for the near future.
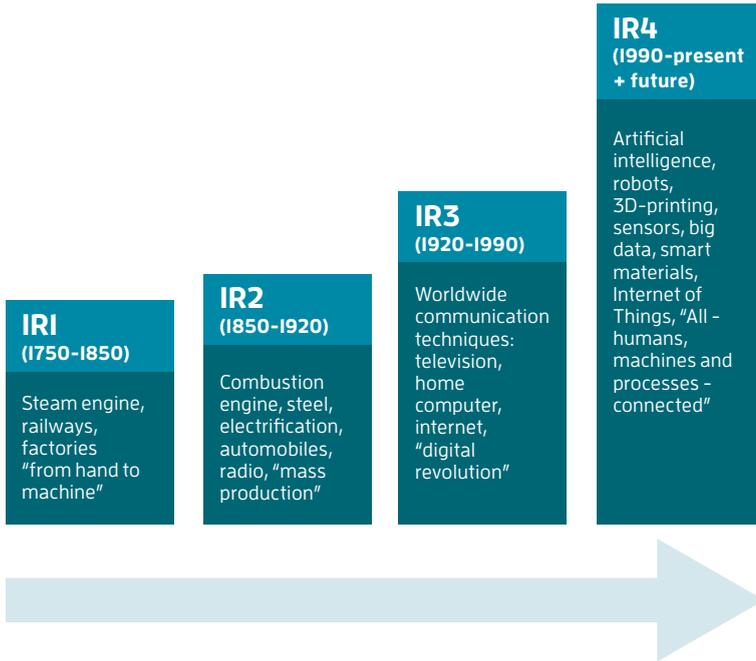

Figure 1.1 Quick overview of past and current industrial revolutions

We have lived through three Industrial Revolutions. Concisely, the first revolution was about the steam machine, the second about the combustion engine and electricity, and the third configured a digital world around us. With the 'Internet of Things' and 'Artificial Intelligence' we have now entered the fourth Industrial Revolution. And, this fourth revolution is all about digital connections using embedded software, sensors, Bluetooth®, Wi–Fi, etc. and about *self–programming* machines, vehicles and robots. It is our premise that we have only taken the first small steps into that new fourth revolution.

At the end of each chapter we have added a couple of questions under the title 'Management considerations'. To reflect on the chapter, but especially as a guidance to initiate a discus–

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sion within your own organization or management team. You will probably not be able to provide a straight answer to several of these questions, but hopefully they will make you start thinking and they will help you building further awareness. We firmly believe that 'awareness' is the first and crucial step to take.

Management discussion

- As management, do you have a common perspective on Singularity?

- Is your organization relatively seen more or less sensitive for singular developments? Why?

- Would you as management like to know more about the business (e.g. on the purchase behavior of current customers, non-customers, customers-of-the-customers, suppliers and (potential) competitors)? How could this 'information need' be resolved within the 4th Industrial Revolution along the way to Singularity?
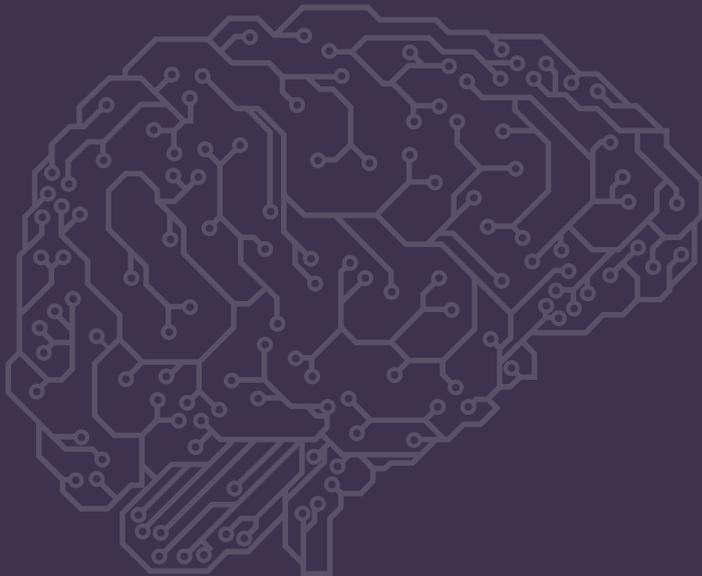
2

Singularity is much closer than you may think
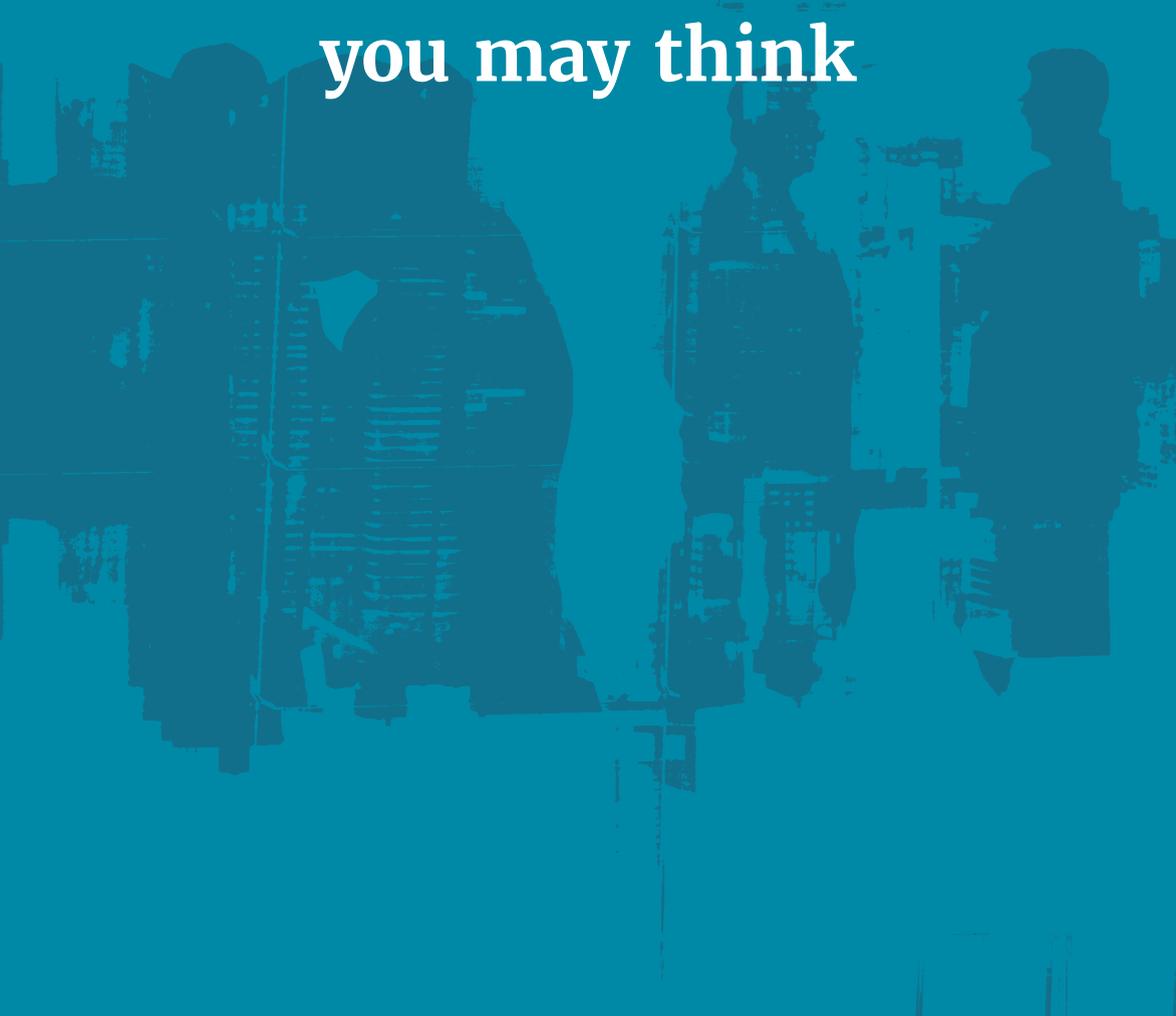
To actually arrive at Singularity during this century, a serious exponential growth in the speed of scientific progress is required. However, we are living in a period in which such acceleration can be witnessed objectively. Just take a look around you; all sciences, be it healthcare, physics, materials, chemistry, electronics, or biology, currently undergo substantial and fundamental changes. These developments seem to progress faster and faster. This is not only a perception: it is the new reality we live in!

It is questionable when the Fourth Industrial Revolution actually started; but somewhere, somehow an early signal of this timeframe can be traced back into the 1960s–1970s. Figure 2.1 depicts where we currently are on our way to Singularity.

The Fourth Industrial Revolution can be more or less divided into two halves: the period until 2015 (1st half) and the period thereafter (2nd half). The fundamental observation is that the speed of technological developments and changes increases over time. The growth in the second half is *exponential* while growth in the first halve was more or less linear. It does not only look like things are changing faster and faster, they really do!

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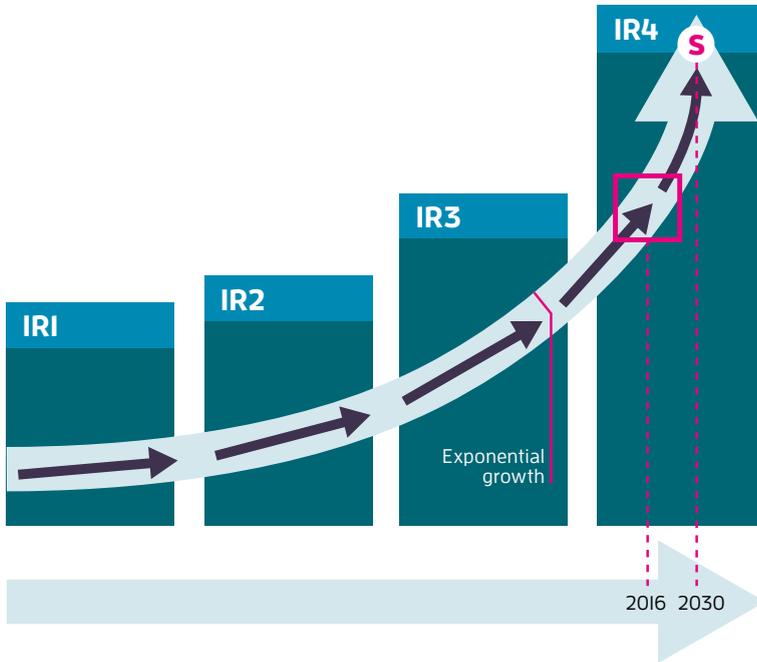
Figure 2.1 The way to Singularity

This is called 'The phenomenon of the second half'. For in–stance, it takes 48 minutes (first and second half together) to fill a soccer stadium up to the roof with an exponential row of water droplets. But it takes 42 minutes to fill the first half and only six minutes to fill the second half of the stadium.

That really is the effect of exponential growth, also called asymptotic growth (1, 2, 4, 8, 16, 32, 64, 128, 256, etc.) with a huge impact in the end.[3] Although the growth rate is already

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3   Often Moore's Law for the semi-conductor industry is referred to as both an important
    driver and a key-indicator for the exponential growth within IT-technology. Sceptics point
    out that there is a 'natural ending' to Moore's Law due to hard physical limits (and as a
    consequence to this, also an ending to the exponential growth in technological develop-
    ments). However, already we see within the semi-conductor industry the development of
    several promising new technologies (often referred to under the collective name: 'More
    than Moore'). For some of these recent developments, see for example Tae-Woo Lee
    (2015) or Bashkar (2016) or for developments within quantum computing O'Brien (2016).

increasing, we have perceived a quite stable development during the first half, and we are able to predict the future relatively easy. We can use plans and budgets, Key Performance Indicators (KPIs), benchmarking, quarterly reporting, etc. And, one person in the organization (often the owner or CEO) may give orders that must be followed up. Being 'in control' in this first half is typically a matter of 'keeping things on track'. However, in the second half things are changing so fast that plans and budgets may become impaired soon after they have been developed. Organizations simply cannot predict and create the future on their own as easily as they may have done in the past. They are part of an ecosystem (suppliers, customers, universities, research institutes, etc.) where they or other members might disappear overnight because of disruptive actions from others.

The concept of 'In Control' in the second half has quite a different meaning than in the first half. In the second half a learning, collaborative and agile (flexible) organization with high levels of trust needs to exist just to keep up pace with the volatile and accelerating external developments. In the second half innovation is an absolute must, not just something to be considered or nice to have. In the second half organizations need to be connected. Being part of an ecosystem as the future is too complex, volatile and expensive to enter alone. Product life cycles will be shorter and predictability must bear much more tolerance. In this second half management standards and routines that were used in the first half (e.g., standard cost price, standard quantities, budgets, and normal capacity usage) tell a wrong story. Deviations between actuals and planning will tell us more about the things we do not know, than about the things we do know.

In all sciences, we currently witness an accelerated growth path whether it is medicine, physics, biology, chemistry, electronics.

In all sciences, we currently witness an accelerated growth path whether it is medicine, physics, biology, chemistry, electronics.[4] These developments drive and are self-reinforced by new applications like 3D and 4D printing, nanotechnology, fiber-reinforced materials, lab-on-a-chip, Big Data and many more. Quite some acceleration stems from smart combinations of these applications, e.g., healthcare merging with nanotechnology that leads to intelligent and personalized pills.[5] Or new materials that are made out of a composite of steel, aluminum and fibers making it much stronger and lighter than steel.

It is clear that the past is no longer a good predictor of the future (if it ever was), all the while the future is arriving faster and faster.

It is clear that the past is no longer a good predictor of the future (if it ever was), all the while the future is arriving faster and faster (so it seems).[6] For some of us the above developments may sound challenging and interesting to explore. Some however may find it scary and intimidating as nobody knows where this all might end. Management has to deal with both views.

However, one thing is for sure: Ignoring the developments and acceleration is a very risky choice. The good thing is that Singularity is more than just a technical masterpiece. It is a community, and a social process as well. Like the 'Club of Rome' in the seventies, its members tended to create a better and sustainable world. To provide the growing number of people on earth with healthy food, good healthcare, proper education

4   See for example Brynjolffsson & McAfee (2014) and Shanahan (2015).

5   See for example 'How will Nanotechnology change the World' on YouTube.

6   For the drivers behind this exponential growth, see for example Dobbs et al. (2015).

and a sustainable planet, traditional views and solutions will not work. It is necessary to explore 'outside of the box' and invent creative ways forward. Singularity can be part of that smart future.[7]

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7   The recent gesture Mark Zuckerberg, founder of Facebook, made to earmark $45bn of his
     wealth ($46 bn) to charity fits perfectly in this kind of responsible global citizenship.

Management discussion

- What is the most important difference between linear and exponential thinking? For you, what does this difference has to do with Singularity?

- How would you describe being 'in control' in a time of linear growth? And how does 'in control' look like in a time of exponential growth? Could you describe three important differences?

- Is there according to you, a relationship between exponential growth, Singularity and preserving our planet?
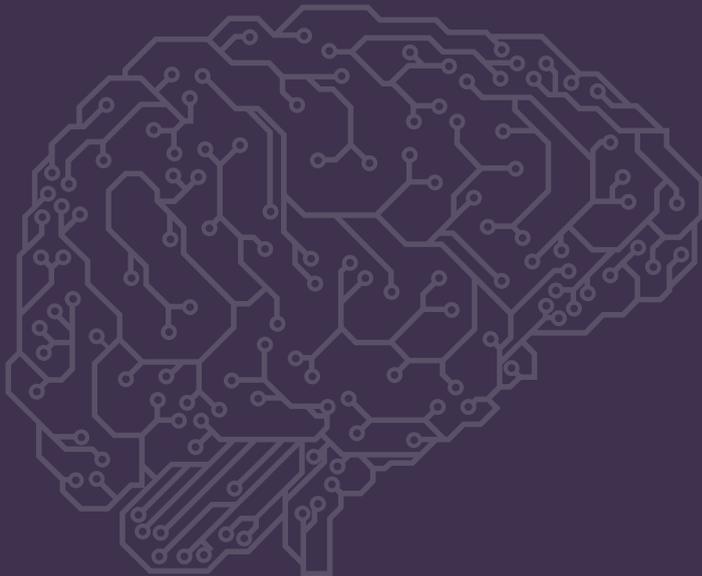
Are you ready for unprecedented acceleration in scientific and technological developments? Innovations and scientific breakthroughs are tripping over each other. Only perception? No, it's a fact. Drivers of this acceleration can be found in the availability of super computers in new technologies like nanotechnology, 3- and 4D-printing, bionics and artificial intelligence.

In order to prepare ourselves, we need to change the way we think: linear thinking is to be replaced by exponential thinking. The best answer to the question 'what's your plan?' is perhaps 'there is no plan, only adaptability to developing circumstances'.

The next software update will not require humans anymore. This point is called Singularity or Transcendence and is foreseen in 2035. Witnessing the current acceleration in technologic developments we are clearly on our way. One thing is for sure: singularity is nearer than you might think.

This book provides insight in important trends & developments and gives a guide to the first crucial steps you and your organization can take in order to be prepared for what has been called 'The New Normal'.
Included is a real-life case on 'Maxion Wheels' accelerated innovation journey'.

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