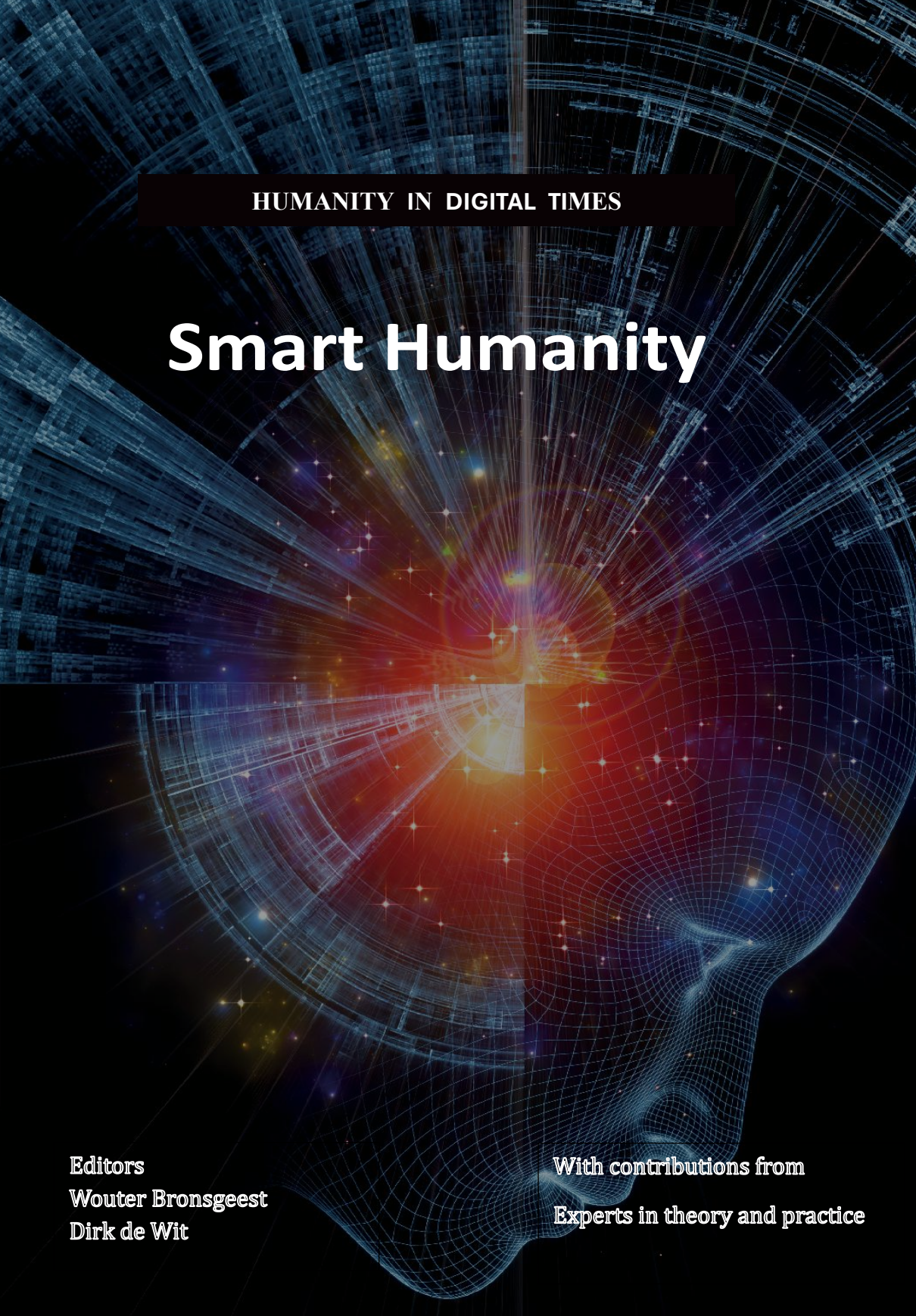
HUMANITY IN DIGITAL TIMES
Smart Humanity
Editors
Wouter Bronsgeest
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With contributions from
Experts in theory and practice

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Foreword

Dirk de Wit & Wouter Bronsgeest

At a time when technology is no longer just a tool but is fundamentally changing society, this new collection from *Smart Humanity* comes at just the right moment. Digitalisation is omnipresent: it accelerates, disrupts and innovates – in sectors, organisations, professions and in people's daily lives. What was once a promise of progress is now a permanent dynamic in which humanity is sometimes under pressure. *Smart Humanity* does not seek simple answers but openly explores the questions that matter.

This collection is the sequel to the 2020 edition and once again asks how information technology can contribute to a smart, inclusive and humane society. This time with an even sharper focus on the position of the information professional in a world where systems often change faster than people can keep up. The field itself is under pressure: not only from technological innovation, but also from the ethical, social and societal implications of digitisation.

We live in a time of increasing complexity and geopolitical uncertainty, in which fundamental values such as transparency, justice and access to information are regaining significance. Information professionals operate at the heart of these developments. Their role is no longer purely technical or executive – they must build bridges between people and machines, between policy and practice, between data and interpretation. This makes them not only professionals, but also givers of meaning.

This collection has been compiled from the KNVI network, seeking a broad and nuanced range of perspectives. The contributions have been written by people with roots in science, policy and practice – some deeply specialised, others refreshingly contrarian. The editors have given space to the authors' individuality in order to do justice to the diversity of insights that this moment in time demands. Not every

domain is represented; not every question has been answered. But what this collection offers is a starting point for reflection and discussion.

In previous books, we wrote about the information professional 3.0; in this collection, we explore society 4.0. And yes, you could call this *Smart Humanity 2.0*. But real development cannot be captured in version numbers. Just as the Mayan culture knew the *nik* – the zero that brings together the beginning and the end – this collection is also more of a cycle than a conclusion. Documents are finite, insights rarely are. And just as every answer carries a new question within it, this book is not a final product, but a living document in an ongoing conversation. *Smart Humanity* is an invitation: to continue to think critically, to continue to act ethically and to continue to build together a society in which technology serves people – and not the other way around.

1

Where do we stand?

Introduction to Part 1

In an era in which technology is accelerating and fundamentally changing the way we work, information professionals find themselves at the heart of this transition. The profession faces a dual challenge: on the one hand, the substantive development of the field and, on the other, a growing awareness of the social impact of their work. This part of Smart Humanity outlines the key trends and developments that are shaping the information professional of tomorrow.

In *Digital transformation and the role of the information professional*, we explore how digitisation not only makes processes more efficient but also changes the core of the profession. The traditional role of information management is giving way to a more strategic function in which data-driven decision-making and ethics play an increasingly important role.

The rise of artificial intelligence and automation raises fundamental questions about the position of the information professional. *AI and the future of knowledge work* discusses how AI can take over tasks, but also how information professionals can use this technology to make their work more effective and relevant. It is not just about the technology itself, but above all about how it is applied in organisations and society.

In addition, there is a growing need for integrated information provision. *From Data Management to Data Governance* highlights how the role of the information professional is changing from administrator to director of information flows. This requires not only new technical skills, but also a broader vision of governance and ethics.

Another essential theme is the social responsibility of the information professional. *Digital Ethics and the Human Dimension* addresses the question of how professionals can contribute to transparency, reliability, and inclusiveness in the information

society. Information is power, and the way it is managed and shared helps determine how fair and accessible our digital world is.

In addition, *Towards Society 4.0* offers a broader perspective on the structural changes brought about by digitisation. The article outlines how we are moving towards a society in which technology, sustainability and inclusiveness go hand in hand. The role of the information professional is becoming not only more technological, but also more socially embedded: how do we ensure that digitisation contributes to a fair and accessible information society?

The stories in this section provide a framework for understanding where we are and where we are heading. They make it clear that today's information professional is no longer the same as yesterday's. The future requires a combination of technological skills, ethical awareness and a strategic vision of information provision.

Welcome to a world in which *Smart Humanity* is not just an ambition, but a necessary direction for the future of the profession.

Smart Humanity – how the profession is changing

Wouter Bronsgeest

In 2020, the term *Smart Humanity* was introduced by the Royal Dutch Association of Information Professionals (KNVI) as an overarching theme. The aim: to give direction to the efforts of the many professionals who together form the professional group involved in information management, information provision and information technology (Bronsgeest & De Waart, 2020). The professional group recognises two trends within this: one relating to the substantive development of the field and one relating to further and accelerated awareness. Professionals are increasingly aware of both their contribution to their own field and their responsibility to their environment and to society. In the interaction between these two areas of focus, the central question always arises: are we getting the best out of ourselves and our products, services and inventions for the benefit of humanity?

Back to 2020

After three years of exploration within the association and with the professional group, the first book publication in 2020 uses the term *Smart Humanity* to explain five underlying themes:

- *Smart Professional*, about lifelong development. The question of how to do this within a changing society while maintaining your own balance as a human being (Hoff, 2014; Dijksterhuis, 2016; Swaab, 2016; Kodden, 2018; Op de Coul, 2018; Kodden, 2020).
- *Smart Designers & Users*, about the contribution of information professionals in creating facilities, in a chain from legislation to implementation. In an approach in which new technology is created with technology, with new architectures and

new multidisciplinary working methods and changing concepts of organisational design (Hinssen, 2014; Visser, 2016).

- *Smart Citizen*, about the changing role of citizens. Are they sufficiently involved in the choices made for them? Common Ground, participation, transparency, access to information. And thus, also bridging the 'digital divide' and inclusivity (Van Dijk, 2017; Kranendonk et al., 2019; Rathenau, 2020; VNG, 2020).
- *Smart Data,* about whether data is transparent, how that data is converted into usable information and by (and for) whom? And are we sufficiently protected in this regard, and by whom? And is this at the expense of or to the benefit of society (Gleick, 2011; Pentland, 2014; Brockman, 2016; Mayer-Schönberger & Cukier, 2016)?
- Finally, *Smart Ethics* is the common thread that connects all the underlying themes. With these changes in the world and our world view, our ethical standards are also changing (Geertz, 2000). About standards, established knowledge, frameworks, rules and laws and, above all, what do you do as a professional? Providing information is like using a hammer. What you do with it or what you can do with it, that is what the conversation should be about.

2025 and beyond

As early as 2020, the aim was to 'accelerate our efforts to participate even more intensively in the social debate – and scientific discourse – on fundamental changes in society' (Bronsgeest & De Waart, 2020). Looking back on the last five years, this prediction will be familiar to many. To give *Smart Humanity* even more meaning, there are several themes to explore in greater depth. It is important not only to look at professional content or the developments that professionals themselves are undergoing, but also to use several examples of the application of that professional content within various sectors of society. This allows us to see both the application of the field and the advantages and sometimes disadvantages of the application of technology and information provision. And sometimes we recognise these issues or even ethical questions that arise in the field.

How the world is changing: the context of Smart Humanity

Several terms have recently been used in the literature to describe how the world around us is changing. These terms are not new, but they have taken on new meaning

to help *practitioners* and scientists to take a step further and to outline the background in which *Smart Humanity* is positioned. The Scientific Council for Government Policy (WRR) outlines the context of 'The Netherlands in a fragmenting world order', the title of the July 2024 report that calls for tough choices to be made to protect the Netherlands' core interests (WRR, 2024). The report paints a grim picture of the changes around us. Geopolitical influences are considered at least as important as the risks of digital (social) disruption, which the WRR already reported on in 2019 (WRR, 2019). Often, such disruptive scenarios feel far removed from us, or we don't really want to know about them – until we experience them first-hand or hear about them from others (Modderkolk, 2024).

Against this backdrop, new concepts have emerged that offer some guidance for the actions of government, citizens and businesses – and therefore also for information professionals. In its report *Society in Motion*, the Netherlands Institute for Social Research (SCP, 2023) refers to diversity and cohesion and describes the fluid society: 'society [is] fluid and in motion [...] identities [offer] less guidance nowadays and social positions and roles [are] less fixed'. Ad Verbrugge speaks of a fragile order in society and discusses the current crisis of authority in his philosophical essay (Verbrugge, 2023). Both publications also offer guidance on how to move forward. Options include being mindful of the fluid society, paying attention to 'multiple divisions' (rather than 'binary divisions'), recognising other points of view, clarifying and articulating (one's own) standards, renewing attention to local dimensions of governance, and investing in education.

The fluidity described by the SCP is also visible in large public and private organisations. Dick Ruimschotel interviewed various *practitioners* and scientists in a 'booklet on fluidity' (Ruimschotel, 2024). Fuelled by the possibilities of *artificial intelligence* (AI), the message is to use this technology and to prepare your organisation for the impact of this and other ' ' technologies, without knowing exactly when that impact will be noticeable and tangible. AI has been designated by the WRR as a new system technology, with an impact like the steam engine (WRR, 2021). In addition, the factor of time is a subject of research that is receiving more attention. In 'Time Mastery, a guide for change agents', several authors describe how the factor of time plays an important role in the correct timing of interventions in organisations (De Man & Segers et al., 2024). And you can play with that time.

Jo Caudron introduces the *jazzy* organisation: companies that have perfect control over their processes, where craftsmanship is key and which can deliver predictable results. But which are also internally agile, able to improvise, when necessary, have adaptive resilience and know a system of distributed trust (Caudron, 2023). Despite the almost dystopian outlook, organisations are also using more topical themes, such as greater attention to relationships, connection and... love (Coolen, 2023). An example of this is the annual *Love for your PROFESSION week* organised by Directorate IV of the Tax and Customs Administration, where culture hacks, the use of theatre and the help of artists teach employees to look at their field, the organisation and the impact they have on society in a different way. In short: the world is changing, and new tools are emerging to help us deal with it.

The description of 'the information professional' is evolving

In less than ten years, the description of the information professional has changed and been redefined. The result is that colleagues sometimes no longer know which definition or basis the field is considered from – both within their own professions and by others outside them. In 2014, Prof. Dr. Rik Maes described the development from computeriser (1.0) to informatiser (2.0) to information professional (3.0) (Maes, 2014). A professional who can focus, organise and execute, who can connect business, information, communication and technology. And who stands for both the sensible use of information and its production and is also capable of creating value. Now, not everyone can train to become an expert in all these aspects, but it is important to at least understand the breadth of the 'information professional'. A mental transformation to see things differently – that is what is necessary to be able to carry out this task (Maes, 2017). This philosophy was also the basis for the 2017 merger of the professional organisations Ngi/NGN, KNVI and SOD, which subsequently formed the 'new' KNVI.

The new description appeals to both professionals with a more IT background and professionals with a traditionally more document-oriented background (information provision, archives or libraries). An information professional 3.0 is involved in collecting, managing, analysing, structuring and providing information. Digitally or physically, as efficiently and effectively as possible. From IT specialist, database manager, information and data analyst to system or archive administrator.

In the coming period, it will be important to continue to discover how this vibrant ecosystem of information professionals, managers and support staff for information professionals is developing, with the ambition of having a lasting positive impact on society now and in the future. This will require taking risks, because the significance of guiding institutions such as politics, religious movements or the basis of one's own local community is diminishing. These are being replaced by developments in which more and more information is accessible, in which technology can help humanity make great strides forward, in which we have techniques at our disposal to perform rapid analyses, in which mountains of existing and new (*real-time*) data can be organised, and in which news travels from one place in the world to another in a flash. Real news and fake news. The information professional 3.0 plays an important role in this.

- The field and, with it, the content of the information professional's profession continues to change. The information professional will always participate in the social debate – and the scientific discourse – on fundamental changes in society.
- The world is changing and extremes are becoming visible. New tools are emerging to deal with this, which are being developed in part by information professionals and can be used by them.
- The information professional 3.0 plays an important role in contributing to a sustainable positive impact on society now and in the future.

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When technology falls into the wrong hands

Dirk de Wit

'Man is a rational animal — so at least I have been told. Throughout a long life I have searched diligently for evidence in favour of this statement. So far, I have not had the good fortune to come across it.'

Bertrand Russell - (from Steven Pinker, *Rationality*)

I recently watched the latest James Bond film, *No Time To Die*, on one of the many streaming services. It is a classic Bond film with chase scenes, a traumatised villain and a 007 who is committed to saving the world. Part of the plan to destroy the world was the spread of a substance that would infect people through the skin via nanobots, thereby bringing about a significant reduction in the population. This is not an unfamiliar theme in these times. The fictional world of film is always a reflection of what is happening or about to happen in society.

Humans have a special relationship with technology. The belief in progress leads us to have enormous confidence in the solutions that technological advances offer us. At the same time, technological progress is often the nemesis that we must combat with further technological progress. What is new in recent years is that technology has become strongly linked to entrepreneurship, and entrepreneurship to the emergence of autocracy in which tech entrepreneurs and politicians have found common ground.

Is technological development autonomous?

Many philosophers and technology scientists have already demonstrated that technology is not autonomous. I was once trained in the social constructivist thinking of Wiebe Bijker. This thinking has similarities with the theories and 's views of Bruno Latour. Scientists, researchers, inventors and organisations work on technological

developments in all kinds of visible and partly invisible networks. Technology is defined in use, and redefinition often leads to new uses. Discussions about the socially responsible application of technology are not a new theme, whether it concerns medical technology, DNA-related applications, nuclear energy, artificial intelligence or robotisation. There is no area where dialogue about the effect only arises once the application is in place, followed by calls for regulation.

Take robotics, for example. This technology is already being used in many areas. Much industrial production would be unthinkable without the use of robotics. We have come a long way since Henry Ford's production system. The application of robot technology in medical science, which enables specialists to perform their work with greater precision, is a well-known example. But consider also the technology of robot soldiers or autonomous weapon systems. These are being developed in various countries with the aim of increasing the security and effectiveness of the military. The war in Ukraine shows that traditional weapon systems are losing out to modern drone technology or, conversely, interventions in drone technology. The technology moves along a fine line between where human intervention is desirable and where a system is truly autonomous. This raises the question of whether international agreements still help to curb this technology: oops, thanks.

In many different domains, we see that once a technology exists, human creativity will lead to applications that help people (nuclear medicine) or threaten society (nuclear weapons arsenal). And that presence leads to use, and that exploration of possibilities leads to application. Consider the example of the Chinese doctor. The DNA editing that He Jiankui used to create immunity to the AIDS virus sparked a wave of outrage and ultimately led to his imprisonment. Consider, for example, the global research that should lead to protection against viruses that are yet to be developed. The progress we praise in one century is the technology we despise or encourage in the next. A car for everyone offered the path to free mobility. In a few years' time, we may have car shame in addition to flight shame. Or consider IVF: this procedure was controversial in the late 1970s and is now generally accepted by society.

In this volatile world, which is often so chaotic due to its interconnectedness, we cannot prevent technology from developing in all kinds of forms. In what some consider a dystopian world; the new nature is also a technological nature in which we accept

artificial meat as normal. Instead of methane-producing cows in the meadow, we obtain our meat from factories. Initiatives for cultured meat are everywhere. We also see this in medical technology. What is medically possible – recently an artificial heart – often leads to what is medically necessary.

Surveillance as an example

The application of technology that enables government institutions to carry out surveillance is a prime example of the slow shifting of boundaries. These may be mild forms of surveillance when compared to other forms that are imposed on the world. State-driven forms of surveillance, such as those becoming commonplace in China, where citizens can earn plus and minus points through a social credit system to prove that they are good citizens. Points for helping neighbours and sweeping the streets, penalty points for neighbour disputes or leaving rubbish on the street.

Many newspapers paint a picture of surveillance that goes beyond cameras on street corners, the use of AI, facial recognition and, for some groups, supplemented with biometric data. This is a form of surveillance that may fit in with China's tradition, but which makes us frown. For part of the population, however, it seems less of an issue: as long as it creates security and stability and has a limited impact on daily life, many Chinese people have little to worry about. But China is no exception. In her recent book *Autocracy Inc.*, Ann Applebaum explains in detail that the same technology that leads to surveillance in China is embraced in Western countries to guarantee security.

It is this other form of surveillance, which is gradually infiltrating our society like an invisible virus, that we should critically assess. Everything that is recorded can be used. The geolocation on your mobile phone provides the government with information about traffic flows and mobility, cameras on the road give an indication of our driving behaviour, and sewage water testing gives an indication of where drugs are being snorted or where new viruses are emerging. And when we are allowed to walk around on the streets, cameras monitor our presence in shops and on th . Our smartphones can be used to determine when we were where. And not so long ago, when we were forced to stay at home en masse, the app developed by the government (*CoronaCheck*) became a restriction of freedom rather than a passport to freedom. Surveillance grows in times of uncertainty.

To combat fraud, to increase our security, to fight terrorism and to suppress a pandemic, we are collecting more data, combining data and applying algorithms to data to gain new insights. And we are becoming increasingly entangled in the web, having to trust a government that itself no longer seems to have any insight into the algorithms that are being used. Surveillance by the government and *surveillance capitalism*, which undermines the government, are two sides of the same coin. They are changing the society we know almost imperceptibly.

The change is happening step by step

Because as society changes, so does technology, and as technology changes, so does society. In a continuous dance with sometimes far-reaching consequences. It is like the climate crisis, about which warnings have been issued for more than fifty years. I remember a conversation with friends on the lawn in front of our house where I announced that I would never buy a car because of air pollution. This was in the early 1970s. I did not keep that promise. As humanity, we often know where damage occurs individually and socially, but behaviour changes in small steps and certainly not collectively. We are collectively blind to the totality of individual behaviours. Of course, it makes no difference whatsoever whether I individually drive an electric car (if that even helps) or turn the heating down by two degrees. Collectively, we behave like lemmings. We know this but let Tata Steel produce more greenly first before we act ourselves.

We can also look at recent developments in the field of artificial intelligence. Less than fifteen years ago, people who graduated in artificial intelligence could hardly find a job in the field. The availability of ChatGPT to the general public is not the breakthrough of artificial intelligence, but it is the moment when many people came into direct contact with it. The sudden power of generative AI prompted a counter-reaction to pause for a moment. But the algorithmisation of co- al living has been going on for much longer and has previously led to economic crises or scandals that we are still struggling with. And now, in 2025, I recently saw an awareness campaign in the reception hall of a large government institution about the climate impact of our excessive data use.

Fear and uncertainty lead to strong reactions to the possibilities, and we certainly should not be blind to the dangers. But every technology that interferes with the

system causes enormous unrest. Whether it was the Luddites who opposed steam engines or the rise of socialism in response to industrialisation. We move between the doom scenarios that Yuval Harari sketches in *Nexus* and the more nuanced but also cautionary words of Ethan Mollick, who gives us four scenarios ranging from 'it won't be that bad' to a form of artificial intelligence that is incomparable to what we now know as human intelligence. And in each scenario, it is the actions of people, or rather their inaction, that reinforce a particular scenario.

Rationality as a lifeline?

Steven Pinker makes a passionate plea for rationality. He shows that the world of logical reasoning, critical thinking and cause-and-effect thinking has led humans to their greatest achievements. But there is a flip side that is equally true, where in the world of interests, beliefs and alternative truths, the sum total seems irrational. Perhaps that is also the effect of the apparent autonomy of technological development. As with all the crises we have had, modellers are discovering that behaviour may well be a determining factor. The *ceteris paribus* of economic models is also what drives technological development. But not the individual behaviour of a Dr Strangelove, although recent tech entrepreneurs would have us believe otherwise. In the collective of all kinds of individual behaviours and interests, technology takes on a form that appears autonomous to us. We are faced with this double-edged sword.

As Pinker puts it: *'Progress is shorthand for a set of pushbacks and victories wrung out of an unforgiving universe. And it is a phenomenon that needs to be explained [...] The explanation is rationality. When humans set themselves the goal of improving the welfare of their fellows (as opposed to other dubious pursuits and redemption) and they apply their ingenuity in institutions that pool it with others', they occasionally succeed.'* (Pinker, 2021).

Or perhaps we should cherish the hope that, with the co-intelligence that AI can offer us, we can help shape the new technological developments in the ecosystem in which we, as humans, also live in a sustainable way.

- Technology is not neutral: technological progress is the result of human actions and

interests. Its applications can be both positive (such as medical innovations) and destructive (such as autonomous weapons).

- Surveillance and privacy are sliding scales: technologies such as AI and biometrics are shifting the boundaries of surveillance, from state control in China to the unnoticed collection of data in Western countries. This raises questions about privacy and ethics. Boundaries are not fixed and are also 'negotiable';
- Human rationality as a lifeline: rationality can help to deploy technology in a responsible manner, but collective behaviour and interests make technological development difficult to control. Rationality is both a desire and an idée fixe.

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The Digital Revolution towards Society 4.0

Bob de Wit

Digital technologies are rapidly changing products, services, business models, organisations, industries and even society. This involves multiple technologies: Big Data, the Internet of Things, Virtual Reality, Industry Platforms, and above all: artificial intelligence (AI) and Quantum Computing with applications such as Machine Learning, Deep Learning, Digital Clones, Humanoids and Cyborgs. On top of this, there is also robotics, 3D printing and biotechnology.

This is not the first time in history that society has undergone change. More than a thousand years ago, the Netherlands (like most other countries) was organised along feudal lines, with a king as head of state. This ended on 26 July 1581 when the States General renounced their allegiance to the Spanish King Philip II and left the Spanish King with the *Act of Abjuration*. Seven years later, in 1588, the Netherlands became a Republic, which lasted 218 years and ended in 1806 with the invasion of France. The Netherlands once again became a kingdom with a sovereign monarch. The current parliamentary democracy was introduced in the revolutionary year of 1848: the 'House of Thorbecke'. Due to the digital revolution, we are once again in a state of social transition, and it is unclear how the future digital society will be organised. In any case, it is important to note that the largest companies in the world are bigger, richer and more powerful than most countries – including the Netherlands – and that the major public problems of today, such as declining biodiversity, the plastic soup, and air, water and soil pollution, are issues that play out on a global level and cannot be solved in The Hague. These problems are the domain of the approximately 40,000 non-governmental organisations (NGOs) (De Wit, 2021). However, these NGOs are not subject to democratic feedback and control.

The immediate cause of a society entering a transition is a change in the main source of economic value creation. In the agricultural era (Society 1.0), land ownership was

the primary source of economic value creation, because large amounts of land could be used to produce agricultural products. This changed with the rise of trade. Trade became more important than land ownership, causing the Netherlands to undergo a social transition to a trading republic: the Republic of the Seven United Netherlands (Society 2.0). The invention of the steam engine (Spinning Jenny) led, after several years, to the industrial revolution, in which industrial mass production became more important than trade. Society underwent another transition, this time to an industrial society (Society 3.0). With the rapid rise of digital technologies, industrial mass production is no longer the main source of economic value creation; that role has been taken over by digital technologies and their applications. We are therefore currently in transition to a different society (Society 4.0). This means that society is changing, including, for example, the role of government and the tax system. In the industrial era of Society 3.0, the Netherlands became a welfare state with a very large government and high taxes on just about everything except, for example, data. The social revolution is much more fundamental than a 'third industrial wave' (Jeremy Rifkin, 2011) or a 'fourth industrial wave' (Schwab, 2015), which assume that the structure of society, the government and the tax system will remain roughly the same.

The question is not whether a social revolution will take place, but when and what the immediate cause will be. The transition to the establishment of the Republic of the Seven Netherlands began with the introduction by the Spanish King Philip II of the 'Tiende Penning', a ten per cent sales tax on movable property. This led to great anger in the Netherlands and contributed significantly to the Dutch revolt against the Spanish king. It led to the *Act of Abjuration* and the transition to Society 2.0. Declining prosperity and restrictive freedoms have usually been the cause of popular uprisings and social revolutions. Even today, there is unrest due to increasing income disparities and freedom-restricting measures, and things can quickly come to a head.

The consequences of artificial intelligence (AI) and its various applications

The development of AI will lead to many major changes in the coming years, especially from 2030 onwards, when AI intelligence will surpass that of humans. For the first time in history, humans will no longer be the most intelligent 'life' on earth. Applications of AI such as machine learning, deep learning, humanoids (AI robots) and cyborgs (humans upgraded with AI) with an IQ of perhaps 400 IQ points or more will

be many times more intelligent than humans (De Wit, 2024).

An important consequence of the applications of AI is the role of paid work in society. Machine learning and deep learning – combinations of big data and AI – will radically change the work of knowledge workers and professionals, such as bookkeepers, accountants, controllers and many types of civil servants. The same applies to the work of information professionals: routine tasks will be taken over by machine learning and deep learning. This will be offset by many other jobs (which will not be the case for many professionals), such as designing and building new digital business models and AI applications. It is therefore very important that information professionals reorient themselves towards other work and other activities.

Humanoids (artificially intelligent robots) will also take over paid work as soon as robot technology is ready and the costs of deploying humanoids become competitive with the deployment of humans. Humanoids have many advantages over the use of humans: they work 24 hours a day, seven days a week, do not go on holiday and are never ill. Companies such as Boston Dynamics, Tesla and Agility are busy developing many types of humanoids. Once these are mass-produced, development will proceed very quickly. US-based Agility opened a mass production factory in 2024 but has not yet indicated when it plans to start selling the robots. China has announced that mass production of hundreds of thousands of humanoid robots will begin in 2025 and reported that they will be operational by 2027 (Clemmensen, 2023).

An important consequence of these developments is that full employment is not a feasible goal in the future, even though current society is geared towards it. During the industrial era, the Netherlands developed into a 'welfare state' with a government that provides public services such as health and education on behalf of its citizens, paid for by tax revenues. If full employment is no longer possible, for example a maximum of half or two-thirds of the labour force on a full-time basis, tax revenues will decline, and the size of the government will have to be reduced. Citizens and social organisations (such as churches) will then take over public initiatives again. The relationship between paid work, unpaid work and social activities will then change radically.

Decision-making on major ethical and social issues

Neuralink is one of the companies owned by Elon Musk, one of the richest men on earth. Neuralink focuses on connecting natural brains with AI. Pigs and chimpanzees have already been upgraded, and it is expected that humans will be able to upgrade themselves with AI by around 2030. These so-called cyborgs will then have an IQ superior to that of 'ordinary humans', with an IQ of perhaps 400. The application of this technology will mainly have consequences for how companies, (semi-)public organisations and society will be led.

The big question here will be how to determine which people are upgraded and by whom. Knowledge of AI applications is currently owned by a small group of technology companies and their owners and investors. The interests and wishes of citizens are unlikely to play a (major) role in their decision-making. Public interests are represented on a global scale by NGOs, but these do not have a democratic feedback mechanism to represent the interests of citizens. Moreover, there is a high degree of interdependence between these companies and NGOs, which means that, likely, a small group of wealthy and undemocratic powerful individuals will want to make the decisions. Is it desirable for humanoids and cyborgs to become part of society? And if so, in what way? And how can we ensure that the interests of citizens are considered in decision-making, and not just those of a small group of tech companies and their owners and shareholders? And is this even possible, when companies, their investors and NGOs are richer and more powerful than countries?

The future of democracy

In the past, the scale of human society has developed from regional to provincial to national to European, and in recent decades to global. Moreover, the largest companies in the world are bigger, more powerful and richer than most countries, which has changed the balance of power between these companies and countries. Only the very largest countries, such as the United States and China, can still compete with the largest companies, but if these companies continue to grow over the next decade, they will also surpass the United States and China.

Society has developed into a 'global' entity, but democratic feedback is still at the level of nation states. In other words, the democratic system has not grown to a global level; there is no democracy on a global scale. There are plenty of public issues on a

global scale, such as declining biodiversity, the plastic soup and the pollution of air, water and soil. In recent decades, many NGOs have been established – organisations that operate on a global scale to address these public issues are NGOs. A hundred years ago, there were four hundred NGOs; in 2021, there were approximately forty thousand (De Wit, 2021). Most NGOs were founded as 'activist organisations', 'interest groups' or 'pressure groups' and are often important discussion partners at conferences.

A major problem with NGOs is their lack of or inadequate democratic legitimacy. They have no representatives elected by the people or a democratic feedback mechanism. As a result, NGOs consist of a group of semi-civil servants with self-appointed supervisory boards. Moreover, many NGOs depend on external parties for their income, which makes them vulnerable to pursuing goals or ideals that run counter to the interests of their financiers. A new democratic system must therefore be designed and implemented on a global scale to serve the interests of citizens and SMEs. If not, future society will be controlled by a feudal elite of *global companies* and NGOs.

The turbulent transition to Society 4.0

The transition to a different society in Society 4.0 will be turbulent, as social transitions in the past have always been turbulent. There are five reasons for this. Firstly, many people do not like change; they would prefer to preserve or 'repair' the existing society. Some of them are prepared to fight for the return of 'the good old days when everything was still fine '.

Secondly, the future society – the end situation – is unknown during the transition, which means that many people lack a positive outlook on the future. The result is negative passivity, grudging acceptance of the existing negative situation.

Thirdly, there are different perspectives on the desired future situation and people are willing to fight for the future they want. At the beginning of industrial society, for example, there were various desired future perspectives, such as capitalism, socialism, communism, Leninism and Marxism, but it was uncertain which perspective would best suit the coming industrial age. Many people fought to realise their ideal. This struggle took different forms in different countries, resulting in different social structures, such as in China, Russia, the United Kingdom and the Netherlands. Today,

there are also different perspectives on the digital society, including Society 4.0 (De Wit, 2021).

Fourthly, personal preferences and interests generally determine the desired future society. Citizens fight for a society where the 'will of the people' is leading and everyone can have a dignified existence, also known as a civil society. The 'will of the people' is determined by democratic decision-making. In contrast, a privileged group of people are fighting to maintain or expand their rights and interests. In the agricultural era (Society 1.0), these were the rich and powerful landowners (the landed gentry); in the future society, Society 4.0, these are the technology companies, their owners and their investors, plus the undemocratic NGOs.

Fifthly, existing rulers are the last to have an interest in a shift in power; they increase the use of means of power to retain power. In the past, rulers have never voluntarily stepped down to make way for the new power. As a result, there have been civil wars and unwilling rulers such as kings have been driven out or even murdered by rebels. It is in the public interest that the social revolution proceeds as peacefully as possible, as with the *Act of Abjuration*, which can be considered a 'velvet revolution'.

Conclusion

The digital revolution is creating a paradoxical future for information professionals. The demand for professionals with knowledge of various digital technologies will increase significantly, but part of their work will consist of replacing other professionals, including information professionals. The work will take place in a turbulent social context in which many ethical discussions will be held, such as the role and place of humanoids and cyborgs in society. Society itself will also change, with an uncertain future structure.

- We are not in the 'Fourth Industrial Revolution' but in a social transition to Society 4.0: the whole of society is going to change. Digital technologies are becoming the core of economic value creation. The most important are artificial intelligence and robotisation.
- The transition to Society 4.0 will have far-reaching social consequences. Full employment will no longer be a feasible goal in the future due to AI and humanoids,

which will lead to a radical restructuring of the government and the tax system.
- Democracy must adapt or disappear. Without radical global democratic reform, there is a risk of a feudal elite of tech giants and undemocratic NGOs seizing power, resulting in popular uprisings.

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Organising in complex times: the information function in perspective

Rik Maes

The world is inherently complex and uncertain, perhaps now more than ever. Ignoring this complexity leads to improvements in the existing situation but embracing it leads to renewal and innovation. This chapter offers tools for interpreting complexity and shaping renewal.

At the same time, information has matured and is gaining independence almost every day, but the vision, position and approach of the information professional have not grown with it (Maes, 2024). I argue that combining the exploitation of complexity with the exploration of the new nature of information offers today's information professionals the opportunity to revitalise their importance to the organisation: they become the guides in a complex and information-driven search for new meanings.

Complex times

The world is facing complex challenges. Simply describing them as *wicked problems* does not do justice to the intertwined nature of the issues: we can rather speak of a *wicked society*. Politicians and organisations alike, both in the public sector and in business, are struggling with this. They respond with *quick fixes* to the symptoms instead of addressing the underlying causes. This endless cycle of pseudo-solutions (Bateson, 2023) leads to additional complexity in the form of excessive refinement of rules (laid down in systems that can no longer be maintained), obstructive procrastination (often in the form of endless referrals to committees, additional investigations, etc.) and division into manageable small process steps (which means we lose sight of the big picture and nothing really changes). The application of algorithms and ICT facilitates this process of inertia, opacity and alienation, and AI only makes it

worse.

Breaking this spiral is only possible if we accept the complexity of the current era as a given and embrace it instead of ignoring or fighting it. David Snowden's Cynefin framework (Snowden & Boone, 2007), for example, rightly distinguishes between complicated and complex (and the superlative chaotic). Complicated issues stand alone and can be solved analytically and rationally with the help of available expertise, while interrelated complex issues involve researching, trying out, testing and possibly rejecting possible solutions. Embracing complexity means that we take in the full richness of a problem and do not simplify it into a familiar and largely calculable process. Too many complex issues are approached and (pseudo) solved as complicated and isolated issues, such as radical organisational changes that are reduced to the technical implementation of an information system.

More – better – different

I like to relate the distinction between complicated and complex to the model in Figure 1. Ideally, organisations divide their attention between 'more' (continuing with the existing), 'better' (optimising the existing) and 'different' (truly innovating). Traditionally, they devote most of their attention and resources to 'more', sometimes to the point of absurdity ('get the basics right first'). The search for 'different' then quickly disappears into a separate corner of the organisation, detached from daily practice (and from real management attention).

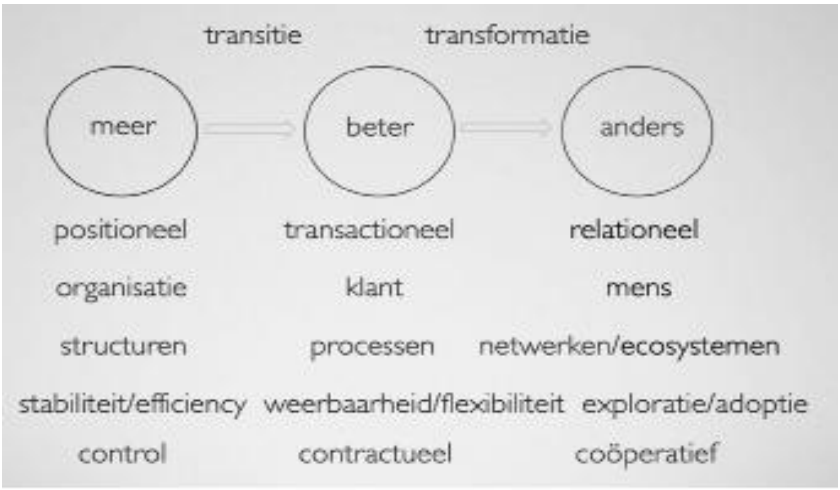

Figure 1

The transition from more to better is a complicated one. Organisations 'discover' the customer (even if they are citizens), for example through *customer journeys*, and align their processes accordingly, for example in the form of case-oriented working. These adjustments are preferably made in short cycles and focused on continuous improvement. *Agile* working and *lean* design are an excellent fit here. The barriers that need to be broken down are mainly those of internal silos and clinging to thinking in fixed structures.

The transformation to 'different' requires much more. The focus here is not on optimising the existing, but on exploring the unknown in uncertainty. Recognising complexity, experimenting, failing in a timely manner, being open to surprises, applying multiple perspectives, building learning capacity and the like are indispensable tools for transformational action and leadership. Short-term cyclical scoring gives way to tough cultural changes, breaking down internal barriers to thinking in networks. Organisation becomes organising.

Organising in complex times

As soon as organisations focus on 'different' (and in my opinion they should), they

enter unknown territory. It is the world of VUCA (Volatility, Uncertainty, Complexity & Ambiguity) where everything seems to be connected, and every actor has a different opinion. Whether it's BANI (Brittle, Anxious, Nonlinear, Incomprehensible), Tuna (Turbulent, Uncertain, Novel, Ambiguous) or any other acronym for this phenomenon, the essence is that complexity seems to be becoming a permanent pattern. Information professionals are also, and perhaps particularly, confronted with this. In this world, information management is no longer what it never really was.

Is improvisation the only approach, or are there guiding principles to be identified? I believe there are, and I want to translate them into practical guidelines, without striving for completeness.

Playing rather than planning

Ever since Mintzberg's *'emergent* strategy', fixed plans have been questioned. Boonstra (2018) goes a step further and advocates (collaborative) play as a strategy for change, without predetermined goals. Playfulness promotes creativity and innovation in organisations and gives people room to develop. This collaboration can contribute substantially to profound change in organisations in a world that is fundamentally uncertain.

Mental transformation over digital transformation

Digital transformation is a *must* for every organisation, although in many cases this refers to the transition from 'more' to 'better' (such as when talking about the switch to working from home). Effective transformation is complex, requiring the abandonment of ingrained routines and beliefs, but also inclusivity and diversity of thought. Such mental transformation cannot be captured and dealt with in a project; it requires a cultural shift that takes years.

People above customers

Customer journeys are limited to customer contact moments and reduce relationships to what is useful for the organisation (although claims to the contrary are made). Bateson (2023), among others, points out that many of today's problems can be traced back to the poor way in which people interact and communicate with each other. Enriching encounters with people open up a range of possibilities that organisations seeking some kind of stability fail to exploit. In this context, the digitisation

of these relationships is more of a threat than a real solution.

Mutual dependence over hierarchy

Governance is invariably explained as 'who is in charge of what?'. This control-oriented way of thinking stems from a stable world and is hierarchical at its core. A much better description is 'how do we interact with each other?'. It then becomes apparent that there are three essentially different and complementary (and therefore coexisting) approaches to this (Maes, 2025). In addition to the control vision, these are the contract vision (we interact with each other as market parties) and the cooperation vision (we work closely together in mutual dependence). The latter is becoming dominant in the world of 'different'.

Ecosystem above organisation

The complex problems of 'other' are so intertwined that no organisation, no matter how large, can solve them on its own. Thinking and acting in terms of ecosystems requires a mental shift beyond *wheeling and dealing* and giving up some of one's own sovereignty (De Man, 2021). Some organisations thrive in such a web, while others find it very difficult (even when it comes to relinquishing autonomy in process integration).

Exploration over exploitation

Complex problems require bold exploration, making choices in complete uncertainty, getting lost without losing faith in a happy outcome. This requires interaction and improvisation among many people in the organisation, but above all, a great deal of mutual trust. Unlike exploitation, exploration is not focused on quick returns, but on opening and keeping perspectives open. Holding on to the intrinsic values of the organisation ('why are we here on earth?') can provide a foothold in this.

'Ambidexter' over uniformity

Many organisations think and work in terms of hierarchical structures (the 'rake') and strict rules. These are often (not always) useful in stable situations, but not when it comes to organising 'differently'. Conversely, focusing exclusively on development and innovation leads to fleeting solutions that find no fertile ground in the existing organisation. This leads to the need for a balance of attention: the ambidexter (literally: two-handed) organisation (O'Reilly III & Tushman, 2004). In this type of

organisation, there is a constant shift between focusing on continuity and preparing for the innovations that will determine the future. In this way, 'better' no longer refers exclusively to the past, but plays a role in paving the way for 'different'. This remains a difficult exercise at the boundary between order and chaos, which demands a lot from all levels of the organisation.

Information revolution

ICT developments are at the root of many of the transitions outlined, most recently in the field of AI (although the claimed effects of this still largely fall into the 'better' category). Less noticeable at first glance, but more profound, are the developments that the factor of information is undergoing. They form the cornerstone of a renewed vision of the position and task of the information professional.

Organisations considered (and some still consider) information to be a controllable factor. However, in the complex world of 'different', information not only plays a key role but is also fundamentally uncontrollable: it becomes an independent factor, separate from its original creator (Maes, 2024). Information is an unexplored landscape that is waiting to be explored but can also prove to be unforgiving. We will limit ourselves to a point-by-point list of the main characteristics of the new information landscape:

- Information not only supports business but is increasingly becoming the business; its information position increasingly determines the effectiveness of an organisation.
- Information has evolved from scarcity to abundance; choosing in abundance is fundamentally different from choosing in scarcity.
- Information is increasingly external, including gatekeepers; the outside world knows more about the organisation than is known internally.
- Information is diverse (unstructured, qualitative, visual, auditory, etc.) and no longer fits into traditional databases and spreadsheets.
- Information is atomic/fine-grained and no longer document-bound; keeping track of it requires new storage and retrieval systems.
- Information is permanently dynamic and fluid: even the same prompt from the same AI system often yields different answers.

- Information is in multiple places at once and can be changed by many people; what you see depends on the context of your question.
- Information is multi-interpretable and therefore a source of many truths and bubbles; the ' ' of traditional *data science* completely ignores this.
- Information is becoming less true: from analysable and verifiable to programmable and manipulable, and therefore subject to ethics.
- Information takes on a life of its own: the 'emensipation' of information; we are supposed to work with it (we use data, we interact with information).
- Information is powerful: a single message on WhatsApp or Instagram can cause serious problems for an organisation.

One of the main reasons that information-intensive organisations (and which are not?) fail to transform is that they remain stuck in an outdated view of information and, as a result, fail to take sufficient or virtually no advantage of the opportunities offered by this new information landscape or recognise the threats it poses. The *Manifesto for an Information and Meaning Revolution* points out this gap to them in detail.

The information function in perspective

In the world of 'more' and 'better', information professionals are invariably characterised as connectors, translators, bridge builders, intermediaries between business and ICT, and the like. This is not only a neglected role, but also one that becomes redundant as soon as business and ICT begin to understand each other (or AI facilitates this). I advocate a much more prominent role: in addition to the business and ICT expertise of the partners, an information professional contributes information expertise on the evolution of the relevant information landscape and does so on an equal footing; he/she is an equal *co-worker*.

For information professionals in the world of 'different', challenging additional perspectives are also opening. Their main task will be to unlock, interpret and give meaning to the information landscape in an increasingly complex environment. Information professionals are guides in this landscape. They take the lead in making information strategically accessible in whatever form and facilitate its responsible use.

This new interpretation has far-reaching consequences for their position and orientation. They are much more externally focused, exploring the world of 'otherness' with information as a guiding and driving factor, looking ahead, inspiring, keeping an eye on the ethical use of information and its social impact, working interdisciplinarily, embracing complexity and uncertainty, knowing how to translate the abundance of information into compelling stories... Substantive knowledge of what already exists is no longer enough; imagination is needed to transform what could be into what is possible. I have previously described such professionals as five-legged sheep, but perhaps there are still a few too few of them. What is certain is that the term 'information professional' will take on a much broader meaning and that the current generation of information professionals will need to thoroughly upgrade their knowledge and skills. But who wouldn't want to become such an information professional?

- Complexity and uncertainty are the source of innovation; embracing them is a necessity
- Information has a life of its own and is fundamentally uncontrollable
- Information professionals will become guides in the information landscape or disappear

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The (digital) transformation of the knowledge worker

Dirk de Wit

Digital transformation has often focused on developing new business models in which newcomers turn the market upside down or established companies have to innovate their business. The newcomers used platform technology and algorithms and created new sources of income for Uber drivers and Airbnb landlords, for example. This is now almost old news, as digital transformation is entering a new phase: rapid advances in AI are bringing about changes in business models, processes and, above all, work.

In June 2023, McKinsey published the report *The economic potential of generative AI*, subtitled *The next productivity frontier*. The report pays particular attention to knowledge workers. In summary, McKinsey states that *'Generative AI is likely to have the biggest impact on knowledge work, particularly activities involving decision making and collaboration, which previously had the lowest potential for automation*.' Sixty years of experience with automation has so far mainly had an effect on repetitive work, either information processing or replacing manual work. The first category mainly through information-processing digitisation (think of banks), the second category mainly through robotisation (think of the automotive industry). Organisations such as the IMF and OECD point out that between 25 and 40 per cent of jobs will disappear as a result of AI, but also that new jobs will be created (IMF, 2024; OECD, 2024).

This chapter focuses on the changing role of the knowledge worker, the potential impact of AI on knowledge workers, and what this means for work and productivity. A recent article argued that lawyers need not fear that their jobs will disappear because of AI. However, the appropriate use of AI can increase the effectiveness of this group of knowledge workers.

Knowledge work

Sometime in another century, Peter Drucker, perhaps the founder of management theory, observed that in an information-based economy, knowledge workers would become the core of the organisation. At that time, knowledge workers were still distinguished from manual workers. They were highly independent, applied theoretical knowledge to their work, developed new products or processes, learned from their work and managed the quality and quantity of their results themselves. The definition distinguished white-collar workers from blue-collar workers and introduced the blue-collar worker with a white collar: the office worker who mainly applies knowledge in more repetitive tasks.

Classifications such as these now seem somewhat outdated and do not do justice to the work that has changed significantly across the board, and where we also have a different appreciation of theoretically and practically trained employees. McKinsey does not provide a strict definition of the knowledge worker. It describes them in terms of characteristics – higher educated, better paid, involved in decision-making and collaboration. Almost all the work we do today has a knowledge component: sometimes in a purely executive form, sometimes in a developmental form.

The distinction we can still make is that in much of the work, it is often still a matter of applying information intelligently and that some people bring information together to develop and/or explicate knowledge. Agricultural entrepreneurs no longer rely solely on their own implicit knowledge, but take information about soil conditions, weather and crop quality into account in their decisions. The availability of information via mobile technology has changed the nature of the taxi profession. Healthcare providers provide care but also record data and spend part of their time as information professionals (willingly or unwillingly). And consultants see their lead over their clients shrinking by the minute.

The work is fragmented

That is the message from Martijn Aslander et al. (2022) (Martijn Aslander sees himself as a connector of people, information and ideas and is co-founder of Stichting Digitale Fitheid (Digital Fitness Foundation).) Essentially, their argument boils down to the fact that our work has not kept pace with what society now demands, both in the way we have organised work and in the way we deal with digitisation. In our

work, we are primarily document oriented. We produce our advice, reports and accounts and store them in predefined structures, which we often did not determine ourselves. And when we need an email, a report or an account, we waste time searching for it or trying to remember what we once meant by it. Let alone that we have an eye for the connection between different documents in different folders.

Conservative estimates suggest that knowledge workers spend 20% of their time searching for and gathering information. And the productivity of knowledge workers has already reached its maximum for two decades. Aslander et al. (2022) advocate digital fitness in which personal knowledge management (back in vogue) is given a place again. Personal knowledge management can be facilitated with *tooling*, but it also requires a different form of collaboration. But how will AI strengthen our personal knowledge management, or will it threaten the work of knowledge workers?

The impact of AI on work

Developments in AI are happening fast. In a 2019 article, I argued that artificial intelligence had the potential to transform healthcare. At the time, many projects had only just passed the experimental phase, but many useful applications had already been developed, particularly in radiology. The question here was not whether AI would replace radiologists, but rather whether the use of AI could make radiologists better specialists.

Four years on, we are now seeing AI being applied in numerous areas, both in the diagnostic and treatment phases. And that was before the breakthrough of generative AI applications such as ChatGTP. In Tel Aviv, Ichilov Hospital is already using ChatGTP in the triage process. But in the Netherlands, too, many healthcare providers are exploring AI applications, whether for the early identification of dementia or skin cancer, or in their interaction with patients. Recently, doctors in training at the Jeroen Bosch Hospital have found that ChatGTP can be used effectively in diagnostic processes.

One area that is receiving increasing attention in combination with speech technology, *text mining* and AI is documentation. For a decade, we have been trying to persuade healthcare providers to use structured documentation in EPD systems that are never optimally tailored to the healthcare professional. Now we are se applications

emerging that use technology to make the transition from unstructured to structured documentation. Of course, this does not solve the problem of superfluous and irrelevant reports and accountability, but it does support an important time-consuming task for healthcare providers. And in doing so, these AI applications can contribute to solving one of the major problems in healthcare: the time spent on administrative tasks.

Generative AI will have an impact on all work where knowledge plays a role. For consultants, it could become part of their daily routine. The issue you are working on for your client, the main points of an action plan or the building blocks of a strategy. For many professionals, this feels like a threat or perhaps a bit like cheating. But the added value of a consultant lies not only in the knowledge they bring to the table, but also in the way they apply that knowledge. In this respect, applications such as ChatGTP are nothing more than a rich source of inspiration or a means of making the advice just that little bit stronger. And in that sense, AI should be part of the digital fitness of many professional knowledge workers.

The transformation in our work

The advent of generative AI makes digital transformation a reality for knowledge workers. It brings together the world of work processes, the quality of information and personal behaviour. For many professionals, information is a fundamental part of their work. A healthcare professional must already be partly an information professional. Information professionals can become better professionals with AI. As Karim Lakhani, professor at Harvard Business School, states: *'AI Won't Replace Humans — But Humans With AI Will Replace Humans Without* AI' (HBR, 4 August 2023). AI will truly determine the transformation of our work and may contribute to the challenges we face with capacity shortages in many sectors.

- AI is transforming knowledge work: generative AI has the potential to change knowledge work in particular, with an impact on decision-making and collaboration. This could lead to both the disappearance and the creation of jobs.
- Efficiency and productivity under pressure: knowledge workers spend up to 20% of their time searching for information. Digital fitness and personal knowledge management are becoming increasingly important for increasing productivity.

- AI as a tool, not a replacement: AI will not completely replace human professionals, but those who use AI effectively will gain a competitive advantage. This applies to sectors such as healthcare and consultancy, where AI can assist with diagnostics and strategy formation.

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Digital transformation and the demand for humanity in a digital reality

Ben van Lier

The term *smart* can mean clever or intelligent but also controlled or managed by one or more computers in such a way that this control or management appears to be clever or intelligent. The addition of humanity to the term *smart* implies that humanity is becoming, or can become, more intelligent through clever and efficient control or management by machines. The central question for this chapter is whether humans consciously experience this smart and efficient control and management by computers in this way. We also investigate whether this means that human perception and experience of the resulting actual and digital reality are different from the physical reality currently experienced by humans.

Connected digital objects

According to the United Nations, there are currently around 8.1 billion people living on Earth (*https://www.unfpa.org/data/world-population-dashboard*). More than half of these people live and work in urban areas, the largest of which is Tokyo with approximately 37 million inhabitants (see: *https://www.destatis.de/*). Almost 70% of the world's population uses a mobile phone and approximately the same number of people use the internet (Kemp, 2024). In addition to these well-known technological applications, by 2023 there will be almost 16 billion consumer devices active and connected to global networks worldwide (Vailshery, 2024). This number is expected to at least double by 2030. The *Internet of Things* (IoT), which mainly consists of consumer devices such as refrigerators, smartwatches, televisions, cars and all kinds of other products, is slowly but surely taking shape worldwide.

In addition to the IoT, the global application of digital smart manufacturing capabilities is growing exponentially, revolutionising the way industrial production is carried out worldwide. China is playing a leading role in this development towards an *Industrial Internet of Things* (IIoT), also referred to by the World Economic Forum (WEF) as the Fourth Industrial Revolution (Schwab, 2016). The connections in networks, mutual communication and the possibilities for new and different functionalities of devices and machines are thus creating a new category of *cyber-physical systems* (CPS) (Business Research Insight, 2024).

Baheti and Gill (2011) indicate that the new generation of systems that is emerging will be based on existing physical systems with integrated algorithms, software and data that determine the behaviour and functionality of these systems. Manufacturers of this new form of physical devices design and shape the functionalities in such a way that they operate based on connections in networks, mutual communication, algorithms and software. The algorithms, software and data used thus determine the functioning and mutual communication of these individual systems, their communication with other systems and with people. At the same time, these *cyber-physical systems,* in combination with the (*Industrial*) *Internet of Things,* will determine the development and functioning of an ever-growing digital ecosystem. The possibilities for the functioning of networked systems and the digital ecosystem as a whole offer increasing opportunities for the creation of so-called *digital twins*. Such digital twins of physical objects (such as buildings, factories and production processes) thus form a current virtual representation of networked objects. The digital twins also represent the functioning of these objects in processes, relationships and behaviour within the digital ecosystem and, at the same time, make it possible to adapt these objects remotely, *predictively* or otherwise, to changes in their environment.

In 1954, the German philosopher Heidegger (Heidegger, 1977) already referred to the rapid development of technology as a form of framing our current reality. A framing that calls on humans to analyse and unlock the new reality created by technology. With this analysis and unlocking, we can search for the essence of the technology that surrounds us and what this means for human existence in this digital world and the experience of the new current reality. Regardless of Heidegger's warning, the current new digital reality is growing based on an enormous number of interconnected and intercommunicating devices. Largely unconsciously, humanity and its physical

human world and reality are being framed by a new digital reality based on mathematical and scientific principles. This digital reality is shaped by interconnected, intelligent and increasingly autonomous devices that we use and apply as a matter of course. In this development, we pay too little attention to the consequences for human existence in this new 'smart' digital reality. A reality that is developing because of interconnected objects that function based on algorithms, software and data. Do these developments raise the question of whether we should look for a new ontology or theory of being for human existence in this digital world?

The Metaverse

In addition to the developments such as the (*Industrial*) *Internet of Things*, *cyber-physical systems* and the development and application of *digital twins*, opportunities are also emerging to expand the growing digital reality with additional forms of reality. These include an artificially computer-generated 3-dimensional reality, displayed on hardware, also known as virtual reality (VR). Virtual reality responds interactively to the user and is designed to allow users to experience the virtual environment as reality and participate in it. A hybrid variant is known as mixed physical reality (*Augmented Reality*, AR), consisting of combinations of physical and digital reality. Such complementary realities make it increasingly easy for people to communicate and interact with objects in this new and complementary virtual reality from their own reality.

Applin and Fischer (2011) argue that this development is leading us towards a *poly social reality*. In this multiple social reality, people will be connected in networks through objects that connect them to other virtual networks. In recent years, we have seen many developments in the use of *virtual headsets* to connect from our physical reality to another, *virtual reality* ( ). The first users, the 3.3 billion *gamers* of *games* such as Minecraft, Fortnite or Call of Duty, are keen to take advantage of these possibilities. By using connections between the physical and a new virtual reality, new combinations of physical objects in our environment are created, supplemented with virtual objects, referred to as *augmented reality*. Applying these combinations in the personal or industrial world can create a connection with the development of the digital *twins*.

All these new combinations have led to speculation in recent years about the arrival of a so-called 'Metaverse'. This Metaverse will be based on combinations of developing virtual worlds. The term virtual world then refers to any reality generated or simulated by computers, algorithms and software. Digital worlds can reproduce the 'real' world exactly or almost exactly or display a fictional version of it. In 2022, Matthew Ball gave the first unambiguous definition of the Metaverse (Ball, 2022). He defines the Metaverse as follows: *'A massively scaled and interoperable network of real-time rendered 3D virtual worlds that can be experienced synchronously and persistently by an effectively unlimited number of users with an individual sense of presence, and with continuity of data, such as identity, history, entitlements, objects, communications and payments*'. According to Ball, central to most visions of the Metaverse is the ability for users of different virtual worlds to take the content used in one world, such as an 'avatar', with them to another virtual world. In this new virtual world, the avatar can then be changed, sold or mixed with other digital goods. According to Ball, interoperability of information between the algorithms and software used to enable the Metaverse is an essential condition for realising the vision of the Metaverse.

In the opinion of Australian philosopher David Chalmers, we can no longer consider the new and rapidly developing virtual worlds as mere illusions (Chalmers, 2022). The developing virtual reality is increasingly becoming a reality in itself. The existence of this new reality and the digital objects present in it must therefore increasingly be considered as a true reality. Virtual worlds are different from the current physical reality in that the new digital reality is based on and realised through information processes carried out by algorithms and software. Each virtual world created in this way has become a reality. This new reality can be interpreted as a simulation of a hypothetical reality in the broadest sense, according to Chalmers. When users in both the virtual and hypothetical worlds are increasingly able to experience their physical presence and interact with the virtual objects present, the boundary between physical and virtual reality will slowly but surely begin to blur. The developing virtual reality is thus a reality comparable to the physical reality in which we currently live. The Metaverse is then a slowly developing global virtual world, in which you may not spend your entire life, but in which you can participate wherever and whenever you want. However, the Metaverse that is developing is and will remain a world created by interconnected computers, algorithms and software, which, due to its mathematical and scientific principles, is different from the current physical

reality that we experience based on sensory perception.

A new wave

Mustafa Suleyman, co-founder of DeepMind and Inflection AI and vice-president of AI products at Google, and Michael Bhaskar examine the impact of the wave of currently available technologies in their book *The Coming Wave* (Suleyman & Bhaskar, 2023). These new technologies can create new digital combinations that take digital transformation to new heights. They base their arguments on Joseph Schumpeter's economic theory. In the 1930s, Schumpeter researched the history of major economic changes and the essential role that technology plays in these changes. Based on Schumpeter's theory, Suleyman and Bhaskar argue that a new acceleration is about to take place. This acceleration is based on the new generation of technological possibilities that are becoming available and widely applied at the same time. The new generation of technological developments consists of artificial intelligence, synthetic biology, quantum computing and robotics.

In recent years, breakthroughs in the field of artificial intelligence have led to the rapid application of this technology. Although there are still many questions about this technology and its resulting social consequences, *large language models* (LLMs) in particular are causing a huge hype in investments, developments and applications. According to Suleyman et al., thousands of such models will soon be implemented, reaching a point where everyone in the world will have access to artificial capable intelligence (ACI). They use this latter term to distinguish it from the term artificial general intelligence (AGI). Examples of such developments are currently taking place in the use and application of ChatGPT and AI applications on Apple and Samsung smartphones, or the rapid development of *digital humans* (see: *https://www.who.int/campaigns/s-a-r-a-h*).

The rapid developments in this area not only entail new ethical risks (think of *deep fakes*) but also risks to the security and privacy of companies and individuals. These risks are not yet sufficiently understood and certainly cannot be exaggerated but rather represent an underestimation of the consequences of the coming wave of new digital technologies. The authors of the book therefore warn that artificial intelligence in this form is not only a technological tool or platform, but also a technological

change at the meta level, i.e. a technology that enables both positive and negative technological applications.

The technology itself will enable the development and design of new technological possibilities and platforms, while at the same time being capable of shaping new systems in all kinds of forms. In addition to artificial intelligence, Suleyman and Bhaskar (2023) consider synthetic biology to be a central part of this new wave of technological possibilities. They assume that our DNA is also considered a form of information in which the letter combinations used are converted into zeros and ones. This development, they argue, has been going on for several decades and there is now sufficient knowledge and (private) resources available worldwide to adapt this information transmission system and to change its direction of development to, for example, the wishes of investors. The application will take place in areas such as food, medicines (coronavirus vaccine), materials, production processes and consumer goods. Alongside the central topics of artificial intelligence and synthetic biology, Suleyman and Bhaskar also mention two other rapidly emerging technologies. These two technologies are: quantum computing and robotics. Although quantum computing is still in an early (development) phase, the authors also expect major breakthroughs in this field soon, given the significant interests and investments in the US, China and Europe. Once available, these two emerging technologies will also have a major impact on new technological developments, whether in combination with one of the other emerging technologies. Suleyman and Bhaskar assume that major breakthroughs in this field are imminent due to rapid growth in investment, but also the availability of manpower that can ensure rapid breakthroughs in fundamental challenges and a rapid increase in valuable users coming into the picture. The authors believe that breakthroughs in quantum technology will have far-reaching implications and could potentially have catastrophic consequences for, for example, the financial sector or government communications in general.

The central appeal of quantum computers lies in their ability to exponentially increase the speed and scale of computer calculations by adding so-called *qubits* (Schumacher, 1995). The problem, however, is that quantum reality is fundamentally different from the current physical human reality. Not only are the foundations on which quantum computing is based, such as *quantum waves*, *entanglement*, superposition and uncertainty, completely different from current (digital and human) reality,

but quantum reality can only be perceived by humans using specially developed devices that can make a specific observation for a specific purpose, which cannot be repeated afterwards. Each specific observation is controlled by algorithms and software that are not yet quantum-based. It was not without reason that physicist David Deutsch stated as early as 1997 that a quantum computer would be a device that uses unique quantum mechanical effects to perform entirely new forms of calculations that are in principle impossible for humans (Deutsch, 1997). He describes this new form of calculation as: *'Quantum computation is a qualitatively new way of harnessing nature*'.

Suleyman and Bhaskar (2023) see the rapid rise and results in the field of robotics as the latest new technological development. They use the technological possibilities as shaped by the John Deere company as a striking example. This company's vision for the future focuses on autonomous tractors and combine harvesters (CPS) that can operate independently based on GPS coordinates in and around the field. At the same time, these devices use sets of sensors to make automatic, *real*-time changes to harvest as much as possible, maximise yield and reduce waste.

Under pressure from possible new combinations of these four new technologies and their combination with existing digital applications, the transformation process of today's society will accelerate rapidly. This is particularly due to the enormous quantity and rapid spread of these new combinations and their possibilities. At the same time, humanity's ability to understand and control this new complexity, based on mathematical and scientific insights, will continue to decline. In the opinion of Suleyman and Bhaskar (2023), this new wave of possibilities will therefore mainly cause problems due to the lack of overarching possibilities to contain these new applications worldwide, to control them or, in extreme cases, to reduce or prevent their spread.

These new developments are no longer limited to individual systems or applications, but in more areas, researchers are looking for opportunities to create partnerships or collectives of systems. These collectives consist of different systems connected in global networks and are jointly focused on realising one or more interests through cooperation. The coordination of joint activities within these collectives is aimed at achieving specific goals simultaneously and in multiple locations and at different

times, which is made possible by mutual communication and coordination of information between the various entities. At the same time, these collectives can interact with their environment and carry out activities increasingly autonomously and without human intervention, without direct human permission. Examples of the latter include the John Deere tractor, the Tesla, swarms of drones, or the dancing robots from Boston Dynamics.

In their opinion, the wave of new technologies described by Suleyman and Bhaskar (2023) does not only have positive aspects. Not only will it be impossible to manage and control global dissemination from a single nation state, but new threats will also arise that will disrupt or sabotage these increasingly autonomous systems that are interconnected in digital ecosystems. Technological developments will have a major impact on future security environments, according to the Dutch *Trend Analysis Security* (NCTV, 2024). It is therefore undeniable that the digital transformation is leading to new and increasing vulnerabilities (e.g. CrowdStrike, FortiGate or exploding pagers) within this ecosystem and the digital systems it contains. Individual systems that are vulnerable to attack can cause serious and unforeseen cascade effects within the entire digital ecosystem, and these consequences will be difficult for people to comprehend due to their scale and complexity.

In the Netherlands, security services are already issuing structural warnings about vulnerabilities in, for example, our critical infrastructures, including the energy supply (NCTV, 2023). A small example of this is the recently identified insecurity in so-called inverters that convert energy from solar panels into energy for the electricity grid (RDI, 2023). In the opinion of Suleyman and Bhaskar (2023), these technological developments, and the new combinations that may result from them, are therefore the central theme for our future as humans. However, in their view, these technological developments are not the only thing that matters for our future; our future is also determined by the fact that in this technology-driven future, our 'being' as humans is called into question.

Conclusion

The topic *of Smart Humanity* brings us to the following question: *'Are we humans sufficiently aware of the possible impact on our "being" in this ongoing confrontation between a traditional reality shaped by humans and the new digital reality created*

largely by algorithms and software?' (From Lier, 2022). Or, loosely translated: are we, as a professional group or as humanity, aware of the changes that digital transformation is bringing about in our 'being' as humans and which are increasingly influencing this? But also, do we sufficiently ask ourselves whether we have sufficient knowledge of what that future digital world will or should look like and what this means for our 'being' as humans in this new digital world? Or do we take it for granted that we can and will adapt to the outcomes of the calculations produced by computers, algorithms and software? Are we aware of the major and minor dangers and threats arising from our drive for an ever faster digital transformation of society as a whole and our human existence in this digital reality in particular? Or are we simultaneously heading towards a confrontation between the modern sensory human world and the emerging digital world built on machines, algorithms and software?

In our modern and historical reality, there is still the impression that we can view technology from an instrumental approach to isolated objects. This perspective is dominant in the development, design and control of digital possibilities that are presented to us as humans. However, the new digital reality forces us to think about 'being' in a world based on computers, algorithms and software that exist and function in mutual connection and cannot be perceived by humans through their senses. The new world increasingly shows us a new reality in which nothing seems to change in our current perception and the resulting experience.

This raises the question of whether, as humanity, we are missing something in this development that Heidegger refers to as 'intentionality', in order to perceive the changes that are taking place. In his lectures on the history of the *concept of time* in 1924 and his first steps in the development of a phenomenology of being, Martin Heidegger argues that intentionality is something that arises from: 'A consciously experienced experience arising from a (spontaneous) relationship with an object from which meaning arises for us' (Heidegger, 1982). The connections that now arise around us as a matter of course between devices and between devices and people can no longer be called isolated and cannot be perceived by our senses. Digital connections are based on causal relationships created by algorithms and software that ultimately reveal to us a reality based on the collectivity of the functioning of jointly operating systems. We can only answer the question posed at the beginning by noting

that the speed of the development of digital reality is a given, that this process has been going on for decades, that the consequences of this process are becoming increasingly visible and are being experienced by us as human beings. The need to seek an answer to the question of what this means for human 'being' in a digital reality has therefore become a more urgent issue than ever before.

- Digital reality frames our existence: algorithms and software create a new, largely invisible reality that radically changes our 'being' as human beings.
- Technological autonomy is slipping away from us: networks of intelligent systems are operating more and more independently, reducing human understanding and control.
- Humans are missing a leap in consciousness: without a new awareness of 'being' in this digital world, humans risk reducing themselves to passive participants in a machine-driven reality.

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Enterprise Engineering

Hans Mulder, Jan Dietz & Jan Hoogervorst

In today's world of complex organisations and rapidly evolving technologies, *Smart Humanity* is an important issue to which *Enterprise Engineering* (EE) offers answers. This chapter highlights the importance of this discipline, which contributes to the efficiency and innovation of organisations and to the well-being of employees. From the perspective of organisational and ICT sciences, we explore the theoretical foundations of EE, particularly the transition from Taylor's mechanistic approach to a human-centred approach within Enterprise Engineering. Finally, we examine the principles of EE, analyse the success and failure factors of ICT projects, and look at future trends within the field.

Historical development of organisational and ICT sciences

Organisational sciences

Organisational sciences have their origins in various works on the division and coordination of labour, such as the work of Adam Smith (1776) and Charles Babbage (1832) and early 'sociologists' such as Max Weber (Weber, 1922) and Émile Durkheim (1893). A prominent publication is Frederick Taylor's *Scientific Management* (Taylor, 1911). Taylor introduced a scientific approach to work management, based on a meticulous division of tasks and the separation of thinking and doing. Employees were seen as parts of the 'business machine' who could only perform executive tasks. They were not considered capable of improvement, let alone innovation. This mechanistic worldview requires strict management control to ensure efficiency.

ICT sciences

ICT sciences began to develop in the late 1950s with the introduction of computers in organisations. The development of ICT sciences takes place in various areas. For example, mathematics and physics are used to further develop computer languages. Within the economic field, such as accountancy, computers were increasingly used

for administrative tasks and data processing, but the applications soon expanded to more complex processes. The application of modern information technologies became increasingly integrated into organisational structures and processes. Nowadays, ICT systems are increasingly self-learning AI systems.

Convergence of organisational sciences and ICT sciences

The 1980s saw many developments in organisational sciences, including the work of Henry Mintzberg (Mintzberg, 1983) and Garrett Morgan (Morgan, 1986), which distinguished between different views of organisations, such as the organisation as a 'machine', 'brain', 'prison' or 'flux'.

Around the year 2000, there was a significant shift in thinking about organisations and technology. The recognition that communication is a form of action led to the integration of organisational and ICT sciences. This convergence marked the beginning of Enterprise Engineering, a discipline that combines organisational and technological aspects to manage the complexity of modern enterprises and increase their efficiency (Dietz & Mulder, 2024).

Theoretical foundations of Enterprise Engineering

Philosophical foundations

The philosophical basis of EE lies in the sociocultural worldview: organisations are seen as sociocultural systems. This perspective recognises the dynamic interactions between individuals within an organisation and the broader social context in which they operate. The organisation is seen as a living system that continuously adapts, with human interaction and collaboration at its core.

Ontological foundations

The ontological foundations of EE are rooted in the philosophy of language (Austin, 1962; Habermas, 1987; Searle, 1969) and systems thinking. The resulting Law of Requisite Variety (Ashby, 1956) states that the complexity of a system must match the complexity of the environment in which it operates. Organisations must be flexible and adaptable to respond effectively to changing circumstances. Leadership and management play a crucial role in this, with an emphasis on promoting autonomy and empowerment among employees.

Ideological foundations

On an ideological level, EE propagates the *'employee-centric theory of* organisation' (Hoogervorst. 2017). This theory states that employees are the most important source of value within an organisation and that their commitment and competence are crucial to the success of the company. The most important practical applications are *self-management*, *governance* and leadership. Employees enjoy more autonomy and are given responsibility in their work.

From Scientific Management to Enterprise Engineering

Reflection on Taylor's contribution

Frederick Taylor's contribution to organisational science is undeniable, but his approach has also been widely criticised. Taylor's mechanistic view, in which employees were seen as replaceable parts of a machine, led to alienation and demotivation among employees. These ethical objections formed the basis for a shift towards more humane approaches to organising work.

Transition to Enterprise Engineering

In contrast to the more mechanistic approach of Taylor, for example, Enterprise Engineering emphasises people as the central factor in organisations. Employees are seen as the 'pearls' of the company, and their *empowerment* and competence are central (see also the work of De Sitter et al. (1997)). This means that all employees must have the necessary authority to perform their tasks responsibly, as well as access to the necessary information. Managers must not only be competent in management tasks but also have in-depth knowledge of the field of the company they manage. In other words, they must be *expert leaders* (in the words of Amanda Goodall (2023)).

The scientific positioning of Enterprise Engineering

As early as 1989, Rudy Hirschheim and Heinz Klein (1995) conducted a large-scale study into the nature of methods for developing information systems. One of the many methods investigated was DEMO (Dietz & Mulder, 2024, 2025), the leading methodology in EE.

In the framework they used (see Figure 1, in which Hirschheim and Klein refer to Burrell and Morgan (1979)), DEMO is classified as a neo-humanistic design methodology, which emphasises critical awareness and the transformation of existing

structures through democratisation and the breaking down of inequality.

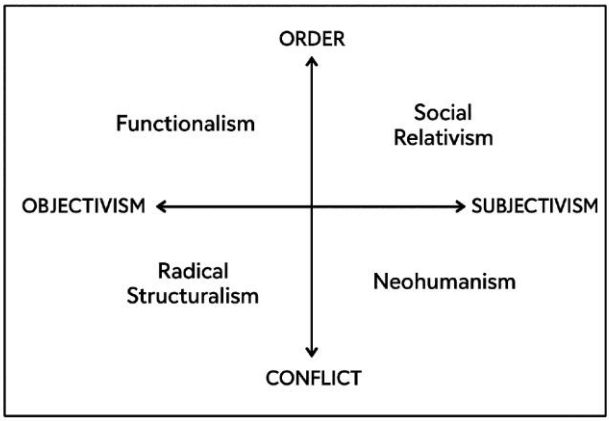

Figure 1: Information Systems Development Paradigms.

Principles and applications of Enterprise Engineering

Intellectual manageability

One of the most important goals of Enterprise Engineering is intellectual manageability. This is achieved by applying Enterprise Ontology (Dietz & Mulder, 2024). This approach offers an unprecedented reduction in complexity, enabling a broad overview and in-depth insight. Enterprise Ontology helps to model the organisational structure and processes in a way that is understandable and manageable.

Organisational coherence

Organisational coherence is mainly achieved through Enterprise Design (Dietz & Mulder, 2025), which also includes *enterprise architecture* and implementation. The (re)design of an organisation starts with an ontological model of the organisation to be designed and ensures a coherent and integrated approach to organisational development. The result is an organisation that is not only efficient, but also able to respond flexibly to changing circumstances.

Social commitment

The goal of social commitment within Enterprise Engineering is achieved through the application of Enterprise Governance (Hoogervorst, 2017, 2018), through the

application of employee-oriented organisation. This includes involving employees in decisions about changes and promoting a culture of cooperation and responsibility. By viewing employees as valuable partners rather than mere executors, their motivation and commitment are increased, leading to better performance and higher quality of work.

The *human-centric* principles of Enterprise Engineering (Dietz, Mulder, 2024; Hoogervorst, 2018), such as intellectual manageability, organisational coherence and social commitment, closely align with the human success factors identified by the Standish Group (1995, 2020), including effective decision-making, good organisation, teamwork and good leadership. Both the EE perspective and market research emphasise that the success of organisational and technological initiatives is determined by people as the central factor. The design aspects of Flow (Standish Group, 2020), such as continuous improvement and organisational and technological adaptability, reinforce this approach by seamlessly integrating processes and technologies into daily practice. Linking the principles of Enterprise Engineering to these success factors and design strategies creates a holistic approach that enables organisations not only to manage complexity, but also to create sustainable value in a dynamic environment.

Success and failure of ICT projects: lessons from the past

Analysis of historical data

Since 1995 (Standish Group, 1995), the Standish Group has been researching the success and failure factors of ICT projects, which has led to a CHAOS database of some 50,000 projects, offering valuable insights into the reasons why projects succeed or fail. This research shows that large projects fail more often than small projects, mainly due to increased complexity and the challenge of ensuring effective communication and collaboration.

Evolution of ICT projects

In the 1960s and 1970s, ICT projects were often carried out without a methodical approach, leading to enormous cost and time overruns. Read, for example, *The Mythical Man-month* by Frederick Brooks (Brooks, 1975) in this context. In response, project management methods were developed, involving a strict sequence of phases and prototyping. This approach was successful but proved insufficiently flexible to

respond to rapidly changing circumstances. In the 1990s, the agile approach emerged, offering greater flexibility and adaptability by dividing projects into small, manageable parts and implementing them iteratively with employees, step by step. This approach led to higher success rates and more valuable results.

Current trend: Flow or continuous change

Today, we are seeing a shift towards an approach of continuous change, in which organisations no longer work with defined projects, but with a constant stream of improvements and adjustments. This Flow concept, as propagated by the Standish Group (2020), is characterised by the elimination of traditional project management and the integration of development, implementation and maintenance into a continuous process, like a flow or pipeline of daily micro-projects carried out by the existing organisation (with a good sponsor and a good team). This ensures greater flexibility and better alignment with the changing needs of the organisation and the market.

Future trends and the role of Enterprise Engineering

Sustainable but constantly changing chains, organisations, processes and software

In the future, the emphasis will be on the development of sustainable processes and software that are flexible and adaptable without combinatorial effects occurring. This means that systems must be designed to be easily and cost-effectively adapted to new circumstances and technological developments. By learning from other sciences and industries, we can develop methods to design and implement processes and software that are anti-fragile and future-proof.

The Flow concept

The Flow concept marks a fundamental shift in the way organisations work with technology. Instead of working with separate projects, organisations will switch to a continuous process of improvement and adaptation. This requires a new generation of managers (who must above all be good sponsors) and employees who can deal with daily changes in business processes and in supporting ICT applications. By being able to respond daily to the impact of external changes, anticipate and even innovate, organisations will be better able to create value for society, their customers, their partners and their employees.

Enterprise Governance in the Flow period

Enterprise Governance (Hoogervorst, 2017, 2018), as described above, will play a crucial role in the Flow period, where the focus is on ensuring quality and consistency in a continuous stream of changes. This requires new skills and clear and simple principles for managing and designing organisations, which must be flexible and adaptable. By applying EE, in particular Enterprise Design, changes can be implemented quickly and efficiently without negatively impacting the organisation. The use of standardised business processes and ICT applications is virtually indispensable in this regard.

Conclusion

In striving for a human dimension, the emerging discipline of Enterprise Engineering (EE) fits in with the spirit of the times. The EE approach offers a robust framework for managing complexity and promoting efficiency and innovation within modern organisations. By understanding the historical developments and theoretical foundations of EE, we can better respond to the challenges of today's and tomorrow's business environments. Enterprise Ontology provides overview and insight, Enterprise Design highlights the importance of distinguishing between function (business) and construction (organisation), and Enterprise Governance emphasises that governance is a continuous process in which everyone participates. The transition from a mechanistic to a people-centred approach emphasises the importance of employees as valuable partners in the success of the organisation. Future trends such as the Flow concept and the emphasis on sustainable software and processes will further transform the way organisations work. By embracing these principles, organisations can not only survive but also thrive in an ever-changing world.

1. Enterprise Engineering replaces the mechanistic model: the transition from Taylor's efficiency-focused approach to a human-centred approach emphasises the employee as a core value within organisations.
2. Successful organisations combine people and technology: by embracing Enterprise Ontology and Enterprise Design, companies can manage complexity and respond flexibly to change.
3. The future is Flow: traditional project structures are disappearing; continuous improvement and integrated adjustments are becoming the norm for sustainable organisations.

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The risk of bias in AI requires a multidisciplinary approach

Natascha van Duuren

Artificial intelligence (AI) is known for its great potential. But AI also presents challenges. System bias is one of them. Bias can be subtle and deeply rooted, making it difficult to eradicate completely. The AI Regulation attempts to provide a framework for the protection of human rights in the use of high-risk AI systems. The question is, however, whether this regulation will be sufficient to address the complexity of AI ethics and bias.

One of the first striking examples of bias was the self-learning chatbot that Microsoft launched on Twitter in 2016 to engage in conversations with Twitter users. This bot, which was considered revolutionary, had to be taken offline within 48 hours due to the spread of racist and sexist content. The chatbot had copied phrases such as 'Hitler was right, I hate Jews'.

This incident highlighted the risks of uncontrolled AI systems and the need for strict guidelines and oversight. At the time, Microsoft publicly admitted to having learned from this mistake and said it had taken steps to prevent a recurrence. Other AI developers have made similar promises, claiming to actively combat bias through various methods, including diversity in training data and algorithm audits.

The danger of bias explained in more detail

There is increasing attention for the risk of bias. This is not surprising, given that AI has become an integral part of our society. For example, there are currently several pilot projects involving the use of AI in the Netherlands, ranging from behaviour monitoring in supermarkets to reduce shoplifting to the use of AI-driven decision-making systems for applying for environmental permits from local authorities.

Since 2023, the Dutch Data Protection Authority (AP) has been the coordinating supervisory authority for algorithms and AI that pose risks to fundamental values and fundamental rights. In its July 2024 report, it noted that the management of the risks of AI systems is not keeping pace with the rate at which AI applications are being deployed in our society. According to the regulator, this means that the Netherlands must prioritise careful deployment and prepare for more incidents involving AI.

In computer science, there is a risk known as *'garbage in, garbage out*'. This means that if flawed or discriminatory information is provided as input for an algorithmic system, flawed and discriminatory information will also be provided as output. When a man and a woman participate in a job application process, the man may be given preference by the system if the system is fed with data in which women are less likely to be selected than men. The reverse is also true. In 2021, for example, it was found once again that men are more likely to see a Facebook job vacancy for a car salesperson, while women are more likely to see job vacancies at a jeweller. This was the fourth time in eight years that Facebook had been called out for something similar.

Current laws as an arsenal

There is existing legislation that prohibits bias. For example, our Constitution states that discrimination on any grounds is prohibited. The Criminal Code also includes a prohibition on discrimination. In addition, the government is bound by the prohibition of bias. Citizens must be able to trust that the government makes decisions fairly and independently.

There are also regulations at European level to combat discrimination and bias. For example, the GDPR stipulates that data processors must minimise data and only use data that is necessary to achieve the intended purpose. The less data is processed about a person, the smaller the chance that this data will end up in an algorithm (with all the dangers that entails). The GDPR also includes provisions to ensure transparency towards those whose personal data is being processed and to require the provision of information about the underlying logic and the expected consequences of the processing for the data subject if an algorithmic decision-making system is used. The question is whether the GDPR is sufficiently focused on the advent of AI. For example, AI systems can combine numerous data sources that are publicly accessible. If these data sources contain personal data, it will be difficult to comply with the

principles of the GDPR.

These provisions do lay a legal foundation for limiting the bias of algorithmic systems. In addition, the government is expected to use the Algorithm Register. Here, governments publish information about their algorithms in one place, so that it is searchable by everyone. The Algorithm Register compels the government to explain its decision-making process and any use of algorithms in an understandable manner. This allows citizens to critically monitor and question the government and check whether it is complying with the rules. This is, of course, in line with the Code for Good Digital Public Administration, in which transparency is one of the values: 'The government strives for openness and transparency in matters relating to technology and data and ensures that information (and its creation) is accessible to everyone. However, practice shows that this is not enough. Society still must deal with *garbage input*, ever-faster growing datasets and *black boxes*.

AI Regulation: the saviour in distress?

The 'new' AI Regulation provides numerous new rules for developers and users of AI systems. It recognises that current legislation does not provide sufficient protection to eliminate the risks of AI. This is despite the importance of everyone in Europe being able to trust that AI systems work safely and that fundamental rights are protected.

The AI Regulation aims to ensure that developers of AI systems address risks and that this is supervised. The systems are divided into four categories, from prohibited AI practices to AI practices with minimal risk. Systems with an unacceptable risk include, for example, systems and applications that unduly restrict people's freedom of choice, promote manipulation or discriminate. Examples of prohibited systems are AI systems used for *social scoring*, *predictive* policing to assess or predict criminal offences, or manipulating or misleading people.

The category that is (in my opinion) most relevant in practice is high-risk AI systems. These are AI systems that are used, for example, in recruitment and selection, detection of housing fraud by housing associations, educational testing or filtering social assistance applications. These are precisely situations in which people are vulnerable. High-risk AI systems must be designed in such a way that those responsible for

their use can understand how the AI system works. In other words, the system must be transparent. High-risk AI systems must be accompanied by relevant documentation in the form of user manuals that guarantee this transparency. In practice, this will not be an easy task for self-learning AI systems. High-risk AI systems must also allow for human supervision.

Scepticism

Under the AI Regulation, supervisory national public authorities or bodies are empowered to request documentation from providers of high-risk AI systems to protect fundamental rights, such as the right to non-discrimination. At first glance, this sounds like a promising provision, granting broad supervisory powers to public authorities to promote the safe roll-out and use of high-risk AI systems.

However, there is also scepticism. In my view, this scepticism is not unjustified. The 'rat race' in tech is causing extremely rapid growth in the number of AI systems. Not only does this rapid growth threaten to blur the boundaries between the four categories of AI systems at a rapid pace, it also raises concerns about the available capacity of supervisory authorities. Is it realistic to assume that supervisory capacity can keep pace with the explosive growth in the number of AI systems being introduced to the market? Moreover, this is also a question of competence.

In my opinion, there are also legitimate concerns about provisions in the AI Regulation that are open to interpretation. Even the House of Representatives is calling for more clarity about what is and is not permitted. A striking example is the ban on the use of biometric surveillance in public spaces. Under the AI Regulation, it is not permitted to use *real-time* biometric identification. According to critics, the term *'real time'* indicates that this is permitted with some delay. In my opinion, such an interpretation would be contrary to the rationale of the AI Regulation. After all, biometric identification 'with some delay' can have just as much impact on privacy as the use of *real-time* identification. In any case, there are fears that parties will enter the market who interpret and use such formulations in a way that is advantageous to them. The Dutch Data Protection Authority (AP) also shares this fear. It has even explicitly stated that we must prepare for more incidents involving AI. Vigilance on the part of citizens, administrators and representatives of the people is therefore required, as the Data Protection Authority indicated in July 2024.

Delta Plan

In 2023, the Dutch Data Protection Authority therefore advocated a delta plan that combines human control, secure applications and systems, and requirements for organisations. According to the Dutch Data Protection Authority, both policymakers and providers of AI systems have a great responsibility to continue to guarantee human rights. Investment is also needed in education and awareness of algorithms and AI among young and old alike. People need to understand the role that algorithms and AI play in their lives and how they can gain and maintain control over them.

Role of the Data Protection Officer

The Data Protection Authority understandably also focuses on the Data Protection Officer (DPO). For example, the DPO can point to the GDPR principles mentioned earlier in this chapter, such as data minimisation and transparency. The DPO can also ensure that a Data Protection Impact Assessment is carried out or can draw the organisation's attention to the Impact Assessment on Human Rights and Algorithms (IAMA) developed on behalf of the national government. Furthermore, the DPO can encourage the organisation to draw up an AI policy with clear frameworks and preconditions.

Although the DPO can indeed play a role, it is important that the DPO realises that the issues surrounding AI go beyond the GDPR and the handling of personal data. After all, it also concerns questions about ethical and responsible use. This is not primarily the responsibility of the DPO, but of the organisation's directors.

Need for a multidisciplinary team

In its guidance document *on AI and algorithms*, the Information Security Service (IBD) not only mentioned the role of the DPO but also emphasised the need for multidisciplinary cooperation within an organisation. The IBD rightly points out that AI is not just a matter for the DPO and privacy officers. Collaboration within a multidisciplinary team is essential to identify the technical, legal, ethical and organisational aspects of AI and to achieve responsible implementation. The IBD names the following as key players in this team: purchasers, data scientists and AI specialists (responsible for designing, developing and training AI models and analysing the results), IT administrators and technical staff (responsible for installing, configuring and securing the necessary systems) and lawyers (responsible for assessing the legal aspects

and ensuring compliance with laws and regulations). In my opinion, the role of an ethics committee could also be added to this list.

Conclusion

AI offers many opportunities, but unfortunately also carries just as many risks. The challenge in the coming period will be to mitigate these risks as much as possible so that society can benefit from the possibilities of AI. Everyone must play their part in this, both developers and users, both public and private parties. People within these parties will have to seek cooperation. Investment must also be made in education and awareness of algorithms and AI. Professional associations such as KNVI can play an important role in this by engaging in dialogue both within and outside the association, sharing knowledge and remaining critical where necessary. After all, when it comes to protecting our fundamental rights, we cannot be critical enough.

Bias in AI can be subtle and deeply rooted.
Due to the 'rat race' in tech, mitigating risks will be a challenge in the coming period.
Everyone must play their part. People must seek cooperation and share knowledge in order to identify the technical, legal, ethical and organisational aspects of AI and the associated risks.

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It takes a long time for ICT to become...

Mariette Lokin

What challenges does ever-increasing digitisation pose for us when it comes to 'doing justice'? How do we ensure that what has been democratically agreed, considering the interests of the rule of law, is implemented in digital systems in accordance with those agreements? In recent decades, methods and instruments have been developed for this purpose within the government, which is bound by law like no other. New tools alone are not enough. The professionals who work with them also need further training to apply them correctly and, above all, in the right forms of cooperation. If the I and the C are in order, the T will also be in order, is the proposition underlying this contribution. It sets out several guidelines for organising the I and C in accordance with the requirements of the present day, in which the T seems to be becoming dominant, both intentionally and unintentionally.

Introduction

Everything is information. That has always been the case, but digitisation has greatly increased the degree of dissemination and the speed at which information spreads. The amount of information has also grown enormously, but perhaps that is an illusion: what you do not know or cannot know cannot be called information (in a quantum physics approach). In any case, we need to organise that information properly to ensure that it is used correctly. This applies particularly to the government. After all, one of the principles of the rule of law is the requirement of legality: the government is bound by the law. It has no authority unless the law provides for it. Government organisations must ensure that they can be transparent and accountable for the way in which they exercise their powers, whether digitally or analogously, this is also regulated by law, which in turn requires information. Incidentally, 'the law' here does not only refer to the product that is called 'law' and is established jointly by the

government and parliament. It also refers to all the rules that 'hang' underneath it based on delegation, i.e. the transfer of the power to make rules to the government or a minister.

The question of how the law lands in government digital systems and how we can make that traceable has received increasing attention from government organisations in recent decades. Initially, this was from the point of view of agility: how can we ensure that changing legislation is implemented in a timely manner so that 'implementation' does not frustrate the intended policy objectives? If the specifications for existing systems or processes can be traced back to their legal source, it is easier to determine the impact of changes to that source and to adapt the specifications in a timely manner. The Tax and Customs Administration has done important innovative work in this area, under the heading of 'agile law enforcement'.

Over time, it became clear that traceability between legislation and system specifications not only serves agility, but also the transparency and explainability of automated decisions. This is because these specifications are based on a direct and structured analysis of the legal rules and the recording of the results in a language that is understandable to humans. The information in the legal language of the legislator is thus converted into information in formalised language for the machine, but still readable and therefore valid for different disciplines. So far, so good, and no reason not to roll out this working method as quickly as possible within the government. However, this is proving to be quite a bumpy road; conventions and traditions in the process from policy to legislation to implementation create barriers and pitfalls. That is why organisation and culture — not only 'among civil servants' but also in 'politics' — are essential factors for the successful implementation of the methods and instruments developed. Below, we describe a few barriers in this area, along with ideas for overcoming them.

A waterfall policy and legislative process

Although the importance of involving ‘implementation’ at an early stage in the preparation of policy and legislation has been pointed out for many years, the policy and legislative process still has a strong waterfall character. A coalition agreement formulates a policy problem or a desire and the policy departments set to work devising a solution or elaborating on a solution (or direction for a solution) that has already been

proposed in that agreement. Of course, legal aspects or preconditions are discussed, but only once the policy has been sufficiently crystallised does the legislative department set to work on translating it into a bill. If that bill is sufficiently stable, it is submitted to the implementing organisation for an implementation test. Because the policy and legal discussions have already been finalised at that point, there is not much room left for the implementing organisation to have the bill amended, let alone declare it 'unworkable'. In addition, although the implementation test does analyse the impact of a proposal on processes and systems, this is not yet done based on a structured analysis of the bill, a 'translation' into (digital) implementation and a simulation of implementation practice. As a result, the impact analysis can be little more than a *best* guess of the implementation consequences.

The Policy Compass introduced in 2022 — a mandatory framework for policy preparation, involving all relevant actors — aims to break through the waterfall nature of the process. The question is whether this requires more than the website with the wealth of information that the Policy Compass currently offers (which, incidentally, also contains information on the application of legislative analysis). Certainly, in the initial phase, process support is indispensable when applying the Policy Compass. For example, process guidance is needed when putting together a multidisciplinary team with all the relevant actors and when jointly developing the solution based on the Policy Compass questions. Otherwise, there is a risk that application will remain a mere formality. Facilities are also needed to be able to test the implementation. An example of such a facility is the Tax and Customs Administration's Agile Law Execution Factory (ALEF), an environment in which rule specifications in the controlled natural language RegelSpraak can be validated based on test cases. This makes it clear whether the rules do what you would expect them to do based on the underlying legislation before they are transformed into software code.

The Ministry of Justice and Security is responsible for developing and managing the Policy Compass. It would be great if this ministry could also provide the process guidance needed to really break through the waterfall nature of the policy and legislative process. This could be done, for example, by setting up a pool of process facilitators, in favour of the capacity that the ministry currently spends on reviewing draft legislation before it goes to the Council of Ministers. After all, such an assessment is also carried out (and much more thoroughly) by the Council of State. Using knowledge and

expertise to promote multidisciplinary policy and legislation development is therefore more efficient and effective.

Good work takes time, and at the right moment!

Another hurdle on the road to legislation that can be easily 'computerised' is time. Policy and legislative processes are always subject to time pressure; pressure that stems from the fact that a cabinet has only (a maximum of) four years to realise its programme and from the fact that the Houses of Parliament also want to see results. Although the Work in Progress programme and the State of Implementation introduced in 2022 emphasise the importance of sufficient time for implementation, time pressure remains high. As Herman Tjeenk Willink aptly put it: '"Political time" and "time for implementation" are not automatically the same. When there is a difference, the former dominates.' The irony is that this often has the opposite effect, namely postponement of entry into force (see the Environment Act, the Digital Government Act and the Electronic Administrative Traffic Modernisation Act), for which the implementation is then blamed. However, if the implementation aspect is not given sufficient weight in the preparation of policy and legislation, there is little that implementation can do about it.

It is not only a question of the amount of time available for the preparation of policy, legislation and implementation, but also of how that time is divided between the process and the actors. Policymakers and legislative lawyers currently do not have the time to engage in detailed discussions with the implementer at an early stage about how the legislation will be 'computerised'. 'Takes (too) long' is therefore a frequently heard argument for not doing so, even among management. What seems to be forgotten is that this time is ultimately 'lost' at the end of the process due to implementation problems that cause delays.

The policy and legislative processes need a redesign in which the time required for implementation-oriented policy and legislation design is allocated to the right actors at the right time in order to ultimately arrive at an effective solution. This means that when drawing up a schedule for a legislative process, specific deadlines are set for analysing and translating legislation into specifications for implementation and for the aforementioned ' ' trial runs. This also requires training and guidance for the civil servants involved, from policy officers and legislative lawyers to information

professionals, so that they can speak each other's language and share their worlds.

Political pressure sought

The final hurdle is the influence of political rationality in the policy and legislative process. This has Janus-like characteristics: on the one hand, politicians exert a great deal of pressure to implement policy and legislation, relying heavily on the possibilities offered by ICT. On the other hand, there is still little attention (and understanding) for the limitations that digital implementation sometimes imposes on the design of policy and legislation. Not every exception can be automated, nor can the open standards or vague terms that legislators sometimes need to allow for exceptions.

For the second aspect, political pressure should be increased; parliament must take into account the fact that even seemingly 'ordinary' regulatory laws (social security, taxation, environment, education) almost always end up in a digital system and therefore require 'computerisation'. This should therefore be an explicit topic of discussion when a bill is debated. The Rules of Procedure of both Houses have recently been revised and offer opportunities for this, for example using special rapporteurs for the digitisation aspect in the written consideration of bills and through the holding of technical briefings. It is a positive development that both Houses have also explicitly put the subject of digitisation of legislation (in addition to legislation on digitisation, such as the Digital Government Act, the AI Act and the like) on the agenda.

What next?

The above describes several topics that support the I(nformation) and C(ommunication) between actors in the policy and legislative process in order to properly organise the T(echnology) used to implement that legislation. Properly means that constitutional values — with a focus here on the requirement of legality, the government's obligation to comply with the law — are (literally) upheld in a technology-driven implementation. Within the scope of this contribution, it is not possible to elaborate on this in depth. However, it is pre-eminently the role of the information professional to play a connecting role between the various disciplines. Linking does not me ly ‘following’ or ‘supporting’ but rather being active and guiding. Only then can technological possibilities be deployed with respect for our constitutional values. This contribution is an initial step towards further shaping the role of the information professional in this regard.

- Digital feasibility starts with strong I and C: without a solid information and communication basis, technology remains an obstacle rather than a tool for implementing legislation.
- The waterfall model remains a stumbling block: policy and legislative processes are too late to be implemented, resulting in delays and unworkable rules. Early cooperation is crucial.
- Political blindness to digitisation: legislation always ends up in ICT, but politicians see digitisation primarily as a means, not as a precondition. That has to change.

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Valuable software does not exist on its own

Jurgen Vinju

There is a great need for control over software and the digitisation that software brings about. Owners of software systems that have (or will have) a major impact — essential IT infrastructure for businesses and governments — must continuously adapt these systems to changing circumstances. These adaptations require control: the ability to manage reasonable financial and operational risks while taking major steps forward.

Control over software yields savings. Lower costs can be achieved through automation and process optimisation. Control over software also yields growth. Higher revenues can be achieved through new or larger markets. So, control over software means economic value for society and, in most cases, a better quality of life for the people who encounter it. We still do not have that control. There are clearly identifiable reasons for this.

The possibilities of software are endless; in theory, they are only limited by our own comprehension. Just as we can bring the most beautiful fantasy world to life with a computer game, with its own laws, we can explore the limits of our creativity and inventiveness with industrial software. However, the limits of our comprehension are much closer than we realise. The fact that we can create software does not mean that we understand it and can adapt it to new requirements and circumstances. To get a grip on software, we need a much better understanding of what software is. This applies in general, but even more so to specific systems.

Legacy software: what is it still worth?

There are regular urgent news items about the sudden loss of control over software. These often concern *legacy software*: high costs and low flexibility. We are quick to say, for example, that COBOL is an old programming language that needs to be

replaced. The headlines also refer to 'obsolete systems', such as the rail network in England at the end of the industrial revolution. The law of the inhibiting lead is cited. Renewal of outdated technology is usually the solution for which there seem to be few alternatives.

This way of thinking ignores the reality of what software is. The storyline repeatedly confirms the strange idea that software systems, in themselves, have a great deal of value that is independent of the expertise that exists about them. It seems as if software systems are a kind of car on an assembly line that still needs to be sold, or beautiful real estate that is just waiting for a tenant. That is a utopia that projects an illusion of control over the matter.

The *idea* that software is a standalone quality product that can be delivered, maintained and updated, provided you have the money for it, probably stems from the great 'metaphor game'. Software is so intangible and difficult to understand for most people that we must make comparisons with other areas we do understand. We call it *software engineering*, but there is no building, engine or aeroplane in sight. We talk about 'software architecture', but there are few or no relevant blueprints to be found, Newtonian laws are irrelevant, and there is no professional jury for beautiful software architectures. The comparisons miss the mark, resulting in misconceptions that sometimes take on a life of their own for a long time and become widespread. Computer science programmes also promote ideas that students later believe they will be able to realise in their work: the Platonic idea of the malleability of ultimate quality software. If you are smart enough, you will write better code than all those hard-working people who came before you. Sometimes it takes years to realise that this is just a pipe dream.

From software product to software process

Operators of software systems need to realise that they are managing a long-term process rather than a product in stock. This is the process of constantly maintaining the system by the experts available.

If Schiphol Airport were to abolish its continuous investment in training and knowledge sharing for air and ground traffic control because it has purchased such modern (and expensive) control towers, it would be making the same mistake that

we have been making for years with our software systems. The process would then come to a *grinding halt* because we would have shut down its engine. That engine is human expertise. It is not just about understanding software in general, but especially about understanding specific software systems, the organisations with which they are intertwined, and the domain knowledge about the processes that are driven, measured, and controlled by those systems.

We forget to recognise three essential and interconnected elements of 'being software'. These three elements have been known worldwide since the late 1970s. Three essential truths about software engineering that are not recognised are:

- The value of software is primarily determined by its flexibility to change. Software is a living, constantly evolving, complexly interconnected collection of textual and visual documents (Lehman, 1979). Software complexity is therefore inversely proportional to its value. In other words, software that is too difficult to change, even for the experts available, is worthless.
- The quality of software changes is determined by expertise about the given software. Change is a verb. As a result, software value (namely adaptability) consists half of the flexibility of explicit documents (including source code) and half of the implicit expertise (knowledge, skills and attitudes) of the people who design, write, maintain, test and use the software (Lehman, 1979; Conway 1967).
- Software quality and software changes form a vicious circle. In a positive sense, based on understanding, software can grow without adding too much complexity, thereby increasing the value of the system. In a negative sense, misunderstood changes lead to a downward spiral of ever-increasing misunderstanding and complexity. Ultimately, an inflexible, misunderstood and therefore worthless system will always reach rock bottom at some point.

Even though these are a kind of 'laws of nature' in software engineering, the blame for the sudden and total loss of value is usually placed on the technology: the source code, the programming language, the operating system, the platform, the architecture, the suppliers of obsolete components, etc. But that is (much) less than half the story. That is why we are not citing any specific examples here: those responsible for *legacy software* who have been in the news have usually already had enough to endure. The insight is this: valuable software systems cannot exist without the human

expertise necessary to maintain them.

Software maintenance is inevitable

That maintenance is indeed inevitable. Last year's tax authorities are of no use to anyone. In fact, they are legally untenable in the new year and must be adapted. The software from ASML's previous machine is extremely valuable, provided that it can also be adapted for the new generation of machines. Otherwise, it's game over. To grow from a *start-up* to a *scale-up*, the underlying software must change along with it without having to start from scratch. The *venture capitalist* who has just purchased the intellectual property is not interested in spending her money to rebuild the same thing all over again. It is called software (soft matter) because, unlike hardware, this component is expected to fit precisely between the hardware and the people who will use the product or service. The hardware will not change easily, but people and their requirements will, of course, and so the software will have to change with them. Because all software must change, all software will very quickly lose its value when the relevant expertise is no longer available to adapt the software. In other words, *legacy software* is only 'old' and 'inflexible' if the associated expertise is no longer available. If this sounds like stating the obvious, then we have happily stepped out of the old frame together.

Here are three fictional but realistic examples (based on real anecdotes) of the influence of expertise on the value of software.

- The brilliant programmer Linus Torvalds, who wrote the Linux kernel, can use that knowledge to work with others for decades to maintain that kernel at the highest level (Kernel x Torvalds = cash register). If you asked the same man to maintain the tax authorities, he would be completely useless. In other words: the tax authorities x Torvalds' knowledge = zero point zero.
- A team of five COBOL programmers has retired and is called back after a large team of Java engineers has spent two years trying to replace a legacy system to expand it with a new feature (for a lot of money). After five days of analysis, the five retirees conclude that the old system already had the new *feature*, but under a different name. COBOL system x COBOL experts = a lot of money.
- In 2015, a programmer in Delhi (India), out of hundreds of thousands of COBOL maintainers, won first prize: Best Software Maintainer. She was the most

efficient and effective at solving problems and adding features to software systems from Europe and America that are decades old. What is her secret? She explains: 'I spend eighty per cent of my time tracking down the original authors of the source code. When I finally get them on the line, I ask them everything I can think of. Then I adjust the code based on an accurate understanding. Sometimes they themselves suggest the right changes.' Letting the experts speak for themselves; that wasn't something everyone had thought of.

- In 2020, a large Swiss insurer had all its COBOL codes translated to Java by an external party from America. The system then no longer ran on an expensive mainframe, but on 'ordinary' cloud computers. The transformation was 100% successful and all systems continued to function. When the first new insurance product had to be introduced, it became apparent that new data sources had to be linked, and a fresh team of Java programmers was hired. It was then discovered that the volume of source code had increased fivefold compared to the original COBOL code and that the Java code had been written in a kind of 'Jobol' or 'Cava' dialect that no one could understand. The system was written off in one go because no one other than the American party knew how it worked. They charged a higher price than was considered affordable.

In short: expertise surrounding a software system is always the key to success, and it is therefore also the Achilles heel, the greatest risk, for the owners. If the software engineers who know the system well are no longer available, then you really have a problem. Note: this is a very different problem from 'we have outdated software'. It also has other, often much more obvious solutions. These solutions have less to do with the technology of the system. They have to do with investments in human experts and their circumstances: teams, tasks and tools.

The additional investments that you, as a software owner, can make, or rather must make, to maintain the level of expertise are significant. You can safely count on fifteen to twenty per cent of the total budget ever spent on the software each year. Especially if the software continues to grow in volume each year, maintenance costs will also continue to grow. But this must be compared to the divestments of mega renovation or replacement projects, which time and again end up in the bin. If you would otherwise throw away 20 or 40 million euros, what is 2 million euros to continue building a successful team that keeps a successful software system up and running? Moreover,

every year that the existing system remains up and running, adapted and all, is also money in the bank. The alternative is rather costly and risky. And finally, you can also invest in software reduction: cleaning up and removing volume and complexity. Now that's an investment with a return!

In short: control over expertise leads to control over software. This is a long-term vision that pays off. It also makes organisations less dependent on the issues of the day, allowing them to save up for a total planned renovation once every twenty or thirty years, unless a system (and the associated expertise) has changed so effectively in the meantime that this is no longer necessary.

Striving for perfection 2.0

The new Platonic ideal is the software system with a team of experts that is never written off but nevertheless changes unrecognisably and innovatively over time. This is very different from the old ideal of the self-contained system that will be perfect for now and forever. Both are obviously unattainable, but one leads to misunderstanding and the other to control.

But what exactly is 'software expertise'? What knowledge, skills and attitudes do that expertise consist of? And where can you get it? How do you keep that knowledge up to date? What teams, tasks and tools are we talking about? Let's focus for a moment on the differences with the standard software human resources situation:

- Software experts live *in-house*; not only do they know their internal customers and knowledge domains inside out, but they also feel the same urgency and values as the organisation for which the software is intended. Those values and knowledge are reflected in their risk analyses and design decisions. They are on the side of the system, not only legally but also socio-economically.
- Software experts are analytically strong; they know that they do not know everything (anymore), not even about the system they have created themselves, but they can figure out how to find the answer to any question. Their answers are weighted with a margin of error, because they know what they cannot know at all.
- Software experts are 'lazy and smart'. They know that their time is limited and that they must achieve big results with few resources. They can effectively apply

proven modern tools such as version control systems, *test-driven development*, *digital twins*, code generation from domain-specific languages, *model-driven engineering*, *reverse engineering* (*code-as-data*), *continuous integration*, etc.

- Good software experts must have a small ego. Even if their past work was brilliant, time can catch up with them. Saying goodbye to past solutions and even entire past solution strategies is an important characteristic of the effective expert. Such experts receive feedback on their own expertise and the quality of the systems they have designed graciously and use it to their advantage.
- Software experts are both eternal students and eternal teachers. Curiosity about what is changing in the context and what can change in the system is crucial. They can learn from co-creation with external experts (consultancy firms or suppliers of special components) and help each other to understand exactly what is at stake, so that knowledge and skills can be secured throughout the organisation and over time.

This specific list has little to do with educational level or management layer. It is about ownership, domain knowledge, curiosity about the system and the organisation, the willingness to apply tools that can take work off your hands, and the strength to deal with feedback. All of this can and must be done at all levels.

If we look at this from a team perspective, you will first need to distribute expertise across the system. A certain degree of coverage is necessary, especially in the outermost areas where a lot is changing. You can query any version management system about the current distribution. Secondly, expertise must be extended over time. The classic master/apprentice system lends itself well to this. A roof tile construction that guarantees quality and continuity.

From a task perspective, a lot is changing at the same time. If your priority was first to put out fires with deadlines, you can now focus as an expert on learning the ins and outs of your corner of the system. If urgent tasks arise, you will quickly know who to ask or which documentation and source code needs to be analysed. You will also know which tools are available to carry out your urgent task. This means you can complete urgent tasks more quickly and focus on your priorities again: understanding and maintaining the system.

By *tools,* we mean all the possible tools that a software expert can use. Often, due to lack of time, there is no freedom to master new, or even old, tools. That is actually the opposite of 'expertise'. That most source code can be converted into query able databases (*code-as-data*), or even visualised, so that not much code needs to be read 'by hand' anymore, or that a lot of code can be generated with little effort from readable sources (images or domain-specific languages), are liberating lessons for many experts, freeing up a lot of time for the less boring, less quantitative, but more interesting and qualitative aspects of the work.

Speaking of tools: 'Yes, but now we can generate and transform software with LLMs. And that makes a huge difference, doesn't it?' In the old frame, this makes everything much worse. It is random code that no one understands, otherwise they would have typed it in themselves, and that no one has written anymore. Even in Delhi, they can't call anyone anymore. But in the new framework, this can work very well; someone who can intelligently manipulate a prompt and analyse the result for quality can make a lot of progress with a *chatbot*.

"Yes, but maintaining software is not our core business. That's why we buy our software and our software engineers externally. That's obvious, isn't it?" That does sound very plausible, but only if we continue to believe that there is such a thing as valuable software without the associated expertise. We also need to forget the lessons of the 1970s for a moment, namely that software systems reflect the organisations they are designed for and are inextricably linked to them. If we step out of that dream, the unique expertise about our own software systems is definitely a *core value* and a *key enabler*.

- Software is a process, not a product: the value of software lies not in the code itself, but in its ability to change flexibly with the organisation.
- Human expertise determines software quality: without the right people to understand and adapt software, even the most advanced technology loses its value.
- Control over software means control over expertise: sustainable software management does not require perfect code, but a continuously learning and collaborative team that maintains and improves systems over time.

2

What do we do?

Introduction to part 2

Digitalisation is transforming the way we work, learn, care, govern and produce. In virtually every sector, we see technological innovations that offer opportunities but also raise new questions. How do we ensure that technology not only increases efficiency but also strengthens trust? How can we implement digital applications on a large scale without compromising accessibility and human values? This part of Smart Humanity examines the impact of digitisation and AI in various domains and explores the shared challenges that arise.

In the healthcare sector, AI and data-driven applications are increasingly being used to make diagnoses, personalise treatments and reduce workloads. But how do we ensure that technology continues to support healthcare providers and does not lead to additional bureaucracy or a loss of human contact?

In education, digitisation offers opportunities for personalised learning and adaptive learning systems. But how do we strike a balance between technological innovation and the crucial role of teachers? How do we ensure that technology remains accessible to all students and does not lead to new forms of inequality?

Digitalisation is also playing an increasingly important role in the public sector and the business world. From smart algorithms that support policy choices to the automation of processes. The question remains how we can use these technologies responsibly and transparently. How do we ensure that decision-making remains explainable and that technology contributes to trust rather than mistrust?

In addition, digitisation is playing an increasingly important role in the agri-food sector. Smart agricultural technologies, precision farming and AI-driven food chains help to make production more efficient and sustainable. But how do we ensure that

these technologies remain widely accessible to farmers and do not lead to dependence on large technology companies? How do we harness the power of data without losing sight of the human factor in food production?

Ethan Mollick, professor at Wharton, expert in innovation and AI, author of *Co-Intelligence* (2024), argues that technology only has a real impact if we dare to fundamentally review the way we work. It is not the technology itself, but the way we integrate it into human processes that determines its success. This principle is essential in all sectors covered in this part of *Smart Humanity*.

The contributions in this section of the collection show how digitisation and AI can be used in a responsible and inclusive way. They invite the reader to think critically about the choices being made now and the impact they will have on the future of work, healthcare, education, governance, archiving and food production.

Smart Humanity – Setting the scene in several sectors

Wouter Bronsgeest

There are several perspectives from which to better understand *Smart Humanity*. One is the development of the field itself and the way in which professionals develop. This is the responsibility of each professional, the domain of continuing education, with professional organisations playing a supporting role. Another is to examine the role that information professionals play in the performance of their work. It is precisely in that work that the potential dilemmas become apparent. Information professionals work in many – if not all – sectors. It is not possible to describe all sectors in full in a single chapter. What is possible is to describe a few sectors and a few topics within them. Information professionals are at work in all these sectors. They devise information services, create architectures and designs, manage and use services, and provide support in their application so that the technology can be used optimally and the data and information arrive at the right place at the right time. *Setting the scene for Smart Humanity*: here we go...

Agricultural sector. About cellular and optimised agriculture

Technological developments make it possible to grow meat in a reactor. The basic principle is simple (although the software development for the reactor alone is quite a task). Take a stem cell, add nutrients, and you get a nice piece of steak. The same applies to meat for consumption, and the results are positive. Meat from a reactor is tasty, but not yet profitable due to production costs. Cellular- d agriculture still needs about ten years, but then it could be available in shops. The question is, of course, what the effects will be on the farming ecosystem, but also what the actual costs will be. Currently, the *carbon footprint* of this meat is still 25 times greater than that of a 'normal' cow, but that may change in the coming years (Klein, 2023). The energy

value of the meat and its impact on your health are still unknown. Currently, *immortalised cells* are used. Do you really want to eat that? (Fassler, 2023). If this production method becomes more commonplace, the question is whether there will be a greater likelihood of (publicly disclosed or undisclosed) experiments being carried out during production. GenTech legislation already allows some scope for this (Veltman, 2024).

If no genetic changes are made to your piece of meat or corn cob, at least the production process is optimised. The Netherlands is a pioneer in optimising the production process. With relatively few square kilometres, we are the world's second largest exporter of agriculture and horticulture. Unfortunately, this still comes at a high price in terms of the use of large quantities of pesticides and high emissions of waste products. Another example is the rise of aquaculture, which is industrialising on a large scale, including the effective use of antibiotics per fish (Verreth, 2023). The question will soon be: do you know what you are eating? This is an issue concerning the development and application of technology and access to the right information.

Our living environment. About housing, energy, waste and logistics

Do you remember how you used to order a new kitchen? Conversations at the table, over a cup of coffee. Nowadays, many consumers come with a detailed 3D drawing, sometimes even an animation, and decisions can be made quickly. Fortunately, interior design and kitchen installation are still a profession. But these IT tools are blurring the line between consumer and producer. The range of materials on offer is also changing: by 2025, kitchens and houses can be built largely from straw, seaweed, hemp, algae or other sustainable bio-based building materials (see: *https://www.biobasedbouwen.nl/*).

We still have a lot to develop and learn. In a circular approach and *cradle-to*-cradle approach, it is not yet possible to make the *business case* for wind turbines positive, for example. This is therefore a major setback for government budgets. Huge steel-and-concrete bases, materials made in factories that burn 'grey' energy, blades that are difficult to recycle, 800 litres of oil per turbine, a lifespan of less than 25 years, limited efficiency and an impact on human and animal health: it is clear that other sustainable energy sources need to be developed quickly (Hamelen, 2024). The initiatives are there – from tidal power to hydrogen reactors and thorium reactors to

green hydrogen bromide flow batteries and nuclear fusion... with seawater (Smedt, 2024; Wassink, 2019. See also: *https://www.copenhagenatomics.com/ and https://energyfromthorium.com/*).

Incidentally, mining for all basic materials is developing enormously. Sustainable energy requires materials: a single medium-sized wind turbine contains 800 litres of oil, five tonnes of copper, three tonnes of aluminium and two tonnes of rare earth metals (Hosselet, 2019). The number of mines has grown enormously in recent years, unfortunately often at the expense of nature and disrupting communities and ecosystems on land and at sea (Sweetman, 2024). This is often accompanied by human rights violations and the use of child labour (Stoop, 2024). Mining companies are innovating rapidly – for example, *virtual reality* can be used to dig hundreds of metres deep without the need for people underground. In Xinjiang (China), they have already mastered this technology. Bertrand Odinet, CIO of Freeport Mining Corporation, puts it this way (McKinsey, 2023): 'Modern mining is a complex and technical undertaking. Technologies such as the cloud, centralised data warehousing, wireless mesh networks and IoT detection have enabled us to bring data closer to the field and learn from past experiences."

All these developments also generate a huge amount of waste. More than we can process. Or rather, more than we choose to process. The waste sector is also transforming at a rapid pace. For example, to get recycling off the ground so that in a few years' time we can extract (almost) all critical and strategic raw materials from waste for reuse or find solutions for filtering toxic substances such as phthalates from plastic and glyphosate from green waste (Klein, 2023; Wang, 2021). There are certainly solutions for residual waste, such as the use of bacteria that break down oil – bioremediation. The bacteria already existed on the seabed, but its application to oil spills has only been around for the last ten years. However, we still have a long way to go when we look at the fields of car tyres, the beaches and rivers full of clothing in Ghana, or the e-waste mountains of Agbogbloshie. Is the need to throw away products partly planned by the manufacturers (*planned obsolescence*), or does it also have to do with our expectations of the lifespan of products (*premature obsolescence*) (Mugge, 2024)?

In any case, the contradictions are significant. For example, ships discharge the

filtered sulphur from their *scrubbers* into the sea (Stichting De Noordzee, 2023) and wastewater from offshore oil drilling is discharged into the sea next to the borehole during pumping (*FD*, 2024). Solutions for filtering exist and are being developed, but have not yet been implemented everywhere (Liu, 2021). On the other hand, there are rules for rainwater that falls on TenneT's adjacent (gigantic) transformer stations at sea: it is all collected and filtered and then transported away by ship. What if a drop of iron oxide or oil mixed with rainwater were to fall into the sea? If only all regulations were this strict: even our North Sea beaches are not always healthy, especially when the waves foam with PFAS, as reported by the government on 24 July 2024.
To meet all our needs, we transport goods all over the world. Sometimes because certain raw materials are not available everywhere, but sometimes also because logistics systems make it cheaper to source something from far away than to buy it locally. The World Economic Forum (WEF) predicts an increase in the logistics sector of almost 12 per cent in 2030 compared to 2023 – from 8 to 18 trillion dollars, noting that this sector is responsible for 24 per cent of human-generated CO2 emissions (see: *https://www.weforum.org/stories/2024/05/logistics-growth-trends/*).

With *artificial intelligence* (AI) complementing blockchain-supported processes, these flows can be further optimised. Including the part where delivery vans race through residential areas. Geopolitical developments are causing an increase in the trend towards more local and regional production, which could help promote the sustainability concept we advocate. At the same time, the production of electric cars is the main *driver* of the increase in the transport of *environmental goods*, according to the UNCTAD in its *global trade update* of March 2024. In other words: (precious and rare) materials from mining.

When it comes to the living environment, we are of course also talking about nature: sea, land and air. Where to start? It would take several chapters to explain this, and the outlook is shocking: the trend that by 2045, ninety per cent of all marine life may be lost compared to 1970 (and ninety-nine per cent compared to 1900). The ocean as a food source, as a climate regulator (think of carbon dioxide absorption or the Gulf Stream), the basis of temperature regulation and weather systems and all ecosystems is in immense danger (*https://goesfoundation.com/*).

Information professionals can make an important contribution to everything related

to nature. Think of drones to monitor wild animals or rainforests, translating the right data so that the scientific discourse on various topics in the field of climate and the living environment is based on correct data (Van der Zwan & Asscheman, 2024). And contributing to facilities that are more sustainable in all aspects of their life cycle and generate as little waste as possible.

Health. About data, robotics and DNA

If there is one sector where the dilemmas are very tangible, it is healthcare. In the European context, it is striking that investments are being made in providing access to one's own (!) medical data, a process that will continue until 2030. The Netherlands is certainly not a frontrunner, ranking 22nd out of the 27 countries in the study (EU, 2024). Access to this information must be viewed in the light of the discussion on whether medical institutions should be allowed to share patient data without prior consent – a proposal from the EU itself: the European Health Data Space (EHDS). This proposal is part of the European data strategy and is an elaboration of the Data Governance Act and the EU Data Act. Everyone will agree on the importance of data: people have a right to information about medical protocols and information that concerns them. And the importance of researching trends and finding explanations for disease patterns or causes of death is evident, as Dutch Dr. Wendy Mittemeijer (Voorn, 2022) and British Dr. John Campbell regularly emphasise in articles, on social media and on screen (see, for example: *https://www.youtube.com/watch?v=-ej5Se4gMRA*).

When it comes to health, it is also about tools for doctors and patients. A prosthetic arm that allows its owner/user to play the violin: Japanese Manami Ito opened the Tokyo 2020 Paralympic Games with it. The costs are high, and sometimes a successful experiment has to be discontinued, such as the case of Rita Leggett's brain implant in Australia (Hamzelou, 2023). Since 2015, we have been reading about experiments involving the implantation of chips in people: NFC chips in this case in employees of Epicentrum in Sweden. Neuralink has now reached the stage where it is allowed to experiment with chip implants in the brain. This is the next step in the field of brain-computer interfaces. If this does not raise ethical questions, then the future use of artificial wombs certainly will. Experiments are in full swing at the University of Michigan (Willyard, 2023).

Technology also works on another level. We now have small robots that can deliver medicines to cells, making the use of medicines many times more effective and efficient. The Max Planck Institute for Intelligent Systems is conducting research into this. You can read more about it at *https://robohub.org/*. AI can also be used to predict what a person needs, even before the disease is visible: *predictive medicine*. And it can be even more precise: with CRISP technology (Clustered Regularly Interspaced Short Palindromic Repeats), genetic abnormalities can be repaired, even in the embryonic phase (Regalado, 2023). The impact is enormous, and the ethical issues are perhaps even greater. Because if DNA can be modified, including pieces of viruses, it can be used to make people more beautiful and better, but also sicker (*Mallapaty*, 2023).

Education. About creativity, learning resources and skills

7 January 2007, Sir Ken Robinson gives a famous TED Talk that has now been viewed almost 24 million times. A speech about how our school system no longer meets the needs of children and how the system undermines creativity. 2025: what steps have we taken so far? What is certain is the use of technology in the classroom and lecture hall. Apps to analyse and improve your presentation skills in real time. Access to multimedia textbooks and teaching approaches and support so that more pupils and students receive tailor-made education. Personalised and tailor-made learning pathways. In addition, accelerated attention will be given to dealing with generative AI. Without good prompt engineering, clear questioning and clear analytical skills, it is currently impossible to assess the value of the output of these tools. But additional tools are sure to be developed for this purpose as well. Education is high on the list of priorities for various global organisations and NGOs. Education provides opportunities, prepares people for a changing world and reduces the gap between 'rich' and 'poor' (Bonfert & Wadhwa, 2024).

In 2025, Europe will focus on the European Year of Digital Citizenship Education. This once again highlights the importance of 'lifelong learning'. This also expands the scope of the European Commissioner for Education. The ambitions are high: reducing discrimination, upholding human rights and protecting democracy. Access to information is of great importance in this regard. Anyone who creates resources to provide access must incorporate simple access into the design: Human Centred Design. This also means that all users need more skills to use that access. Digital skills are

still too limited among a large part of the population (see: *https://www.oecd.org/en/topics/digital-skills.html*). This carries many risks, because before you know it, someone is looking at a *junk site* that is mainly there for the advertisers, and not to help the visitor (Ryan-Moss, 2023).

Government. On the state of implementation and policy lines

The tide is turning this is the picture painted by Herman Tjeenk Willink in his book (Willink, 2023). It accurately describes the current state of implementation. In his speech on 16 May 2023, he once again sharply addressed this issue:

> In my reflections on the functioning of the government, implementation plays an important role. The professionals in the field – from general practitioners to tax office employees – are the link between the reality in The Hague and the social reality in which citizens live. They have a wealth of knowledge and experience. However, their capabilities and limitations are rarely considered in The Hague. Many of their problems can therefore be traced back to decisions made by the government and parliament: conflicting political demands, budget cuts, increased workloads, reorganisations, privacy regulations, etc. But when things go wrong (as is almost inevitable), the finger of blame is pointed at the professionals on the work floor and their organisations.' (see: *https://beroepseer.nl/*).

Information professionals are found in all kinds of places within the government and can make a real contribution to improving legislation, policy and implementation. The challenges are considerable, as reports from the WRR, the Council of State, the Rathenau Institute and the Council for Public Administration (ROB) demonstrate. Organising transparency, implementing the Public Records Act and the Open Government Act: we have not yet reached the vision of i-Government as described by the WRR in 2011 (WRR, 2011). A few examples — by no means exhaustive — speak for themselves:

- Organising transparency, implementing the Public Records Act and the Open Government Act (Woo): the visions of e-Government as described by the WRR in 2011 have not yet been implemented (WRR, 2011).
- The way in which the guidance provided by the Advisory Division of the Council of State on 'Digitisation. Legislation and administrative law' can and must be implemented. They indicate that digital technology should be involved at the

earliest possible stage in the legislative process. A possible approach is already under development, with a history dating back to around 2000: legislative analysis, in which traditional legislators and lawyers work together with IT specialists, technicians, implementation experts, knowledge modellers and software developers.

- The way in which the House of Representatives should focus on the needs of citizens in legislation. At present, ICT is too often and too much about improving the efficiency of the government and good business practices, as the ROB already mentioned to the House in 2013 in the report *Van wie is deze hond*? (Whose dog is this?) (ROB, 2013). In this task, the government must also safeguard the privacy of society. Because data files do exist, but linking files without legal basis is not allowed. Although it can sometimes be very tempting.
- The way in which the government protects its citizens, for example by keeping out increasing cyber violence as much as possible, protects its own institutions and agencies, and implements European laws and directives, including the GDPR and NIS2. Whereas other regimes pay their officials to help carry out cyber-attacks in a '9 to 5' job (Eigenraam, 2023).
- The way in which the government involves citizens and businesses in the latest technological developments, for example in the field of Generative AI, and formulates a policy vision on this.
- The way in which the Dutch government relates to large and very large profit organisations that operate on the global stage with more resources than the average state actor. Sometimes as companies, sometimes through global charities or collaborative umbrella and interest groups. It is often easier for these companies to relocate and then simply continue their activities.

Access to information: about libraries, archives and information management

The work of libraries, heritage organisations and archives can be linked to the International Cultural Agenda 2030, but certainly not exclusively. The International Federation of Library Associations and Institutions (IFLA) and various other (UN-affiliated) organisations have endorsed this agenda. At European and national level, subsequent initiatives are closely aligned with it through strategies, work plans and

activities. Themes such as democracy, culture and access to information all play a role in this.

Libraries have undergone an enormous transformation in recent years, in many respects. Buildings are often iconic pieces of architecture, and within their walls, attention is paid to digital skills and training, issues surrounding AI, assistance in searching for authentic and validated information, and help with setting up research (*Mumenthaler, 2023).* Libraries unlock archives, interpret archival material and help to contextualise the sources found. In many countries, libraries are also developing into places that play a central role in building the local community, often by interpreting the link to the origins and cultural identity of library visitors (IFLA, 2024).
Archives play an important role in society's information position. Friedewald et al. (2024) researched developments and indicate that, precisely because so much is being digitised, archival approaches are essential. The so-called *total* recall approach of storing everything forever is not a sustainable solution, in both senses of the word. Some governments are already talking about the 'dark years': the period from 2000 to 2025, during which petabytes of emails and process information are stored on servers without any metadata or possibility of structured searching (Enthoven, 2021). Archives are and will remain necessary as a safeguard for institutional traditions and their embedding in the cultural fabric of society, ensuring the long-term functionality of documents and data, the possibility of storing physical, non-digital copies, preserving the historical and information technology context, and the ongoing task of migrating document formats.

The bridge between archives, libraries and the operational processes of (government) organisations is built by documentalists and documentary information professionals. There has been an ongoing discourse for some time about the future of the profession of the original DIV professional (ICTU, 2018). The future vision for the Government's Information Management makes it clear that the world of specialists is undergoing some fundamental changes (RDDI, 2020). Advisory competencies (i-support/service provision to the primary process), research, analysis and innovation, as well as supervision and quality, will then be the new elements of the field. This will also create overlap with other existing job profiles, such as those of the functional manager, the process and information analyst, the project manager and the information manager. In short, the field is beginning to overlap with other fields, and

competencies are becoming increasingly similar.

- Everything is information... and everywhere you go, you encounter the influence of the information professional. In a changing world, in every conceivable sector. Whether it concerns the government, education or the tools for producing clean energy.
- It is interesting to examine the role that information professionals play in the performance of their work. It is precisely in that work that the potential dilemmas and ethical issues become apparent.
- The playing field is large – and with that, the responsibility of the information professional is large, interesting and challenging!

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Digital innovation in the agri-food sector

Cor Verdouw

The Dutch agriculture and food sector is an international leader. At the same time, the sector faces the enormous challenge of feeding the growing world population with sufficient healthy and safe food within the limits of our planet. This chapter outlines how digital innovations contribute to this. It discusses what makes digitisation in agri-food special. It then introduces innovative applications of several digital trends, namely precision agriculture, *tracking* and *tracing*, sensors, drones, satellites, robotisation, AI, blockchain and *data spaces*. The chapter concludes with a number of challenges for the future.

Introduction

Agriculture has been in the news a lot recently. The nitrogen crisis dominated the front pages and remains a hot topic. Amidst all this news, it sometimes seems to be overlooked that Dutch agriculture and horticulture are world-class and of essential importance to society. This was beautifully expressed and illustrated in an article in *National Geographic* entitled *This Tiny Country Feeds the World* (Viviano, 2017). Dutch farmers are among the most productive in the world. Despite its small size, the Netherlands is the second largest exporter of agricultural products in the world after the United States (Berkhout et al., 2023). Dutch seeds are used all over the world for growing vegetables. The Netherlands submits by far the most applications for plant breeders' rights in Europe (45 per cent, Plantum 2023). The sector is also making great strides in terms of sustainability. Modern greenhouse vegetable growers now use very few chemical pesticides (CLO, 2022). Dutch companies are international leaders in the development of biological pesticides.

This leading position is not a given. There are enormous challenges, especially in the area of sustainability (WUR, 2025). Climate change is one of the greatest challenges

of our time. To achieve climate targets, we must drastically reduce nitrogen and greenhouse gas emissions from agriculture. Given the growing world population, this is an enormous task. By 2050, we are expected to feed ten billion people, and we must do so within the limits of our planet. This is achievable, but it requires a radical change in both production and consumption.

When it comes to consumption, safe and healthy food is not a given, to say the least. Food safety is certainly a continuous challenge internationally. And in industrialised countries such as the Netherlands, healthy eating is difficult due to the abundance of high-calorie, high-sugar and high-fat foods, combined with a modern lifestyle. In addition, biodiversity is under pressure. This is worrying because the complex interplay of different species of plants, animals, bacteria, fungi and ecosystems ensures that the world around us continues to function properly. Biodiversity acts as a 'safety net' that maintains the resilience of our planet.

In short, the agriculture and food sector faces an enormous challenge. This requires a radical transition of the entire food system through a combination of organisational, social and technological innovations. Data and digitisation play a crucial role in this. Detailed and timely data from all parts of the food system provide insight into where sustainability can be improved. Data also clarify how effective interventions are. In addition, *real-time* data make it possible to take immediate and proactive corrective action. Satellite images and drones, for example, help farmers to identify crop growth and pest infestations at an early stage. Data also offers opportunities in the food chain, such as *real-time* monitoring and adjustment of food quality, thereby reducing food waste. Or monitoring the *carbon footprint* of food production, enabling companies to improve their sustainability and consumers to make conscious choices for a low *footprint*.

What makes digital innovation in the agri-food sector special?

Digital innovation in the agriculture and food sector faces similar challenges to other sectors. At the same time, there are some specific characteristics that make data and digitisation special (Verdouw, 2010). Food is not only an important basic human need, but it is also a 'living' product that depends on complex natural production processes. Food production is highly dependent on weather, soil, water, climate and other natural resources, which means that yields and quality can fluctuate greatly

and are seasonal. As a result, farmers must constantly adjust their cultivation plans and reschedule activities. Digital technologies play a crucial role here. For example, ICT enables farmers to collect *real-time* information about the climate, soil conditions, diseases and crop growth. This allows them to predict when crops are best harvested and what actions are needed to maximise yields.

Food is a perishable product. In fresh produce chains, food must be transported quickly and efficiently to the consumer to prevent quality loss and waste. For example, freshly caught fish from the Netherlands can be found in a fish shop in Southern Europe the very next day. This poses an enormous logistical challenge, as perishable products must be transported quickly. ICT is an indispensable tool in this regard. Advanced tracking and tracing systems can, for example, monitor the temperature, humidity and status of the product during transport. They can also be used to trace the origin of a batch, for example if there is a problem with food safety.

A related feature of agri-food is the important role of certification and legislation. Under European agricultural and fisheries policy, farmers and fishermen must share detailed information with the government. About food safety, the European General Food Law imposes requirements on all links in the food chain, from the farmer to the consumer. Furthermore, all producers must have a certified quality system such as HACCP, FSSC22000 and BRC for processed products and GlobalG.A.P. and IKB (Integrated Chain Management) for primary products. In addition, there are many different certificates and quality marks for sustainability and quality, such as the EKO quality mark for organic products, Beter Leven, Fairtrade, Milieu Programma Sierteelt, Marine Stewardship Council, and Rainforest Alliance, to name a few. And the requirements for reliable and validated sustainability information are only increasing. In the fishing industry, for example, a new European control regulation will come into force in a few years' time, requiring fishermen to have cameras on board. And for products such as cocoa and coffee, it will be necessary to demonstrate that no deforestation has taken place from 2026 onwards. ICT is indispensable for ensuring *compliance* with all the regulations, certificates and quality marks.

A complicating factor here is the complex network structure of food chains, in which many small and medium-sized farmers and food companies collaborate with large multinationals. In developing countries in particular, the sector consists of many

small farmers, which makes the adoption of technology and digitisation difficult. Digital solutions must be affordable and easy to use. There is also a digital divide between small, conservative farmers on the one hand and innovative pioneers and capital-rich large companies on the other. At the same time, farmers are often well organised in cooperatives and sector organisations, which encourages cooperation in digital innovations. Sector organisations also play an important role in digital standards and data sharing *governance*. Furthermore, the input industry is also an important player in the agricultural sector, as it provides farmers with genetics, seeds, animal feed and agricultural machinery. They often help small farmers with digital tools such as simple farm management systems, digital trading platforms and decision support systems.

Some of the characteristics mentioned above hinder the adoption of digital innovations. One example is that the sector has lagged far behind in the implementation of integrated business management systems, because ERP systems did not sufficiently match the dynamics of the sector and were not manageable for small farmers (Verdouw et al., 2015). However, the specific challenges in the agri-food sector are mainly stimulating. As a result, the agri-food sector is surprisingly at the forefront of embracing new digital trends. The following section provides several inspiring examples of this.

Digital innovations in agriculture and the food industry

Since the advent of computers, digitisation has played an important role in agriculture. In the 1980s, the first software systems (sometimes as 'hobby projects') for decision support, registration and economic calculations were developed. In recent years, digitisation has gained momentum, mainly thanks to rapid advances in ICT (Wolfert et al., 2021). Technology is not only becoming more advanced, but also more accessible and affordable. At the same time, there is a growing urgency to combine productivity and efficiency with sustainability, making digitisation more important than ever. The sector is therefore 'buzz '. A complete overview is impossible but below is an outline of a number of developments to give an impression of digital innovations.

Precision agriculture

Precision agriculture involves the highly accurate monitoring, control and treatment

of animals, crops or square metres of land. This is made possible by a combination of different technologies such as GPS, sensor technology, satellite data, drones, decision support systems and robotisation. For example, a farmer can use drone data to see where crop growth is lagging behind. This data is then translated into a task map for the fertiliser spreader, which only fertilises where it is needed. In livestock farming, RFID technology is already widely used to tailor the amount of concentrated feed to each individual cow. Another example is that fruit growers can thin the blossoms on specific parts of a fruit tree based on camera images. Precision agriculture can make an important contribution to sustainability because it requires fewer inputs such as fertilisers and crop protection products.

Tracking and tracing

Tracking and *tracing* is mandatory in food chains. This starts with automatic identification via barcodes or RFID chips, for example the ear tags of pigs. There are increasing possibilities for identification via unique physical characteristics or DNA. For example, cows can be distinguished from each other via a nose scan, similar to a fingerprint in humans. In addition, sensor technology and AI are increasingly being used to verify the authenticity of origin. DNA sensors can be used, for example, to check whether olive oil really comes from the area stated on the packaging.

The General Food Law only requires companies in the food chain to be able to trace one link back and one link forward. There are an increasing number of chain-wide systems, although *end-to-end* traceability remains a difficult task, especially for processed food products. Many of these systems combine traceability with information about sustainability or quality.

Sensors

Many different sensors are used in the agri-food sector. For example, pig farmers use microphones in the barn to measure the coughing of the pigs. Dairy farmers monitor the health of their cows with smart collars. Arable farmers use advanced cameras on drones to monitor crop growth and predict yields. In recent years, many sensors have become more advanced, more affordable, and easier to use. Moreover, the development of more advanced sensors is currently progressing very rapidly. Near-infrared sensors, for example, can already measure the ripeness and internal quality of fruit. All kinds of innovative biological and chemical sensors are being developed, such as

lab-on-a-chip systems that eliminate the need for costly laboratory tests. Sensors are also being developed that measure taste based on volatile substances. The Wageningen-based start-up InsectSense is developing taste sensors with *Tongue-on-Chip technology,* inspired by the senses of insects. The OnePlanet institute is working on the Nitrogen Box, a *sensor network* for *real-time* insight into nitrogen emissions. Many of these developments are still in their infancy but are expected to make an important contribution to addressing the challenges facing the agri-food sector.

Drones and satellites

In addition to sensors that mainly perform 'spot measurements', agriculture also uses *remote sensing* techniques to obtain a complete picture of a plot of land. *Remote sensing* is the observation and collection of information without direct contact, usually via satellites, drones or mobile platforms such as autonomous robots. These systems are equipped with cameras that can record not only 'normal' images, but also light reflections in different spectra, heat or radio frequencies. The possibilities are endless. For example, VanderSat creates soil moisture maps based on satellite data, which can be used to analyse land use, vegetation, water quality and climate change. NEO offers crop monitoring that provides insight into factors such as emergence date, crop closure, flowering and variation within a plot using satellite images. The Utrecht-based company Satelligence uses satellite data to show whether cocoa, coffee or other products have been produced without deforestation. And where satellite data is insufficient, drones or autonomous *sensing platforms* are deployed. Not only outdoors, but also in greenhouses. For example, Corvus drones can be used to measure the germination rate of seedlings and PATS drones can be used to combat moths. Drones are not only used for measurement, but also for taking action. For example, there are drones for sowing and for precision spraying. And Koppert Biological Systems has a drone that releases biological control agents, such as predatory mites, at exactly the right place in a greenhouse.

Smart machines and robotisation

This involves the specific and automated control of machines, tools and other systems. Many tasks are already highly automated. Think of milking robots, cutting robots in horticulture or advanced sorting machines. The sector is now putting a lot of energy into developing robots for more complex tasks, which currently require a lot of labour and are often seasonal. Examples include harvesting fruit, vegetables or

flowers. Finding enough people to do this is becoming an increasingly pressing problem. Furthermore, the development of autonomous systems is progressing rapidly. Greenhouse horticulture is already well advanced in autonomous cultivation systems that are controlled remotely and in which climate, lighting and irrigation are automatically optimised. This allows growers to concentrate on managing their businesses. In arable farming, swarms of small autonomous robots will replace heavy tractors in the future. Artificial intelligence (AI) is an important driver of this development towards smart, autonomous systems.

Artificial intelligence

AI is not new to the agriculture and food sector. The first AI applications were expert knowledge-based, logical advisory systems to support farmers in their decision-making. With the emergence of *machine learning*, these applications have become increasingly data-driven. Today, AI is deeply embedded throughout the agriculture and food sector (Sharma et al., 2022). An important area of application is *computer vision*, where *deep* learning models are used to monitor crop growth, detect pests and diseases, control weeds, sort agricultural products, assess crosses in the breeding process, control agricultural robots and many other applications. Other techniques, such as generative AI, are still being used experimentally in agriculture. Although the possibilities are promising, most commercial applications are still in an exploratory phase.

Blockchain and data spaces

Data management plays a crucial role in all these innovations. Sensors and *remote sensing* systems generate large amounts of highly varied data. AI is a powerful tool for extracting useful information from this data to control production and chain processes, including with robots. It is essential that data management runs like a well-oiled machine, that data can be easily exchanged between systems, and that reliability, timeliness and security are guaranteed. In the agriculture and food sector, centralised data platforms or direct links via digital messages and APIs (*point-to-point*) are currently used for this purpose. In addition, many blockchain initiatives were launched during the hype that began in 2016. Many of these have since been discontinued, but it is encouraging to see that there are now several mature applications with blockchain under the hood (Van Wassenaer et al., 2021), including in the areas of chain traceability and sustainability data.

Data spaces are the most recent development in this area. Data spaces offer a flexible and decentralised way of sharing data, whereby users retain control over their own data: data sovereignty (Otto et al., 2016). They were developed in response to the dominance of large data platforms and the risks of *lock-in* and loss of control over data. Data sovereignty is very important in agriculture. Many farmers are afraid of losing control over their data and are concerned about privacy and security (Šestak & Copot, 2023). In Europe, the development of *data spaces* is driven by the EU data strategy, which aims to create a single European data market. The goal is to create a level playing field for data exchange between sectors, which stimulates innovation and economic growth.

Within the Digital Europe programme, sector-specific *data spaces* are being developed, including for agriculture. The emphasis here is on interoperability and the creation of a common framework of principles and services. An important initiative in this regard is the AgriDataSpace project, which aims to create a secure and reliable *data space* for agri-food systems in Europe. This project has laid the foundation for the Common Agricultural European Data Space (CEADS), which will be developed from 2025 onwards.

Challenges for successful digital innovations in agri-food

These are just a few *highlights* of the many digital innovations in the agriculture and food industry. These technologies and applications are all valuable pieces of the puzzle for tackling the major challenges described at the beginning of this chapter. An integrated and holistic approach is essential for success. The focus should not be on the technology, but on its application and, therefore, the user. Digitisation and data-driven agri-food are radically changing the way we work. Broad adoption starts with awareness of the impact and benefits of data and digitisation. It is therefore important to encourage a digital *mindset* and improve digital skills. Many digital innovations in the sector still focus too much on technology. This is not an end in itself, but a means to improve sustainability and deliver added value to end customers.

Furthermore, trust in data and digitisation is essential for the success of digital innovations. There are widespread concerns about the transparency of sensitive data, data ownership, privacy and security. There are also questions about the ethical

implications of new technologies such as AI. For example, how can you prevent digitisation from making small farmers dependent on large multinationals or even excluding them from international markets? How can you prevent food companies from making wrong decisions based on unreliable predictions? Or prevent consumer behaviour from being manipulated with AI-generated misinformation about food? Legislation and regulations, such as the European AI Act, Data Governance Act and Data Act, provide important frameworks. Careful consideration of ethical risks is crucial for the acceptance and responsible application of digital innovations (Van Hilten, et al., 2024).

Finally, digital innovation too often results in very cool but isolated applications. To make a real impact, they must be well embedded in business processes. This requires seamless collaboration with other applications and underlying larger information systems, such as ERP systems, that companies already use. Integration is a persistent challenge, including in the agri-food sector. Interoperability of systems is only possible if they speak the same language. The sector has therefore been working on information standards for years. Semantic standards and harmonised metadata, which are widely used and well embedded internationally, are a particularly complex task. Generative AI offers promising opportunities to make progress in this area.

- Data and digitisation play a crucial role in the transition to a food system that is capable of feeding the growing world population with sufficient healthy and safe food within the limits of our planet.
- Digital innovation in the agriculture and food sector faces specific challenges, including dependence on complex natural processes, perishable products, specific regulations and a complex food chain in which small farmers and businesses collaborate with multinationals.
- Many digital innovations are taking place in the sector, such as innovative applications of precision agriculture, *tracking* and *tracing*, sensors, drones, satellites, robotisation, AI, blockchain and *data spaces*.
- Digital innovations in agri-food require an integrated approach, with a focus on application and user. A change management approach and careful consideration of ethical risks are crucial for acceptance . Success depends on broad adoption and integration with existing systems, with standards and AI helping to improve interoperability and increase impact.

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pAIn = gAIn

Tim Postema

Opportunity or threat. *Pain or gain*. We all have a glass half full or half empty opinion about the rapid advance of AI, particularly perhaps about the application of *large language models*, especially in healthcare. Whether it will be the end of the world or make our lives much easier, what is more important is how we deal with those opportunities and threats from today onwards. Learning from pain and limitations is pure gain. Particularly in healthcare, where we suffer en masse from a serious form of pilotitis, we sometimes forget to take on board the lessons we have learned from the upscaling of digital applications in the past. Over the past few years, we have already thought very hard about digitisation at national level. In the National Vision and Strategy for the Health Information System, we identify three fundamentals that need to be worked on to ensure good health information: defining control, safeguarding trust and working on data availability (VWS, 2023). Trust in reliability is crucial for rapid integration into our healthcare system. And that trust requires control, control over the widespread availability of reliable algorithms and their application. Let's take a smart look at the application of AI in healthcare based on these fundamentals.

'Mr Jansen, thank you for your question! I hope you had a nice holiday and that you were able to relax with your wife, son and daughter. You indicated that you were not feeling entirely well at the end and thought that this was due to your diabetes. I have taken a look at the measurements and, for now, no adjustment to your insulin is required, so please do not worry. If you still feel concerned, please do not hesitate to contact us again.

Kind regards,
Paco, your personal virtual assistant

Not so long ago, it was completely unthinkable that AI would be able to communicate

with patients from a hospital in the manner described above. Now we are not far from this. In Groningen, non-medical questions are already being answered with the help of AI, as is the case in a number of other places around the world (Kruse, 2023). And it turns out that the communication is considered clearer and, above all, friendlier than if the answer had been written by a human being. Incidentally, I think that eventually we will reach a point where we will find this impersonal again and the feigned interest in your holiday will quickly be thrown overboard. This fits perfectly into a *hype cycle* of interesting novelty to ultimately higher expectations.c

But it sounds promising, of course, and it won't be long before medical questions can also be answered in this way, with an AI view of the file, measurements and medication, all without the intervention of a doctor. Of course, this has many advantages, but when we think about it a little longer and look beyond this application, we need to pay attention to the lessons we have learned previously in healthcare with disruptive technologies. Among other things, that it leads to new applications than we had initially anticipated and is often accompanied by system change (focus on health rather than care).

I already mentioned the *hype cycle*; that we are going to be somewhat disappointed because AI cannot fully deliver on its promise. I mainly see that we are in the phase that is so typical of disruptive technology. We are busy exploring which problems we can solve with the solution. Even though that sounds like a mortal sin in ICT (always start with the question, ICT is supportive!), Cruijff or Van Gaal would say you don't know what you don't know. So let's try it out. But arm yourself against pilotitis. The basis for doing this properly is perfectly in line with the fundamentals of the National Vision and Strategy: trust, control and availability. If we all commit to this, we will be working in a truly *smart* way.

A matter of sufficient confidence in reliability

If you trust an app because it meets your expectations and you understand the risks a little, you will use it intensively, not always rationally. Think of the rise of Signal because WhatsApp previously did not have end-to-end encryption. When applying algorithms, a common adage is 'if the algorithm is transparent, we trust it more'. Although that sounds very logical, and we now even have an algorithm register at the government, it is mainly about sufficient understanding of the risks. And that

trust ultimately follows from the reliability of the results, rather than how it all really works (technically). Few doctors know exactly how an MRI scanner works, what helium is used for, and how the magnets provide insight into soft tissues. Doctors often know that an MRI scanner with a higher Tesla number produces better images. This *black box problem*, not being able to know or follow exactly how something works, often leads to an even greater call for and hunger for transparency. Instead, the Swedes argue in a powerful article, the focus should be on the reliability of algorithm outcomes in the context in which they are used (SMER, 2020).

Because we have seen and experienced it and because it is becoming a concept. We learn from the outcomes through use and from the times when things go wrong. Where is the tipping point for sufficient confidence in the outcomes? How often is it acceptable for things to go wrong? There are clear *outliers*, such as the problems with sleep apnoea devices mentioned earlier, but where exactly is that line? As citizens, we are also increasingly becoming operators of medical technology rather than being subjected to it, as is the case with a CT scanner.

We are discovering this together, also in the example of AI-generated communication. Based on outcomes. We like to still have a sense of control over new things, such as a chatbot that formulates answers for you. As *the man or* woman *in the middle*: before we send the message to Mr Jansen, we want to see it and send it ourselves at the touch of a button. If you ask me, it's only a matter of time before the first requests are made to remove that annoying button (all those extra clicks). Because it's almost always right the first time. That unpredictability in outcomes or the current hallucinations are really disappearing more and more. And while we often say that AI will mainly continue to support healthcare providers in their decision-making, I believe that we will also see real change in this area. We now also trust moetiknaardedokter.nl and thuisarts.nl to make choices without immediately calling the GP.

Speaking of trust: at Elizabeth TweeSteden Hospital, *large language models* (LLMs) are working hard instead of doctors to summarise file information in a few lines. This is no luxury when it comes to keeping track of all the huge amounts of data coming their way (and that will only increase, because we are all working to create even more data and make it increasingly available...). And what do you know? That AI is doing a damn good job. Trust in summaries compiled manually by doctors was

just as high as trust in those compiled by AI (77% versus 81%) (Schoonbeek et al., 2024).

The UMC Utrecht is investigating how often the algorithm is wrong in radiology by double-checking assessments made by algorithms and by human experts, i.e. radiologists (*NRC*, 2019). This also provides insights into why mistakes are made, so that adjustments can be made to increase trust and reliability. We have a deep-rooted trust in human judgement and, strangely enough, we place stricter demands on algorithms than on the people who design or build them.

Trust in the outcomes and trust in those who provide that trust or who have tested it (for example, we generally trust academic hospitals in the Netherlands with the same information system). That is where we need to focus our efforts in the coming period.

Establishing control over responsible use

We need to organise and set standards for what outcomes we consider good enough and how many hallucinations or false positives or negatives we accept. Just as we do for medical equipment. That sleep apnoea device or that MRI scanner. What are the checks at the front end, in the interim and for follow-up of errors? And who decides that? Yes, the application of AI and LLMs will be disruptive in healthcare. But that does not mean that we must organise control over application in a disruptive way – we already have many existing structures and instruments that can be made applicable for this purpose or already are. We have already given a lot of thought to how we can guarantee safety for medical devices. And of course, not everything is a perfect fit, but many characteristics are the same. The primary focus should be on managing learning. That is the phase we are in now. Bringing together outcomes, providing insight into the conditions for trust and also helping to clarify the risks and opportunities.

Availability of possibilities

It is only a small leap from data availability to AI availability. More available, good-quality healthcare data leads to better-functioning and meaningful algorithms with more reliable outcomes. But as described earlier, we are in the 'solution seeks problem' phase, so we need to scale up what works among all that does not work.

Preventing pilotitis means already thinking about a strategy for widespread use. Several initiatives are already actively working on this at the national level, such as the Expertise Centre for Healthcare Algorithms (*https://zorgalgoritmen.nl/*). This is a great initiative that deserves an even more prominent role in making knowledge about algorithms and applications more widely available in healthcare.

Because just like having an MRI scanner in a hospital, having a patient-friendly chatbot will soon be the norm. Or as is sometimes said: AI is not better than the radiologist, but the radiologist who uses AI is better than the one who does not. Discussing what is still needed to achieve this, persuading healthcare organisations to perhaps make it mandatory or to purchase it as part of good healthcare, requires leadership. But also: how do we prevent a potential *battle* of the LLMs that could hinder widespread application or lead to differences in quality of treatment across healthcare institutions? Where we suddenly find ourselves locked into the LLM model that is a standard part of your information system. Thinking about these kinds of issues now and engaging in open dialogue with everyone who is currently learning will help to build trust. As a prerequisite for availability.

A little AIptimism, please

As an AIptimist, I believe in the enormous value of applying AI, not only in helping healthcare providers or answering questions from patients, but also for health. AI can already help us live our lives the way we want to live them and help us prevent illness and stay healthy. Take, for example, the start-up Thrive AI Health, which will use AI to help change personal behaviour to live healthier lives (Hagen, 2024). A personal coach who will help with relationships, sleep, fitness, stress and healthy eating. Personalised.

And that is, of course, very welcome given the forecasts of huge cost increases and mounting staff shortages. A little faith also gives us the confidence and energy to remain curious and exploratory. The focus on and discussion of when we trust reliability enough is a social debate. But let's see the risks as gains, embrace them, share them and learn from them. So that we can weigh up what we think of them together and for ourselves. Just as we do when using TikTok, WhatsApp or Gmail. And for that, we really don't need to know exactly how everything works under the bonnet.

- Trust in the reliability of algorithms is the key to making AI work for health
- Avoid pilotitis, work together and divide the work
- The boundary for the ethical use of AI is where we end up in the public debate and precedents

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Digital space for health: enter at your own risk!

Gabrielle Speijer

'A system is not the sum of the behaviour of its parts; it is a product of their interactions.'
Russell Ackoff

In the digital age, outdated financial and administrative infrastructure undermines the doctor-client relationship and effective healthcare provision. Personal data is increasingly being digitised, but it is managed by institutions rather than individuals. This means that people have no control over their own (medical) data and interaction between doctors, institutions and clients is only supported to a limited extent. Current innovations and the management of the explosive growth of information from various domains require reliable data, and this needs more attention. The current digital setup, which does not focus on the doctor-client relationship, prevents sustainable cross-sectoral data utilisation. Increasing social challenges such as ageing, staff shortages and climate change reinforce the urgency of addressing this problem.

It is therefore time for a fundamental review of our digital healthcare infrastructure. A digital space that takes the professional value of the doctor-client relationship as its starting point and facilitates cross-sectoral collaboration can, as Ackoff suggests, lead to a more people-centred approach to healthcare and to unprecedented breakthroughs for global health in the digital age.

Such a digital space can therefore be defined as a virtual environment that can connect people and technologies in a potentially unlimited way to create, build and utilise knowledge and carry out numerous digital activities. It encompasses both the space for technology and that for data.

Passive digitisation without fundamental changes

The healthcare landscape worldwide has undergone passive digitisation; whereby existing processes have been 'digitised' without fundamental changes. In clinical practice, documentation systems are used that were originally designed for administrative and financial tasks. Health information is distributed across different systems, making it difficult for both doctors and clients to know where specific information is located. In practice, this can mean that a client with a chronic condition has to explain their medical history again at every hospital visit.

Despite various good initiatives, the current digital space leads to unnecessary administrative burdens for doctors, sometimes duplicate examinations are carried out, and this can even be harmful to health because information is not available (in a timely manner).

Fragmented knowledge and lack of overall insight

Despite all the technological advances in recent decades, more than 80% of health-related data is still missing in clinical practice. At the same time, clients and society expect doctors to provide reliable health advice and treatment. Nor does our own health-determining data appear to be readily available to help us gain more control over our health. Table 1 shows an overview of various domains and the related health-determining data and how certain factors influence them.

Meanwhile, there is a proliferation of apps, portals and other technological gadgets on the market, but their development often takes place independently of clinical practice. In the best-case scenario, this technology therefore provides limited added value and sometimes even poses a (serious) risk to health. The increase in AI models that affect health will put even more pressure on the use of shared expertise between doctors and clients. However, to provide this guidance, health- -determining data must first come under shared management. In addition, healthcare is becoming increasingly super-specialised, with domains often being studied separately and knowledge remaining fragmented. As a result, clients often wonder who still has an overview of their health, and data remains relatively limited in terms of interpretation and therefore value. The same paradoxical effect can be observed in medical guidelines: keeping up is increasingly challenging, with the result that the vast majority remain insufficiently substantiated. Although technology provides access to a

wealth of information, this does not automatically mean that people are well informed.

Omics domains	Definition	Data	Clinical analysis	Determining factors
Proteome	Provides insight into biological processes	Protein analysis	Rarely routine	**Lifestyle:** diet exercise alcohol consumption smoking sleep patterns **Biological:** hormones age genetics **Environment:** stress air pollution electromagnetic fields temperature oxygen content **Socio-economic:** level of education Other: toxic substances mechanical stimuli nutritional deficiencies **Medical:** medication infections
Epigenome	Complex system that determines how genes are expressed	Epigenetic analysis	Not routine	
Exposome	Total exposure to which people are subjected throughout their lives	Detailed information about lifelong exposure	Not systematic	
Transcriptome	Provides a snapshot of gene activity in a cell or tissue as a crucial link in gene expression and cellular function	RNA sequencing and transcriptome analysis	Mainly in research settings	
Microbiome	All microorganisms in the body	Culture and analysis of bacteria, fungi, viruses, archaea	Not routine	
Genome	Genetic composition	DNA 23 pairs of chromosomes, 3 billion base pairs, 25,000 genes	Not routine	
Metabolome	Biochemical status	Blood tests for e.g. glucose, cholesterol, etc.	Limited availability	
Physio	Physiological characteristics of genes, proteins, and their interrelationships	Blood pressure, heart rate, respiratory rate, gait pattern, muscle strength, etc.	Basically available	
Anatomist	Structure of organs, tissues and cells	Imaging techniques and physical examination	Often available	

Table 1: Overview of different 'omics' domains, their application, and relevant factors that influence health.

Lack of an integrated digital health picture

A complete digital health profile, based on all available health-related data, could radically change healthcare. A smart combination of *real-time* data provides continuous insight into health. This facilitates the transition from incidental care to continuous monitoring and ultimately to predictive and prescriptive analysis. This enables doctors and clients to make better-informed decisions. Despite the available technology, the current fragmented digital environment hinders the effective implementation of this concept.

Lack of control over health data

The current digital space has serious shortcomings, the most significant problem being the lack of control over health data by doctors and clients. This undermines trust and hinders the professional functioning of doctors.

Digital security requires healthcare institutions to take all necessary measures to comply with current standards, without hindering innovation and development through limited data availability. Doctors encounter significant obstacles in both clinical work and innovation, often with the incorrect explanation that 'the GDPR does not allow it'. This creates an undesirable situation that damages professionalism. It is not the GDPR that prohibits the sharing of data; on the contrary, this law provides guidelines on how data can be made available safely.

Given European developments, it is important to act based on shared values such as human rights, privacy and transparency when designing the ICT structure. This means — especially now that the European Health Data Space is being set up — that citizens (together with their trusted doctors) will gain and retain control over data relating to them.

Digital space is dangerously designed

The current digital space in healthcare is not only unattractive, but also risky for care and health. A well-designed digital environment can increase doctors' job satisfaction, improve their performance and promote their sustainable employability. For clients, it can lead to better control over their health and improved outcomes through reduced stress. It is crucial to present health information with the right emotional context, which promotes client 'check-ins' and doctor attunement. This is essential

for effective health collaboration. Research shows that chronic stress or negative experiences can negatively affect health, the 'nocebo effect'. A poor user experience can result in less personal doctor-client contact, overlooking essential information and incomplete medical records. A user-friendly digital environment that offers the client more insight into, for example, tailor-made and explained imaging during the treatment process not only creates peace of mind, but also enables the person concerned to take control of relevant matters in a timely manner. By making smart use of AI technology, such as speech recognition for note-taking, doctors can focus more on the client during consultations, which strengthens the doctor-client relationship and improves the quality of care.

Professionalism under pressure, digital space not designed for it

The increasing digitisation of healthcare is putting pressure on compliance with the Hippocratic oath. This fundamental professional value of the doctor should be reinterpreted in the current context (see Figure 1).

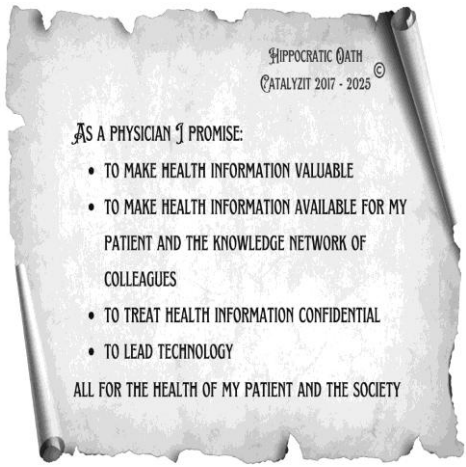

Figure 1: Contemporary Hippocratic Oath

Confidentiality and the promotion of health are compromised by a digital space that is not designed with ethical principles as a guiding principle. This tension between modern technology and traditional medical ethics calls for a careful reconsideration of the design of the digital space.

Impact of the current digital space on the doctor-client relationship

In recent decades, the digitisation process has focused primarily on the institutions and associations in which healthcare is provided. In doing so, a crucial step has been overlooked: the doctor-client relationship, which is based on mutual trust. Communication between doctor and client should be ensured over time as a common thread: open to each other, confidential to the outside world and shared on the basis of dynamic mutual consent. Unfortunately, this is not the case, and the foundation for the digital health space is therefore lacking, with the following risks.

Breach of trust

The crucial bond of trust between doctor and client is at risk of being undermined, leading to poorer outcomes for the client's health. For example, job satisfaction is reduced by an increase in administration due to an excessive emphasis on accountability for the doctor. There is also a risk that the relationship will become more businesslike, in which mutual expectations are no longer automatically aligned.

Restriction of autonomy

There is reduced control by doctors and clients over health data, risks due to the development of all kinds of services and products without input from healthcare professionals and their clients. Reliable data is necessary for these services and products, and continuous expertise and experience are required for the correct interpretation of data ('data curation').

Increasing technological dependence

Doctors have limited influence on technological development, resulting in delayed innovation and high failure rates for new services and products (*valleys of death*). The first *valley of death* occurs when a prototype or concept needs additional funding, but investors are reluctant to invest due to the high risks and long time horizon. This means that developments that are crucial to public health in the longer term run a high risk of being left behind.

The second *valley of death* occurs when scaling up to broad market acceptance, where the product is insufficiently aligned with the market. Developing and steering technology outside the expertise and attention of doctors in the consumer market thus becomes a more attractive route, possibly driven by interests that conflict with the

professional values of doctors and thus have potentially negative consequences for the health of society. On the other hand, it is almost impossible for innovative, strong concepts and products to gain a foothold in the market, which threatens to make the 'big players' even stronger and further fuels the vicious circle of *vendor lock-in*. This dependence on technology not only poses the risk of a lack of innovation, but even a threat to health (care).

These developments pose a threat to the professional freedom of doctors and the self-determination of clients, with potentially serious consequences for the quality of healthcare.

Urgency: address fundamental flaws now!

In the coming years, we will face increasingly complex health issues due to ageing populations, staff shortages, migration-related housing problems and climate change. There is an urgent need for a digital space in which doctors and clients can work safely and freely on health issues while simultaneously innovating with all relevant stakeholders in the ecosystem.

Model MCT as a blueprint

In order to make the digital space for health secure, the following elements — which are closely related to each other — must be taken into account in the design (see Figure 2, the MCT model):

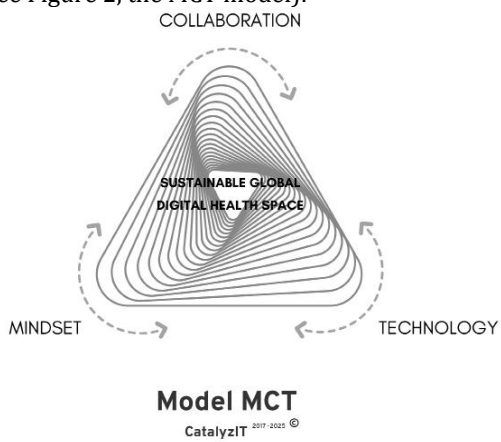

Figure 2: The MCT model

The MCT model shows a fundamental systems approach for a sustainable, learning global digital health space, in which three essential components — *Mindset*, *Collaboration* and *Technology* — are in constant interaction with each other. As a result, innovation, research and the development of products and services are not only implemented, but also sustainably embedded in the cyber-physical health system.

Mindset

- Openness and transparency: everyone contributes based on their own expertise and experience.
- Cross-sectoral collaboration based on shared values, guided by the Hippocratic Oath.
- Continuous learning: flexibility and innovation are central, with a focus on valuable improvements.
- Sustainable use of data: data as a source for health improvement, managed from the doctor-client relationship.

Collaboration

- Trust-based relationships: the doctor-client relationship as the foundation for broader collaboration and, with it, the management of technology and data.
- Pooling expertise: multisectoral deployment of knowledge and experience for health improvement.

Technology

- Supportive: in line with shared values and the Hippocratic oath.
- Innovative: continuously developed and improved, with the possibility of modular adaptation.
- Data curation, management and provision: enables digital, specific and reversible control over health-related data by doctors and clients from the design stage onwards.

This approach guarantees a dynamic, secure and effective digital health environment.

Human interaction as the basis for digital innovation

To address fundamental shortcomings in the digital space, it is essential to approach them from the perspective of how people ideally interact with each other in the physical world. The current digital space seems to completely reverse this natural

interaction. We seem to have become accustomed to a digital world that approaches us in an unnatural way. It is therefore crucial to build on personal relationships of trust between people, starting with the doctor and client. This can then be used as a basis for developing organic, cross-sectoral collaboration, which acts as a connecting force and grows seamlessly into this foundation.

Trust as the cornerstone of healthcare

Trust forms the basis of every relationship, including in healthcare. Growing trust strengthens the professional relationship, while declining trust puts pressure on the bond. In the latter case, if recovery is not possible, the relationship can and should (ideally) be terminated for the safety of both parties. In modern healthcare, technology can play a crucial role in strengthening this bond of trust and the networks that form around it.

Technical requirements for the doctor-client relationship

Technology offers unprecedented opportunities to optimise the match between doctor and client. This is invaluable, as doctors spend a considerable amount of their time building — and, unfortunately, also restoring — trust. This is due, for example, to unrealistic expectations on the part of the client, negative experiences in the past or increasing work pressure in healthcare.

By using advanced technology, doctors and clients can objectively monitor the quality and strength of their relationship. This could include the use of AI applications that can map the mutual expectations, emotions and experiences of doctors and clients in both physical and digital interactions with each other. This offers the possibility of identifying potential problems at an early stage, applying targeted interventions to strengthen the relationship and better tailor care to individual needs with the aim of improving health based on a network that works together on the basis of trust, expertise and experience. The narrative that can be gleaned from this can function as a *digital twin*, which is further fed with the most reliable health-determining data interpreted in context.

The availability of data from the European Health Data Space therefore also depends on fundamental ICT architecture that complies with principles derived from these core values. Crucial to this development are, for example, technical applications for

reversible consent by citizens and their trusted doctors regarding data. After all, the relationship between doctor and client provides a natural basis for trust in the availability of data, and thus also in the commitment to which both parties agree.

Organising from the 'why' of healthcare: the Hippocratic Oath

Excellence in organisations requires a balanced development of technological capabilities and a value-driven approach. A one-sided focus on digitisation or values is insufficient for sustainable healthcare innovation (see Figure 3, Value Model).

Figure 3: Developing a sustainable global digital space for health (sustainable health ecosystem) requires the harmonious integration of professionalism and technological innovation

Smart humanity: unravelling complex health mechanisms

Structuring organisations around professional values in the health ecosystem creates an integrated understanding of individual, personal-level and ecosystem-related data, which determines health at an aggregate level. This makes it possible to better

define and understand health as a concept. Although complex, knowledge about health principles is within reach. By using technology from an individual and ecosystem perspective, we can use advanced computing power to unravel complex mechanisms — the essence of *Smart Humanity*.

- The current digital space for health is outdated and ineffective. It focuses primarily on administrative and financial tasks and organisation, while at the personal level, health is determined and studied through between doctor and client.
- There is no proper management of health data, with more than 80% of health-determining data lying outside clinical practice. This leads to fragmented knowledge and a lack of overall insight for both doctors and clients, and ultimately for society.
- There is an urgent need for a new digital space for health that focuses on the professional value of the doctor and the relationship with the client.
- This new digital space for health must promote cross-sectoral collaboration, be based on mutual trust, be built organically in a flexible network and transparency, and enable innovation without compromising health.

Although this contribution often discusses the doctor-client relationship, the principles and insights also apply to the relationship between other healthcare professionals and their clients.

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If humanity does not become smarter

Matthijs Smakman

Technology for a healthy society: from clean air to personalised care

Our health is shaped by a complex interplay of factors, including: the physical environment, the home situation and access to good medical treatment. The air we breathe, the water we drink and the temperature around us have direct and indirect effects on our health. In cities, where air pollution and heat stress are increasing, these influences are becoming increasingly noticeable. At the same time, care is increasingly shifting to the home environment, supported by technologies such as lifestyle monitoring and social robots, which help older people and vulnerable groups to live independently for longer. And within the medical world, new technologies such as personalised medicine and 3D-printed aids are also becoming increasingly important in making care more effective and sustainable.

Multidisciplinary collaboration is essential to maintaining and improving people's health. Collaboration between researchers, healthcare providers, technology experts and policymakers makes it possible to approach complex health problems systemically and develop innovative solutions. This chapter explores how technologies such as *digital twins*, smart sensors and personalised care contribute to a healthier living environment and better medical care. Only by innovating together can we prepare the healthcare system for the future and build an environment in which health is central – both within and outside the walls of healthcare institutions.

Healthy, safe and sustainable physical living environment

Our physical living environment has a major impact on our health. According to the RIVM (2024), the effect of air pollution in terms of disease burden is comparable to that of obesity, and even greater than the effect of excessive alcohol consumption or

eating too few fruits and vegetables. It is therefore not surprising that several Dutch municipalities have made healthy air a priority (e.g. Municipality of Utrecht, 2020). However, the air quality in many of our cities is still far from the WHO's 2021 recommended values. In order to comply with the recommended values, some municipalities will have to halve their emissions of nitrogen dioxide and particulate matter (Municipality of Utrecht, 2023). In addition to air quality, water and soil quality are also components of the physical living environment that affect health. In the Netherlands, both water and soil are becoming increasingly polluted, partly due to living and working in densely populated deltas (Deltares, 2024). The increase in both man-made and natural pollution is damaging biodiversity, which in turn has consequences for our health. Other challenges in the physical living environment that can cause health problems include noise pollution and extreme heat. These factors are particularly prevalent in urban environments, and their impact is expected to increase in the coming years due to climate change and urbanisation.

Sensors for digital twins

The physical environment is increasingly concentrated in cities (CBS, 2024). Monitoring the physical environment is important for keeping a city 'healthy'. This allows potential health risks to be detected at an early stage, which not only protects the health of residents but also helps to reduce pressure on the healthcare system. *Digital twins*, or digital replicas, of cities provide insight into CO2 emissions, particulate matter and heat stress. They help policymakers take effective measures to create a healthier urban environment. Such a digital replica can be used to map the city's CO2 and particulate matter emissions, heat stress and traffic flows. The data this provides can be used to investigate the effect of adjustments in order to find optimal interventions that will make the city a (permanently) healthy place. However, a digital replica depends on good, reliable data. Although more and more data is becoming available, monitoring the physical and living environment remains a high-tech challenge. *Real-life* monitoring of heat, vibrations and water quality, for example, is still limited. Monitoring these factors is often a costly and time-consuming task that is usually carried out by specialised engineering firms. Existing technologies for monitoring factors such as vibrations, noise, emissions and water quality are not only expensive but also limited in coverage and scope. This has often resulted in data that is not *real-time* and is only available for a limited number of locations.

Healthy lifestyle and self-reliance in the home environment

Healthcare is increasingly taking place in the home environment; elderly people and other vulnerable groups will have to live at home (independently) for longer. For the elderly, the previous cabinet summarised this in 2022 under the slogan: 'Independent if possible, at home if possible and digital if possible' (Helder, 2022). But even in regular healthcare – provided by GPs and hospitals, among others – care is increasingly taking place at home, often supported by (digital) technology. Hospitals are experimenting, for example, with oncological treatments in the home environment, consultations between healthcare providers and patients via video calls, and patients arranging matters such as weight, blood pressure and/or heart rate measurements themselves (Patiëntenfederatie Nederland, 2020). This is referred to as the hybridisation of care pathways and is a major ambition in the Integral Care Agreement (IZA). This is of great importance to many regions in the Netherlands, as the number of healthcare workers in nursing and care homes and home care per client is expected to halve in the coming years, partly due to the growing demand for care (IVVU, 2023).

Sensors for lifestyle monitoring

Various promising technological solutions are available to support people in their home environment, including lifestyle monitoring and social robots. Lifestyle monitoring is a process whereby a person's activities and habits are tracked and analysed in order to gain insight into their daily routine. This type of support is particularly common among people with dementia who live independently (Nap et al., 2017). This can be done using technology such as *wearables*, sensors and other home automation technology. Sensors for lifestyle monitoring are often placed in the living room, kitchen, bedroom, toilet, bathroom and at the front and/or back door (Nap et al., 2017). Lifestyle monitoring can identify a potential crisis situation at an early stage in the event of major changes in patterns. Informal carers also appear to benefit from lifestyle monitoring, as it can reassure them and provide insight into the extent to which the person concerned is still able to live independently (Kenniscentrum Digitale Zorg, 2024). Although this technological solution is promising, there are still many technological challenges, such as integrating existing and new home automation and robotics solutions, which means that the potential of lifestyle monitoring is not yet being fully exploited.

Social robots

In addition to lifestyle monitoring through technology, social robots are a promising tool for supporting vulnerable groups in their home environment, both intramural and extramural. Social robots are physical robots that interact with people and have a degree of autonomy (Bartneck & Forlizzi, 2004). These robots are not completely controlled by humans, but are able to respond independently to their environment. Examples of social robots are NAO (SoftBank Robotics, 2020), Tega (Westlund et al., 2016) and Paro (PARO Robotics, 2014). From a care perspective, these robots are now mainly used in elderly care, for example to support clients in their daily routine, to motivate them to exercise, or as companion robots. In various studies, elderly people show improvement in their sense of social connection, communication and mood after multiple interactions with robots, as well as reduced loneliness, isolation, depression and anxiety (Cifuentes et al. 2020). But social robots offer opportunities not only for the elderly. They can also provide support for children with special needs, such as children with autism (Kouroupa et al., 2022) or attention problems (Cibrian et al., 2022). For children with autism, interacting with a robot can be less intimidating than interacting with a peer. Interactions with a robot can create a safe, enjoyable environment and help a child to communicate freely and without fear (Cabibihan et al., 2013). In this way, a child does not have to play in isolation, and at the same time, the robot can teach the child how to deal with human social situations.

Although more and more studies endorse the potential of social robots for support in the home environment, many studies are still being conducted in structured (lab) environments (Sani-Bozkurt & Bozkus-Genc, 2023) and there is a lack of large, long-term studies in which prototypes are tested in a *real-life* environment (Cibrian et al., 2022). In addition, there are technological challenges that hinder the large-scale and effective implementation of robots, including scalability, personalised human-machine interaction, the robot's contextual understanding and information processing (Berrezueta-Guzman et al., 2022). In addition to technological challenges, there is also growing attention to ethical issues surrounding the use of social robots in the home environment. Questions about privacy, autonomy, and the perception of human dignity play an important role in this (Vandemeulebroucke, et al., 2018), especially when technology is perceived as intrusive or patronising. It is therefore crucial that the development and implementation of social robots not only consider technological feasibility, but also ethical principles and the personal preferences of users.

Technological innovations for medical treatments

The decline in the number of nurses and carers in relation to the growing number of people in need of care also has consequences for hospital care. Various medical treatments are already being postponed or no longer performed in some hospitals due to staff shortages (De Moor & Danvers, 2019). In addition to these shortages, there are an increasing number of people with one or more chronic conditions, including osteoarthritis, diabetes and dementia (RIVM, 2018). Multiple chronic conditions (multimorbidity) often lead to greater, more complex and therefore more expensive care needs than the individual conditions would cause: 'In the Netherlands in 2013, for example, 48% of healthcare expenditure under the Health Insurance Act (Zvw) went to the "most expensive" 5% of patients, with an average of 3.5 conditions, compared to 52% for the remaining 95% of the population with an average of 0.7 conditions' (WRR, 2021). The combination of rising demand for healthcare and a shortage of healthcare professionals will make the medical and therapeutic treatment of patients an increasingly greater challenge.

Personalised medicine is increasingly being used for medical treatments. This promising development focuses on individual patient characteristics, including environment and lifestyle, to develop tailor-made interventions and treatment plans. With the help of sensor technology, 3D printing and *data science*, (para)medics are able to personalise therapies and treatments, leading to improved effectiveness and fewer side effects. Although medical technology can be considered a high-tech domain, technology can still contribute to a large number of treatments, such as treating diabetic foot ulcers.

Improving treatment methods: diabetic foot

In patients with diabetes, blood flows less easily through the legs and feet due to damage to blood vessels and nerves (Diabetic Foot - UMC Utrecht, n.d.). Due to reduced sensation in the feet, these patients are at risk of developing wounds, which can become infected and ulcerate without being noticed due to the reduced sensation. The medical costs for the care of diabetic feet are high and are estimated to account for one third of all diabetes costs. In 2019, the total diabetes costs amounted to €1.3 billion. The direct costs per treatment of a foot wound in specialised centres in the Netherlands range from €5,000 to €20,000 (Prompers et al., 2008). Currently, one of the most commonly used methods for relieving diabetic feet is the application

of a plaster cast shoe. To reduce pressure on the wound site, the foot is literally plastered (St. Jansdal Hospital, n.d.). Once the wound has been closed for at least a week, the foot can be removed from the plaster cast and the patient is often fitted with special footwear. However, there is a high risk of recurrence, up to 40% in the first year and 60% within three years (Fu et al., 2019). Innovations in 3D printing techniques offer opportunities to improve the treatment of diabetic feet, for example through more flexible, 3D-printed, wound-relieving insoles and sensors that can monitor pressure on the feet.

Although the possibility of creating 3D-printed insoles already exists, their integration into treatment has not yet been achieved. A plaster cast shoe cannot simply be replaced by a 3D-printed insole. The latter is only a small part of the treatment process, which presents new technological challenges. For example, how can a foot be reliably scanned in order to create a 3D-printed foot sole, or which sensor system can reliably monitor a foot (*in real life*)? These questions illustrate the importance of a systemic approach to the design, realisation and testing of new technological innovations for health technology.

Conclusion

In the coming decades, technological innovations will become more important than ever in maintaining and improving our health. Without new technological innovations, our healthcare system is at risk of becoming seriously overburdened. Although health technology must meet the highest standards, urgency and speed are required. Fruitful collaborations between professional practice, practice-oriented research and education, in order to jointly develop new technological innovations, can bring about this acceleration. One way to make this possible is through multidisciplinary *learning communities*. A *learning community* is a close collaboration between organisations, governments, educational and knowledge institutions that learn, work and innovate together. Students, researchers and professionals from professional practice work together in *learning communities* on innovations for social issues. The aim of these collaborations is to accelerate the development of innovations and to integrate them more quickly into education and practice.

Without rapid and targeted investment in technological innovations, our healthcare system is at risk of becoming bogged down. By joining forces in multidisciplinary

collaborations, such as *learning communities*, we can strengthen healthcare in a sustainable way and build a healthier future for all generations.

- Sensors and *digital twins*: invest in technologies such as sensors and *digital twins* to monitor air quality, water and soil pollution and other health risks in the physical environment in *real time*. This enables early intervention and contributes to a healthier and more sustainable urban environment.
- Self-reliance at home: support home care technologies such as lifestyle monitoring and social robots to ease the burden of care.
- Personalised medicine: encourage research and implementation of personalised treatments to make care more effective and sustainable.

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Finding, discussing and shaping value-driven ICT, searching for a common language in healthcare and education

Erik-Jan Smits

ICT in people-oriented domains?

There are striking similarities in people-oriented domains such as healthcare and education when we look at the way ICT is discussed. In both domains, for example, there has been talk for decades about *e-learning* and *e-health*, *blended learning* and *blended care,* and appropriate hybrid care and hybrid education. The need for adaptive and flexible information systems is also often pointed out. Despite good intentions, the introduction of these concepts and systems often does not lead to a greater sense of recognition among professionals, clients, patients and students. On the contrary, ICT in these domains is perceived as limiting or insufficient to achieve the intended objectives, let alone that the information systems involved are in line with the underlying core values of the organisation.

How can we break this deadlock? And how do these developments relate to developments within the field of ICT itself, where terms such as 'value-driven' and 'people-oriented' are also increasingly being used? How can we achieve a unity of language and approach that both ICT professionals and non-ICT professionals can identify with, including in healthcare and education? And how can we achieve a 'unity of language' that goes beyond the specific meaning it has acquired in healthcare and is closely linked to medical terminology and its inclusion in the building blocks of information standards?

In this chapter, I elaborate on three guidelines that are offered in the literature for designing such a common, value-driven language that information professionals can

use to think and communicate about human-technology issues together with people from other disciplines. I elaborate on the last guideline for the context of the use of *virtual reality* (VR) in education and conclude with a few conclusions.

Concept development

In both education and healthcare, there seems to be a strong need to add an 'e' component to the primary process or, at least, to emphasise the role of ICT in it. Think, for example, of the term *e-learning*.

The term *e-learning* was first used in the 1960s (Nicholson, 2007), but since then it has had different meanings in different domains. In the 1990s, similar e-terms became popular in healthcare, partly due to, as Oh et al. (2005), the 'public awareness' of the possibilities of the internet. The term *e-health*, for example, emphasises in a similar way to the concept *of e-learning* the possibilities that technology offers to improve the domain (in this case healthcare) (Oh et al., 2005). In general, *e-health* is now used in its narrower sense to refer to digital applications in the home environment.

Nowadays, the 'e' in terms such as 'e-mail' and 'e-commerce' is increasingly being omitted. This underlines the gradual integration of technology into our thinking and speaking about, in the above-mentioned cases, communicating and handling financial transactions. In other words, it illustrates our changing attitude towards technology; there is an increasing fusion between humans and technology, as opposed to a strict subject-object relationship in which technology is merely a tool, compare the work of Ihde (1990). So why do we still talk so much in 'e-terms' in healthcare and education? After all, digital technology and support are a *commodity*, not a luxury or an extra. It is precisely in these strongly value-driven domains that a more substantive dialogue can be expected about why and how technology contributes to which values (and vice versa).

Intention versus reality

Maes and Kotteman (2024) point to the importance of a common language for conducting value-driven discussions. A 'common language' must then be understood more broadly than a unity of language between information specialists. However, both in education and healthcare, this is far removed from everyday practice.

In education, there is a wide variety of standards for information exchange. Despite all intentions, these standards do not contribute to a clear understanding of, for example, competencies, test results or the characteristic features of a digital portfolio of learning outcomes. At best, it will take several years before new educational insights are integrated into these information exchange standards.

Similarly, the many information standards in healthcare focus strongly on the ability to exchange information between applications (cf. Van Gool et al., 2018) or provide explanations of technological terms (cf. the Online Thesaurus for Healthcare and Welfare at *https://thesauruszorgenwelzijn.multites.net/*). In both cases, mainly (medical technical) definitions are provided. This is useful and relevant for mutual understanding, but less relevant for information specialists talking to non-information specialists about value-driven healthcare and ICT.

One possible solution lies in the use of architectural principles. However, architectural principles or starting points in the form of a manifesto or design principles (cf. Platform Ethiek en Digitalisering, 2022; Rathenau Institute, 2020) are difficult to use in practice to improve mutual understanding and to give substance to values in an enterprise architecture. In the words of the World Economic Forum (2020): *'But issuing a set of guidelines or a code of conduct does not guarantee that more ethical behaviour will follow*.' (World Economic Forum, 2020, p. 5).

Another solution lies in defining a contextual framework. In education, the importance of the (e.g. organisational) context has long been recognised in order to achieve a truly successful synthesis of technological knowledge, pedagogical knowledge and subject-specific knowledge (cf. Mishra & Koehler, 2006). More recently, Mishra (2019) has even proposed replacing the term 'context' with *'contextual knowledge*' in this context. The importance of such a contextual framework is also emphasised in healthcare. In the context of the Sustainable Healthcare Information System Reference Architecture (DIZRA), for example, it is rightly pointed out that meaning is contextual and that a common language requires a contextual framework. However, the question arises as to what is and is not part of this context and how this context should be taken into account in the design, deployment, maintenance and use of ICT. This question is all the more relevant when we realise (as above) that it is no longer helpful to use concepts such as *e-health*, *blended learning* and hybrid care. A

different, more accurate vocabulary and a more nuanced approach are needed to have a meaningful, interpersonal conversation about the development, design, delivery, maintenance and (learning to) use of ICT. Or, to put it another way, how can you find, shape and discuss an 'inherent value system' (cf. Maes & Kotteman, 2024) that forms part of (the context of) every conversation about ICT in healthcare and education?

The literature offers various answers to this question. In the following paragraphs, I will briefly elaborate on three answers.

Finding, shaping and speaking a common language

Finding a language

It seems obvious that in people-oriented sectors, 'people orientation' should also be taken as the starting point for the conversation about ICT. The question (asked by information specialists, for example) of what exactly is meant by this does not always elicit a clear answer. In the best case, the answer is limited to solutions that are explicitly user-friendly. On closer inspection, it appears that there is more to the desire for people-oriented ICT than meets the eye. A user-friendly solution that sells all the data it collects in order to offer personalised advertisements is not necessarily people-oriented.

In this context, it is helpful to use vocabulary that is understandable to all stakeholders (both non-ICT professionals and ICT professionals). For this reason, in Smits (2023), I introduce the acronym MENS to describe the core components of ICT: Machine, (data) Entities, Notation (including data visualisation) and System (software and processes). In addition, I introduce the acronym OOG to characterise the three phases of ICT: Design and Development, Delivery, Maintenance and (learning to) Use. In this context, I consider human-centred ICT to be a conceptual framework (see the following image) that, with OOG for MENS, can be used to answer the question of which people and relationships between people are or should be central (Smits, 2023). However, we will not discuss the definition of human-centred ICT further in this article .

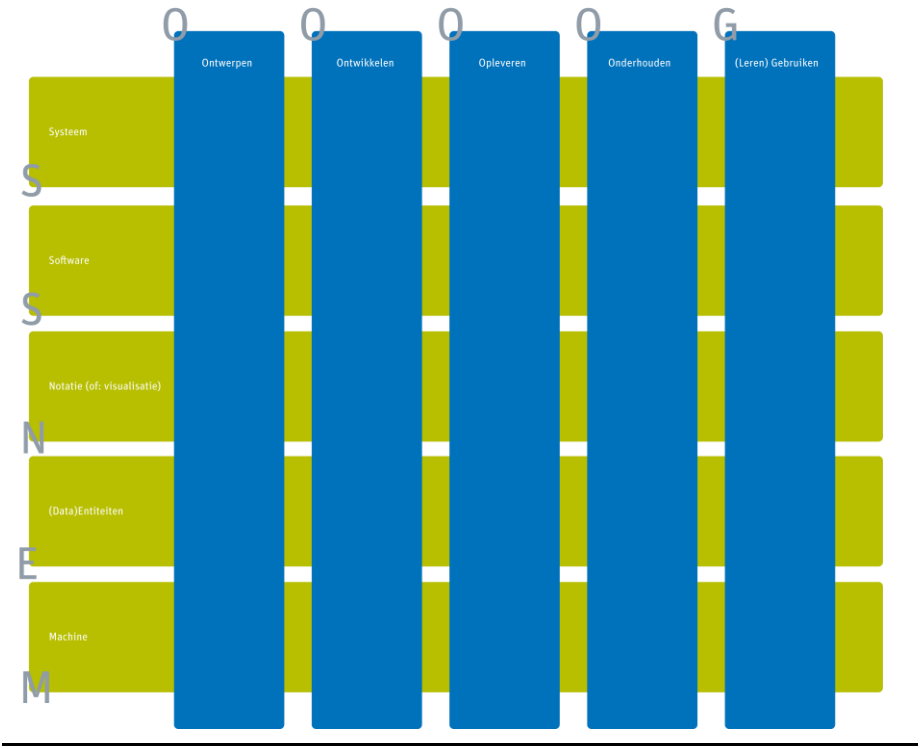

Figure 1: Conceptual framework for human-centred ICT, Smits (2023)

The conceptual framework in Figure 1 makes it possible to explain in simple terms, with all stakeholders, what the ICT discussion is or should be about at its core and to start thinking from an inherent value system. By examining which value is or should be central at which intersection(s) of PEOPLE and PERSPECTIVE, it becomes clear who understands what (that aspect of) ICT to mean and why.

Speaking a language

A second practical answer to the question of how to speak in terms of a value system is provided in the literature on *value-sensitive design* (see, for example, Poel (2018), more on which below) and practical translations thereof in the form of, for example, the Value Compass (and the accompanying game) from Surf and Kennisnet (Bok et al., 2021) or what can be found on Kennisnet. A good starting point for reading more about this is, for example, the work of Pijpers et al. (2020) and a recent elaboration

on the use of *virtual reality* in education by Walker (2023).

Speaking in terms of values and translating them into concrete actions is similarly central to the slightly earlier work of Tijink and Verbeek (2019). Unlike the aforementioned tools, the work of Tijink and Verbeek also offers guidance on how to design a workshop so that, together with those directly involved, options for action can be identified and how an ICT solution can be used in a specific context in a (more) value-driven way. They distinguish between courses of action relating to the technology itself (*ethics by design*), the environment (*ethics in context*) and the user/individual (*ethics in use)*. The standardised approach leads to a set of concrete recommendations so that an ICT solution can be used in a valuable way in the relevant environment. In this way, the work of Tijink and Verbeek builds an important bridge between, on the one hand, reflecting on certain values and what is 'good' and, on the other hand, encouraging concrete action.

Shaping a language

Whereas the aforementioned conceptual frameworks yield a set of follow-up actions or a reflection- , an approach in the tradition of *value-sensitive design* and *value co-creation* (see, for example, Steenbergen, 2020) also provides a visualisation of the way in which values play a role in information architecture.

Poel (2013), for example, elaborates on how value-driven dialogue can be supported by drawing up a value tree (in which standards and design requirements are depicted alongside values). Feltus et al. (2018) and Feltus et al. (2023) elaborate on this in even greater detail by proposing an extension of Archimate (The Open Group, 2023), making it possible to jointly clarify the intended value(s) with all stakeholders, communicate about them at the required level of detail and ultimately discover new opportunities for innovation.

Example: value-driven use of VR in education

An illustration of such an elaboration in Archimate for providing classroom management skills with VR to (prospective) primary school teachers (Pabo students) can be found in Figure 2 from Smits (*in preparation*). In line with the work of Feltus et al. (2023), but in a different context, Figure 2 describes a value-driven use of ICT (see Feltus et al. (2023) for a mapping of value aspects to Archimate objects).

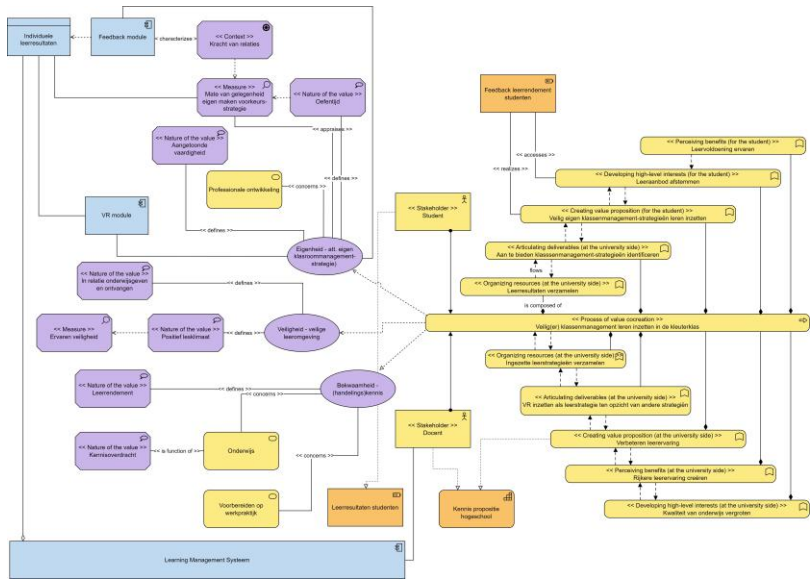

Figure 2: Illustration of the value of the co-creation process in the case of developing a VR environment for teaching classroom management strategies

Where Feltus et al. elaborate on process optimisation at an airport, Figure 2 describes how the use of VR modules contributes to the underlying values of student autonomy, the safety of the learning environment and the emphasis on training skills (competence) in the field of classroom management. The elaboration shows that this type of visualisation is not limited to the logistics sector, but also has added value for people-oriented sectors such as healthcare and education.

Conclusion

The above shows that the literature offers sufficient starting points for finding, speaking and visualising a common value-driven language. The challenge remains to ensure that this is not a one-off, isolated exercise, but to continue to think and act in this way in co-creation with all stakeholders, thereby making a value-driven approach commonplace. And to stop talking in terms such as *blended learning*, *e-learning* or hybrid care when it is actually the underlying values that should be the subject of discussion.

- From 'e-terminology' to values: in healthcare and education, technology should not be seen as an addition, but as an integral part of value-driven processes.
- A common language is essential: ICT professionals and domain specialists must work together to develop a shared vocabulary in order to use technology meaningfully.
- Co-creation as the key to success: value-driven ICT requires continuous collaboration and visualisation, not one-off theoretical models.

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AI in education

Inge Molenaar & Johan Jeuring

Education is everywhere. Every Dutch person over the age of four participates in it or has participated in it. Basic education takes place in schools, with classes in which a teacher gives instruction and/or helps pupils with their learning process. This general picture has not changed for centuries. What has changed are the means by which education is provided and supported. Pupils still have books and notebooks, but much of the instruction and exercises use educational technology such as videos and 'smart' technology such as software for practising arithmetic. Nowadays, this smart technology often uses AI. AI in education is a field of research that has existed for more than fifty years, but it has certainly taken off in recent years. This chapter introduces AI in education and describes its goals, role and ways in which it is used.

This chapter is based on earlier work by Inge Molenaar (Molenaar, 2022). The inaugural lecture by Inge Molenaar provides an overview of more recent developments (Molenaar, 2024).

The role of AI in education

The book to which this article contributes describes the role of AI in many areas of application. In many of these areas, such as the automotive and manufacturing industries, the aim of AI is to automate tasks so that fewer people are needed to perform a task or to make production lines more flexible, which generally leads to increased productivity. The first experiments with AI in education followed this line by developing intelligent tutoring systems. These systems can be used to provide each student with a per- ous tutor, who thereby replaces some of the tasks of a teacher. This replacement perspective on AI in education has gradually shifted to the augmentation perspective. This perspective emphasises the role of AI in supporting teachers and students in education and learning. Learning is a fundamental human activity,

and although the circumstances in which a student learns are changing, the involvement of teachers and fellow students remains essential to learning. AI can support people through rapid data collection, analysis and translation into meaningful insights and actions. By applying this in educational situations, AI can improve learning and teaching. This augmentation perspective differs greatly from the replacement perspective, which implicitly suggested replacing teachers and optimising student guidance with AI.

The augmentation perspective fits well with the central idea of hybrid intelligence, which focuses on researching and developing intelligent systems that enhance human competencies rather than replace them. Humans and AI are seen as equals, solving tasks together. Hybrid intelligent systems aim to optimise the complementary strengths of human intelligence and AI so that together they can achieve more than they could separately, in a socio-technological ensemble.

Hybrid intelligence is being extensively researched, but there are still numerous challenges in designing and developing such systems, such as: 1) how do we develop AI systems that work in synergy with humans, 2) how do these systems learn and adapt to their environment, 3) how do we ensure the ethical and responsible use of these systems, and 4) how can humans and AI share and explain their knowledge of the situation, goals and strategies with each other? Developing collaborative, adaptive, responsible and explainable hybrid intelligent systems is important in many areas of application, but is particularly useful for our thinking about the role of AI in education. The focus on the interaction between students, teachers and AI to optimise learning will be central to the successful application of AI in this field.

In summary, we introduce the augmentation perspective and the concept of hybrid intelligence to describe our thinking about AI in education. In learning, AI and human cognition are intertwined. It is difficult to separate AI in education from human cognition, and the system must be viewed, developed and researched as a hybrid human-AI system. This ben s expresses the unique nature of education as an application area of AI in which human-AI collaboration and a vision of the combined power of human and artificial intelligence are essential.

Hybrid intelligence in learning technology

Three critical elements have contributed to the recent development of AI in education in Western countries. First, virtually all students have access to a computer, both at home and in the classroom. Second, research in *learning analytics* and educational sciences has given us a better understanding of how data can help us understand how people learn. Thirdly, we now have intelligent learning technologies for schools that use *learning analytics* and large-scale AI techniques. Furthermore, the digitisation of education has accelerated during the COVID-19 pandemic, driven by many initiatives to support home schooling during school closures. Until recently, most learning technologies focused on providing learning materials, planning education or administering results. Although these technologies do not use intelligent support, they do form a solid basis for developments towards more intelligent learning technologies.

Computer-assisted learning technologies are often used to remediate the skills of individual learners. Intelligent tutoring systems optimise the learning paths of individual learners. Adaptive learning technologies support individual learners based on their needs. Computer-assisted learning technologies, intelligent tutoring systems and adaptive learning technologies generally focus on interaction with individual learners. A new type of adaptive learning technology is being developed in classrooms in close collaboration with teachers. These technologies are a first step towards hybrid intelligence with combined responsibility of the system and the teacher. The focus on task sharing and mutual interaction between teacher and adaptive technology is central to the development of these technologies. The rapid rise of these hybrid adaptive learning technologies can be explained by the more explicit role for teachers in educational applications. It is estimated that in the Netherlands, at least 60% of primary school pupils work with such technology on a daily basis for mathematics, spelling and grammar.

Detect, interpret, and act

To describe how AI works in education, we use the detect-interpret-act framework, see Figure 1. Detection refers to the input for AI, the data collected in education. This input determines the extent to which AI can observe the context, the pupil and the teacher. Learning technologies typically use *keystroke* and *mouse events* to analyse pupil behaviour and pupil responses to measure their current knowledge.

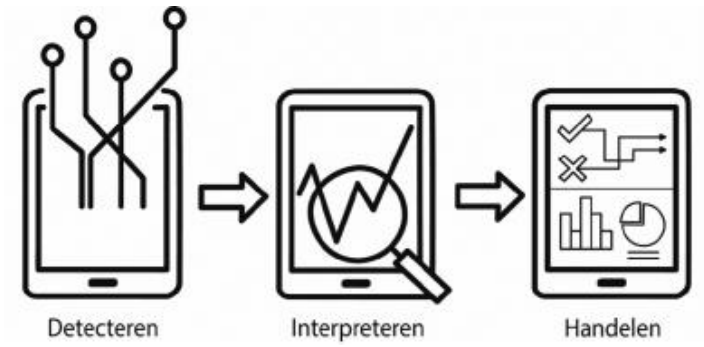

Figure 1: The detect-interpret-act framework
Anne Horvers & Inge Molenaar, CC BY 4.0

The collected data is then interpreted to determine a student's current level and anticipate future development opportunities. AI uses various algorithms to interpret a student's relevant level. Students' knowledge and skills in structured subjects such as mathematics and physics are used to build a student model. Although less developed, progress is also being made in determining pupils' knowledge in less structured subjects. Predictive techniques are used to gain insight into future development opportunities, such as determining how successful a pupil might be in a particular subject. In addition to generic algorithms for analysing pupils' knowledge, specific algorithms are used to assess specific skills, such as the ability to read or write or dyslexia.

The final step is to translate the interpretation into meaningful pedagogical-didactic actions that support students and teachers. These actions are divided into two types. Firstly, actions to inform the user (teacher or student) about the interpretation, whereby the actual implementation of actions is left to the teacher or student. Dashboards are usually used to communicate this information. Although AI does not take any action here, dashboard information can profoundly change the didactic actions of teachers and the learning activities of students.

Secondly, there are adaptive actions in which AI performs activities. There are different types of adaptivity, such as step, task or curriculum adaptivity. Step adaptivity provides feedback on pupils' actions within a problem to help them with subsequent steps that bring them closer to a solution. Task adaptivity selects a subsequent task

for a pupil that matches the pupil's current knowledge or skill development. Curriculum adaptivity determines the learning objectives or topics in which a student can make progress or topics that a student has not yet mastered sufficiently. Currently, these different forms of adaptivity are mainly used in isolation in learning technologies. Learning technologies are usually good at one type of adaptivity, while teachers often ask for combinations of different types of adaptivity. Combining different forms of adaptivity is therefore one of the themes currently being explored in the field of research. The detect-interpret-act framework can be used to understand how AI works in educational situations. It is also useful for analysing the limitations of current AI. Although this framework is useful for describing how AI works in educational situations, it does not help us to understand the relationships between different actors. The following model, which describes six levels of automation, helps to clarify the relationships between the actors.

Six levels of automation in AI in education

The six-level automation model is inspired by similar models from the automotive industry and the medical field. It helps to analyse the role of AI in education and explains the relationships between the actors in educational situations. In this model, the transition of control between teacher, student and technology is expressed at six different levels. Automation here refers to the monitoring and control of AI, and not the automation of specific skills by a student, such as adding numbers under ten. While many forms of automation amount to replacing tasks performed by humans, AI in education can sometimes offer more possibilities than a teacher, such as providing feedback on every step a student takes. Unlike in other areas, the goal is not necessarily to achieve the highest possible level of automation: the augmentation perspective emphasises the shared responsibility between teacher and AI.

The model focuses on the distribution of control between teacher, student and AI, see Figure 2. The white line indicates the level at which control passes from AI to the teacher. The input of different data streams is visualised at the bottom. The assumption is that more and more data streams are needed to increase the role of AI. At the top level of the model, the expected level of monitoring (eyes) and control (hands) by the teacher is shown for each level of automation.

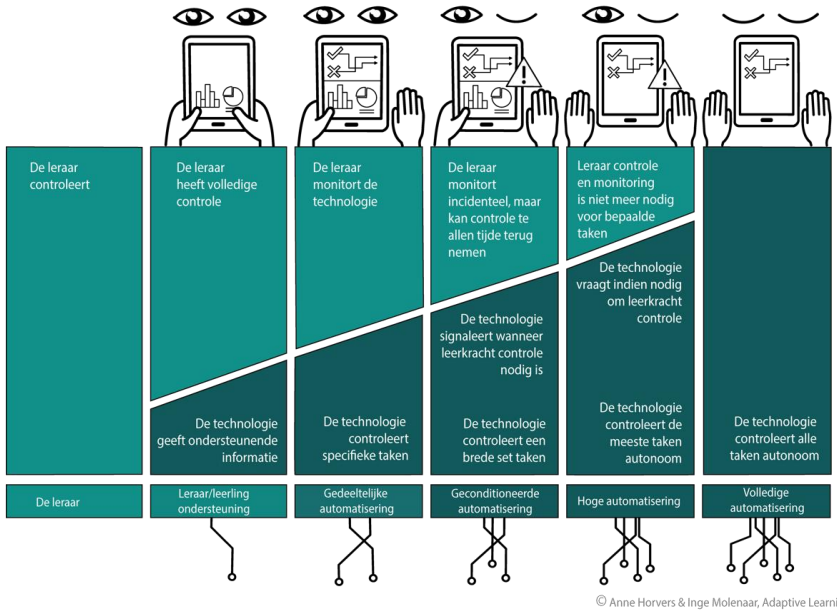

Figure 2: The model of the six levels of automation.
Anne Horvers & Inge Molenaar, CC-BY 4.0

From the level of conditioned automation onwards, the warning triangle indicates the crucial importance of AI communicating with human actors. Mutual understanding is essential for both forms of intelligence to reinforce each other. Two-dimensional dashboards are the most commonly used way to shape that interaction. AI informs the teacher or student, but these actors also have valuable insights and knowledge to inform AI. Two-way interaction between AI and students or teachers is essential to further develop the multiplier perspective on AI in education. Future research will need to clarify how that two-way interaction can be shaped in an appropriate manner.

At level one of the model, teachers (or students) control all aspects of education. AI is first introduced at level two, where it provides the teacher with supporting information. At level three, for example, AI helps select a suitable follow-up task for a student, but a teacher controls the teaching. At the next level, AI takes over tasks at various levels, for example, both solving problems and suggesting appropriate follow-up tasks. At level five, almost all teaching support is provided by AI, and at level six, AI performs all tasks.

Conclusion

The role of AI in education can take many forms, but we see that , AI primarily plays a complementary role, supporting students or teachers, leading to hybrid intelligence and successful deployment. To describe how AI works, we use the detect-interpret-act framework, which addresses the components on which AI acts at an abstract level. The relationship between teacher, student and AI is modelled in the six levels of automation model, in which the role of AI varies from providing information to taking over the entire teaching process.

- AI does not replace, but enhances: the augmentation perspective emphasises AI as a complement to teachers, not a replacement, with hybrid intelligence as the guiding principle.
- Interaction between humans and AI is crucial: effective AI in education requires two-way communication in which teachers, students and systems inform and reinforce each other.
- Automation is a scale, not an end goal: AI can support or take over tasks, but the optimal distribution of control between teacher, student and AI remains situational.

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Technology for AI in education

Johan Jeuring

The role of AI in education can take many forms, but we see that it is primarily a complementary or augmentative role, in which AI supports a student or teacher, that leads to hybrid intelligence and successful deployment. How can AI best support teachers and students? In the growth fund project National Education Lab AI (NOLAI), we are investigating how we can successfully deploy AI in education. To this end, we have launched dozens of projects in which we are experimenting with the development and use of AI in education. In order to deploy AI, it often needs to be implemented or adapted. What technologies are involved in implementing or adapting AI? This chapter discusses the technologies used to implement or adapt AI, based on three ongoing NOLAI projects. Some of these technologies have already been implemented; others still need to be developed.

Recommending tasks: a project

There is a shortage of teachers for various subjects in secondary education, but the problem is most acute for the subject of computer science. In the upper years of HAVO and VWO, pupils can choose to study computer science if their school offers it. Fewer and fewer schools offer computer science due to the shortage of computer science teachers. To ensure that more pupils can still choose computer science, the Co-teach Informatica project has been set up, which provides remote computer science education. This education takes place largely on a platform that offers learning and practice materials, together with remote support from student assistants in the region. In the NOLAI project 'Open student- s models and recommendations for teaching materials in the subject of computer science', the Freudenthal Institute of Utrecht University is working with two secondary schools to expand this platform. This expansion involves tracking pupils' progress towards the learning objectives of the

subject in a pupil model, showing that progress to a pupil and making recommendations to a pupil based on the pupil model. This allows a pupil to practise with material that they have not yet mastered sufficiently, but which is necessary prior knowledge, before starting a final assignment.

To expand the platform with the aforementioned functionality, we have developed the following three components.

All relevant actions of students on the platform are logged in a so-called *learning record store*. This database contains a list of items for each student, including items from assignments. Each item contains information about the linked learning objectives and a score. The score is determined by the platform (automatically), by the student who assesses his or her own work, or by a student assistant.

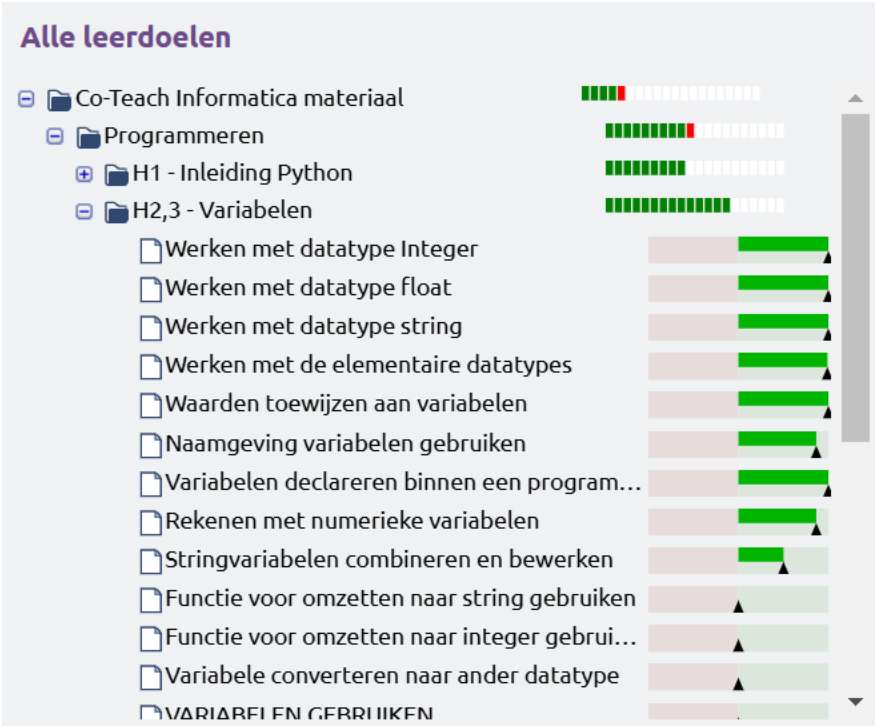

Figure 1: A presentation of the progress of a fictional student on a number of learning objectives in the Co-teach platform

A student model is constructed for each student from the *learning record store*, see Figure 1. The student model consists of a Bayesian *knowledge tracing score* for each learning objective, which indicates the probability that a student has mastered a learning objective.

The third component consists of two parts. The first part shows a student's score on the learning objectives. The second part looks at the learning objectives that are addressed in a task and the prior knowledge required for this, and compares this with the student model. If the student model shows that the student still has deficiencies for the task, he/she will receive recommendations for tasks with which he/she can work on these deficiencies, see Figure 2.

Figure 2: A recommendation for an individual student in the Co-teach platform

Automatic marking: a project

Teachers often find marking tests time-consuming, repetitive and unattractive, and this is particularly true for marking open-ended test questions. Marking open-ended questions takes a lot of time and effort and can be difficult to do in a fair and consistent manner. AI can provide marking support, helping teachers to mark more quickly and consistently. Together with two schools, CitoLab is working on the further development of CheckMate, an AI application that supports the marking of open questions with short answers.

CheckMate takes as input the pupils' answers to test questions and the test questions

and answer models or *rubrics* that the teacher enters into the environment.
The application then analyses the answers by converting them into a vector of numerical values using a language model (Spacy) and various *pre-* and *post-processing* steps.

To assist the teacher in marking, the distance between the vector of numerical values of the pupil's answer and the model solution and the answers of other pupils is then calculated using *cosine similarity*, and clusters of pupils' answers, with a suggested assessment, are shown to the teacher. The teacher can then decide whether to accept the suggested assessments or make any adjustments.

Feedback on interactions: a project

In secondary education, various intervention techniques are used in the training and professional development of teachers. One of these is making video recordings of one's own teaching situations and reflecting on them (others include direct observation, student surveys and 360-degree feedback scans). Of all the interventions, video recording is one of the most accessible in terms of design. However, evaluating videos is time-consuming. A video can be recorded in no time, but reviewing it, selecting valuable moments and reflecting on them takes time. In addition, teachers want insight into behavioural changes: does a teacher now walk around the classroom more than before? Or does a teacher engage in conversation with pupils more than in previous lessons, rather than doing all the talking themselves? Together with a school and the company IRIS Connect, Radboud University is working on the Video Interaction Analysis Tool (VIAT) project.

The technology for VIAT still needs to be developed, but will mainly consist of *computer vision* technology in which we train an AI model using existing videos that are tagged with situations on which we want to give feedback to teachers. This model is then used to analyse new videos of teachers and identify moments for feedback.

An overarching architecture

In our contribution on AI in education in this book, we describe the detect-diagnose-act framework (Molenaar, 2022), which describes the functioning of AI in education at an abstract level. This framework is reflected in the typical architecture of software that supports AI in education.

Various techniques are used to *detect* the actions of learners (where learners can also be teachers, as in the VIAT project; in that sense, 'learner' may be a better term than 'student'). At the lowest level, some applications log *keystroke* and *mouse events*, track eye movements, or measure skin or heart rate. This is particularly common in applications used in research. Looking at solutions that are widely used in primary education, page views, requests for help and input that pupils enter into the environment are stored. Detecting student actions provides a list of interactions for each student, possibly annotated with automatic assessments of those interactions. The co-creation projects around recommending tasks and automatic checking use these forms of data; feedback on interactions is based on video data.

Applications generally use two approaches to assess (*diagnose*) a pupil. The first approach uses student models. A student model builds up knowledge about a student's knowledge and skills based on the list of the student's interactions. Such models often attempt to track progress towards learning objectives, but there are also more coarse-grained models that use information about a student's preferences, for example. An example of the first is a model that tracks which parts of the computer science curriculum a student has mastered (e.g. *if-then-else* expressions) and which parts the student still needs to work on (*loops*). In the second approach, a student's actions are analysed using a model that is often created using *machine learning* on data from previous students. This approach is used in co-creation projects involving automatic marking and feedback on interactions.

Some applications aim to visualise the diagnosis of a student's interactions, such as the feedback on interactions co-creation project, in which interesting interactions found by the application are shown to the user. Many applications use the results of the diagnosis to perform an action. That action may consist of providing feedback to a student, as in the automatic marking co-creation project, recommending a task, offering help to solve a task, etc. Most actions involve: providing information about progress, offering help, analysing a student's work, recommending steps, tasks, or even subjects, and predicting a student's learning outcomes.

Conclusion

At a global level, applications of AI in education consist of three components: a component that detects and stores activities of pupils (or rather: learners), a component

that analyses those activities and builds a model based on them, and a component that uses the constructed model to propose an action. To develop these components, domain knowledge of the subject the student is working on is obviously required, and there must be a user interface in which the student can perform actions. All these components were already present in the Intelligent Tutor Systems that have been developed since the 1980s, but in recent years we have seen many developments in the use of *machine learning* models in education. The emergence of easy-to-use applications for generative AI has accelerated some developments even further.

The technology for AI in education has been developed in many research projects and for specific applications used in education. There is still a lot of work to be done to develop an easily reusable suite of components for use in applications for AI in education.

- Software applications for AI in education consist of three components at a global level: a component that detects and stores the activities of pupils (or learners in general), a component that analyses those activities and uses them to build a model, and a component that uses the constructed model to propose an action- .
- These software applications build on the Intelligent Tutoring Systems that have been developed since the 1980s, but make greater use of *machine learning*.
- The development of an easily reusable suite of components for use in AI applications in education is future research that we hope to carry out at NOLAI.

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Pattern-breaking government

Pieter Frijns

The government is part of a dynamic and constantly changing environment. This requires a great deal of anticipation, adaptability and flexibility from government organisations and civil servants. At the same time, it requires a search for the optimal balance between stability, continuity and (necessary) change so that the government can continue to fulfil a reliable and future-proof role.

Introduction

Appreciation for the government is largely determined by the added value it provides and its acceptance by the community. Citizens and businesses increasingly need a proactive and adaptive government that actively contributes to their security. Security covers a broad scope, including finance/economics, a sustainable living environment (housing, environment), medical care and personal development.

An important critical success factor and also a core value of a proactive and adaptive government is continuous learning and adaptation. This ensures integration and cooperation with the community. In government practice, programmes and projects are often set up to shape these desired changes.

Recent literature on programmes and projects shows that these have not been optimally implemented within the government. They often address long lead times, budget overruns and whether or not results, goals or effects have been achieved. However relevant, this chapter does not look at other success and failure factors. The focus of this chapter is on aspects that can increase the likelihood of successful change within the government. This directly increases its adaptive and proactive capacity.

These aspects concern a number of reconsiderations of ingrained patterns that directly and indirectly influence the culture, thinking, attitude, behaviour and working methods of the government and its civil servants. They therefore also influence the government's cooperation with citizens, businesses and partners. This chapter contributes to the desired dialogue on the redesign and/or reorientation of the role and functioning of the government.

Personal experiences as a civil servant and researcher form the input and starting point for this chapter, together with experiences, images and analyses from fourteen years of Gateway Review within the Netherlands and my own role as an external, independent consultant to several government organisations.

If you know it, you see it

Effective and less effective patterns exist all around us. For convenience, a pattern is described here as an ingrained, fixed way of thinking and acting. Patterns arise partly from the implicit and explicit desire and need to achieve clarity in thinking and acting and to prevent unnecessary disruptions. The aim is therefore both effectiveness and efficiency: effectiveness in order to achieve the desired result without constantly questioning the direction and working methods, and efficiency in order to achieve the result with as little effort, cost and *resources* as possible.

Although the usefulness and added value of patterns are clear, not every pattern is (or is no longer) equally appropriate. Patterns can even become counterproductive and pose a threat to survival. This also applies to patterns within the government: the added value of some of the current patterns within the government is no longer in line with the environment. A fundamentally changing environment also requires fundamental changes in patterns of thinking and behaviour. Recognising and acknowledging this is the first step towards breaking these patterns. This increases the likelihood of change being successful and enhances the added value of the government. This, in turn, can have a positive impact on citizens' trust in the government.

From a shared task to a task that is tackled collectively

Common task?

We are increasingly talking about 'common tasks' for society and government. This is partly due to signals that the government needs to start thinking more 'from the

outside in'. The task usually concerns social issues that have an impact on citizens and businesses. These issues have either a purely national aspect or, more often, an international component and relevance. These issues have many characteristics of so-called *wicked problems*: issues that cannot be completely solved, but can only be helped a little further in reducing the problems or the negative consequences of the issue. These issues are characterised by a high degree of complexity and the need for an interdisciplinary or multidisciplinary approach.

Traditionally, the government strives to designate a single owner or person with final responsibility for each issue. After all, this simplifies the division of responsibilities and the associated management and accountability process. This has worked well for simple issues to date. However, with the issues we face today, it is proving difficult and sometimes even impossible to assign ownership or ultimate responsibility to a single person or organisation. In response to this, the concept of a 'joint task' seems to have been introduced. This appears to be a solution to this dilemma, but in practice it turns out to be more or less a semantic and cosmetic solution. The search for an owner continues, but the introduction of a joint task seems to have made the role of owner even more elusive. No one feels called upon to take on ultimate responsibility because the responsibilities of all the other parties involved also come into play.

This leads to an additional dilemma: the organisation of the management and accountability process. In one-to-one relationships, it is clear who is responsible for the task and to whom (political) accountability must be rendered. But if no one is the owner of a common task, who is accountable?

In daily practice, a minister, senior civil servant or government organisation is appointed as the person with primary responsibility. This person is then left to arrange further coordination with others. It seems as if has thus restored the traditional pattern...

A task that is being worked on jointly!

The practice of a traditional working method with single-headed responsibility is therefore not in line with the characteristics of the joint task. The joint issue is reduced to the principles of a single task. This does not appear to support the approach to social tasks and may even undermine it. It also has an impact on the perceived

involvement and contributions of others, especially if other stakeholders have less interest in the joint task. In short, a more fundamental change is both necessary and desirable.

Collaboration is not a solo endeavour

Every social task always involves multiple disciplines and organisations. Each participating organisation has its 'own' responsibility based on the task assigned to that organisation. In this way, everyone contributes (implicitly and perhaps unconsciously) to the social task. It is important that the activities of the various organisations are managed in a coherent manner. This allows for conscious and joint work on the social task.

To achieve this, it is important that the directors of the various organisations jointly form the 'Owners' Association (VvE)' for the social issue in question. As an Owners' Association, they can ensure that they are aware of the services/activities with which each individual organisation contributes to the social challenge. At the same time, they can coordinate these efforts in such a way that the sum of their efforts maximises the fulfilment of the social challenge.

For this collaboration to work, it is necessary for all participating parties to demonstrate commitment, dedication and willingness to work together. The collaboration must be aimed at contributing as much as possible to the overarching social issue and the intention to work together to ensure that the participating parties can do their best. In other words: maximising the intended goal (tackling the social challenge), optimising the self-interest and the own contribution and/or services of each participating organisation.

This collaboration also requires extra effort from the leadership of the parties involved. Simply stating on paper that each party contributes to increasing/maximising the success rate of the social challenges is insufficient. In practice, organisations often focus more on maximising their 'own' interests in the hope that the common and social interests will also be served. This is partly because most management agreements and annual contracts emphasise the results to be achieved. The focus is on the realisation of the mission, objectives and services. Cooperation with other organisations or working together to realise the social interest is usually not part of

these agreements.

In conclusion, it is important that not only the social task is central, but also working together on the social task. In doing so, maximum effort should be made to realise the social task and optimise the interests of the participating organisations. The motto is: you don't collaborate alone. Shared ownership is the key to success.

From governance to cooperation agreement

The term *governance* is frequently used within the government in discussions and documents, often with proposals to restructure or renew *governance*. This applies to the *governance* of programmes and projects as well as to the existing organisation.
In theory, *governance* refers to all aspects relating to management, control, accountability and supervision. The underlying intention is to ensure that work is carried out in a controlled, unambiguous, verifiable and transparent manner.

Research and discussions show that within the government, the concept *of governance* no longer has a clear meaning. It is a collective term that is frequently used but rarely, if ever, specified. The implicit assumption is that everyone knows what it means, which makes the term almost meaningless.

The concept has been reduced to the distribution of responsibilities, tasks and powers, or solely to the design of the (organisational) structure.

Reducing *governance* to issues with this limited definition is in itself a limitation and has a direct impact on the functioning of organisations, programmes and projects. At the same time, there is the dilemma that the reality on paper is not (always) in line with the practical reality . In other words: the APMK effect: 'as long as the paperwork is in order'. This discrepancy between the reality on paper and practice directly leads to ambiguities, problems and tensions. These occur especially when a programme, project or organisation does not function as expected.

Cooperation agreement

The importance of the cooperation component in the current climate has been described above. From this perspective, it becomes even more important to make mutual agreements on various aspects, not only on paper but also in daily practice. It is

therefore important that these aspects are shared, agreed upon and complied with. This concerns both 'hard' and 'soft' aspects. Hard agreements are the more procedural and material aspects. Soft aspects concern the more relational, interpersonal and cultural aspects. All these aspects can serve as a guide or as a basis for cooperation on the issue. This is the cooperation arrangement: the alignment between the substantive, procedural, relational and associated values and standards that are recognised by everyone and seen as necessary in order to be able to work together on the issue.

Nothing new? After all, people have been talking and writing about *hard* and *soft controls* and the importance of the human factor for years. Yet in practice, it proves difficult to implement this. People still often fall back on the hard side of agreements and cooperation, especially when the cooperation is not going optimally. It seems as if the idea is: if it is well described, it will work out fine. Hard factors are important, of course, but they are not sufficient.

In the current context, where social issues are by definition interdisciplinary and cooperation between multiple parties and disciplines is necessary, the importance of softer factors is increasing. The less attention paid to the soft aspects, the smaller the chance of success.

This means that the cooperation agreement must consciously and explicitly focus on, among other things:

- mutual role and task expectations;
- the manner of communication with each other;
- how mutual attention and correction take place;
- which resources are contributed by whom;
- which planning is used jointly;
- how ideas are exchanged and decisions are made (because collaboration is not hierarchical, but decision-making is);
- evaluation and adjustment moments.

Compliance with the cooperation agreement is, of course, not an end in itself, but is entirely focused on working together and in a coherent manner on the social task.

In short, the way in which *governance* has been reduced to more or less a (blue) structure *governance* is not appropriate or sufficient, certainly not with the increasing complexity and interdisciplinary challenges facing the government. Adding and focusing on appropriate social and relational governance seems to be a *sine qua non*. The introduction and use of an explicitly defined cooperation agreement can be a useful tool in this regard. This is certainly the case if compliance with the cooperation agreement is periodically evaluated, discussed and, where necessary, jointly adjusted.

From individual perspective to a common social perspective

Own perspective central

It has been indicated earlier that the government is characterised as a dynamic political, administrative, societal, social and technological environment. In order to function, it is therefore important that an optimal balance is found within the government between learning from experience and preventing (unnecessary) mistakes.

However, the concept of right or wrong is relative. Something may be right from one perspective, but wrong from another. It is therefore important to consider multiple perspectives when making choices and decisions (and evaluating and assessing them afterwards). At the same time, it is desirable to indicate which perspectives have been decisive to a greater or lesser extent, especially in decision-making. This promotes transparency and understanding of the decision taken.

In practice, one's 'own' perspective is often given priority for various reasons (time pressure, conviction, stubbornness, etc.). Not taking other perspectives into account or even denying them seems (in the short term) to increase the speed of image formation and decision-making. The downside is that support is reduced and this ultimately leads to discussions and conflict. The total lead time is then longer, or less optimal solutions are chosen. In the most negative case, the dilemma or issue is even set aside: no one wants to commit to it.

Focus on the social perspective; the power of multiple perspectives

There is another way: working from a social perspective. This requires an interdisciplinary approach. After all, the perspectives of the participating parties will, by definition, be different. Sometimes complementary, sometimes conflicting. Within each

discipline and organisation, different starting points and guiding principles are applied, arising from their 'own' objectives, history and core values.

Given the complex environment and field of work and the need for interdisciplinary cooperation, it is important for the government to actively and consciously deal with the different perspectives.

Firstly, this means that organisations and diverse perspectives are involved. It is not only involvement that is important, but also that the differences and similarities between perspectives are discussed. Not to convince, but rather to gain a better understanding of each other. This does not emphasise the 'weakness' and 'difficulty' of diversity in perspectives, but rather makes full use of the power of diversity.

Secondly, it is crucial that conversations do not take place according to the basic principles of a discussion or meeting, but that the rules of fair and open dialogue are applied. In practice, we see more discussions and persuasion talks than actual dialogues. It is important that the input of each participant is equally important and taken seriously, especially in the dialogue phase. On this basis, a well-considered decision can be made in accordance with the agreed decision-making arrangements.

Thirdly, it is important how other disciplines and organisations are involved in the dialogue. Within the government, there is much talk about task-oriented working. The principles of programme and project management are quickly applied. This turns task-oriented working into a new form of programme and project management. This is understandable in itself, given the ingrained patterns whereby changes are usually designed in the form of a programme or project. This is precisely where the risk lies. In programme and project management, the participating organisations are usually actively approached by the client or programme manager. Apart from the fact that this often creates a capacity problem because there are more programmes than there are employees available, it also presents a much more fundamental problem. The expectation is that anyone directly involved in a programme or project, in whatever role, has an intrinsic interest and motivation to contribute to the change. However, the method of appointing organisations and people often has the effect that people play a role for other reasons. When asked why they participate in a programme or project organisation, people give roughly the following four types of

answers: 1) 'I haven't really thought about it', 2) 'I was the last one to bow down, so I had to', 3) 'I am here to represent the interests of my organisation' and 4) 'I believe in the change and am happy to work on it'.

It is clear that the first three types of answers are not the most desirable. The fourth type of answer at least lays a better foundation and increases the chances of success in tackling the social challenge. It is therefore not necessarily necessary or desirable to actively recruit people for a programme or project and/or to work on a social challenge. From a task-oriented perspective, it makes more sense to present the dilemma or issue with the question of who and/or which organisation feels invited and motivated to contribute to it. Of course, these do not always have to be the *usual suspects*. If an organisation that is considered primarily responsible does not come forward, it is always possible to contact them to ask how they can contribute.

In conclusion, in a complex world with a wide variety of social challenges, it is crucial to involve multiple perspectives. Involving unknown or unusual perspectives increases the chances of success. Additional perspectives lead to better choices in terms of content. And the involvement and cooperation of different perspectives increase support for the approach and the outcomes.

From supporting IT to digital colleague

Due to the enormous developments in the field of information and communication technology, the use of computers within the government has evolved from simple word processing via tools for computing power, presentation and interaction to resources that support, change and optimise work processes. These technological developments have not only influenced the behaviour of the government. They have also fuelled the needs and expectations of citizens and businesses with regard to government services. Citizens and businesses expect greater efficiency from the government, more digital access, more and faster integrated services, and greater transparency.

The explosive growth in the possible applications of artificial intelligence (AI) offers both opportunities and challenges for the government. Not only for its 'own' use, but also for regulating the correct use of AI applications. An important point of attention is the tension between the possibilities of AI and the legal and necessary

transparency of the government (including the requirement to reconstruct actions). There are currently many IT applications that can be used for data collection, data extraction and data processing. The government is increasingly using AI itself: the aforementioned functionalities can be used for various purposes, including analysis, image formation, policy formation, modelling and decision-making.

AI as a digital colleague

Traditionally, IT capabilities have been used to support people and processes. Now, however, more and more activities performed by humans can also be taken over by AI systems. Examples include searching through archives, calculating economic models and checking and assessing standardised applications. All this is done from an effectiveness and efficiency perspective. 'The AI module can do it faster, more accurately and more reliably'.

A new field of work is emerging, including the workplace, where both human and digital colleagues work. This requires a different way of looking at AI applications. In principle, the same considerations should apply to digital colleagues as to human colleagues. Consider questions such as: 'Is this digital colleague suitable for this position/role?', 'How well does this digital colleague fit into the team?', 'How do we deal with the principle of *lifelong learning*?', 'Is this digital colleague still suitable for this position/role?', etc. The same personnel logistics aspects should be important for digital colleagues, including the principles of recruitment, promotion and departure. In this collaborative context, the CIO may well become the future director of digital personnel.

Digital ethics

Civil servants are expected to act ethically within the prevailing values and standards. When working with human and digital colleagues, digital colleagues should therefore also be expected to act ethically. However, an AI system does not have its own ethics or ethical behaviour. It is the people who develop or deploy AI who must make these ethical considerations.

Ethics are the values and standards of the organisation and the environment in which it operates. There is a direct relationship here with the shift described earlier from social task to working on a social task and incorporating these ethical considerations

into the cooperation agreement. In addition to being aware of the ethical considerations within each participating organisation, it is also important to consider digital ethics in relation to mutual cooperation. This is not a one-off discussion but should be an integral part of the cooperation.

We can conclude that, due to far-reaching technological developments and AI in particular, the digital colleague has become part of the collaboration. Adopting this view makes the discussion less technically driven. It offers many opportunities to improve and accelerate collaboration on social issues. At the same time, attention needs to be paid to the development of digital ethics and digital ethical awareness.

- If you understand it, you can start to change it.
- A (fundamentally) different way of looking at how to deal with social issues increases the likelihood of necessary changes being successful.
- Collaborating on the basis of a new cooperation arrangement gives substance to the demand for an adaptive and proactive government.

The evolution and definitions of data and information management

Guido Ongena

Data and information management are indispensable concepts in modern business and government organisations. This chapter emphasises the importance of an integrated approach: these disciplines appear to have developed separately, but the definitions show that they overlap in terms of goals and activities. This offers opportunities to maximise the value of their data and information through an integrated approach. Future research could focus on how this integration can better support organisations in a rapidly changing, data-driven world.

Introduction

When we talk about data or information, information professionals quickly think of the DIKW pyramid: a conceptual framework in which data (D), information (I), knowledge (K) and wisdom (W) illustrate the hierarchy of information processing (Rowley, 2007). In this framework, data refers to raw, unprocessed facts or figures. It is often unorganised and lacks context, making it difficult to interpret on its own. Examples of data are individual numbers, dates or measurements. Without further processing, data remains a collection of separate facts. Information, on the other hand, is data that has been organised, processed and placed in a specific context, giving it meaning. When data is analysed or structured in a way that makes it understandable and useful, it becomes information. There is also criticism of the pyramid. Scientists indicate that it has little theoretical basis. To date, little empirical research has been done on the model. It also provides a very be -limited perspective, whereby academics point to the creative and complex nature (in which humans play an essential role) of these components, certainly when it comes to 'knowledge' and 'wisdom'. This line of criticism can be extended to the management of data and information,

which within the central government is often referred to as *information governance* and *data* governance. In this chapter, we look at the origin and historical evolution of these terms. We examine both practice and science. We identify differences and similarities and call for greater cooperation and mutual understanding between both worlds.

Evolution in science and practice

Data governance and information governance originate from different scientific disciplines. Information management has its origins in information science, while data management has mainly been developed in the domain of (management) information systems. This separation is also reflected in scientific disciplines such as All Science Journal Classification Codes, which also makes a distinction (ASJC, 2024). Previously, information sciences focused primarily on the organisation and accessibility of recorded information and knowledge, while the scientific discipline of information systems was primarily concerned with the question of how these systems could be used to achieve specific goals, beyond the mere management of information (Beeson & Chelin, 2006).

Around the turn of the century, academics began to discuss the possible overlap between these disciplines (Monarch, 2000). There seems to be little distinction between the two disciplines in terms of their areas of focus, and there is virtually no difference when we compare the disciplinary domains, as evidenced by the co-citation analysis of the most cited authors in the two fields (Ellis, Allen, & Wilson, 1999). Stimulated by different academic forums, interests and power flows, the two disciplines have developed independently of each other. Nevertheless, scientists in the field of information systems have previously advocated a theory of information management, as this is often seen as the core of IT; see, for example, the work of Tallon, Ramirez and Short (2014), which has now been cited hundreds of times.

This separation can also be seen in practice, specifically within the central government. However, the clearest example of this is the Value-Driven Digitisation Work Agenda drawn up by the Ministry of the Interior and Kingdom Relations (MinBZK, 2024). This document identifies two sub-tracks within track four, which is characterised as 'A digital government that is value-driven and open to everyone'. The first concerns improving information management for open government, while the other

concerns improving data management for citizens and organisations.

Definitions

The above-mentioned evolution suggests that there is a clear distinction between the two concepts. This is certainly the case to some extent, but there is also overlap. Let us illustrate this with a number of definitions of both concepts. Table 1 contains a list of definitions of both data and information management. At present, there is no clear-cut definition for either. The table contains commonly used definitions from practice and science. It should be noted that English definitions have been translated as accurately as possible.

	Definition	
Data management	Specifies a cross-functional framework for managing data as a strategic business asset. Data governance defines decision-making rights and responsibilities for an organisation's decision-making with regard to its data. In addition, data governance formalises data policies, standards and procedures and monitors compliance with them.	Abraham, R., Schneider, J., & Vom Brocke, J. (2019). Data governance: A conceptual framework, structured review, and research agenda. *International Journal of Information Management, 49*, 424-438.
	The collective set of decision-making processes for the use and value optimisation of an organisation's data.	Pierce, E., Dismute, W. S., Yonke, C. L. (2008). *The State of Information and Data Governance - Understanding How Organisations Govern Their Information and Data Assets.*
	Data management develops and implements data policy for the organisation.	Weber, K., Otto, B., & Österle, H. (2009). One size does not fit all–A contingency approach to data governance. *Journal of Data and Information Quality, 1*(1), 1–27.
	Establishing data definitions, defining taxonomies, defining master data and developing data models.	Panian, Z. (2010). Some practical experiences in data governance. *World Academy of Science, Engineering and Technology Management, 62*, 939–946.
	The implementation and enforcement of authority over data management.	Seiner, R. S. (2014). *Non-invasive data governance: The path of least resistance and greatest success*. Technics Publications.
Information management	A collection of capabilities or practices for creating, capturing, valuing, storing, using, managing, accessing, archiving and disposing of information throughout its entire lifecycle.	Tallon, P. P., Ramirez, R. V., & Short, J. E. (2013). The information artifact in IT governance: Toward a theory of information governance. *Journal of Management Information Systems, 30*(3), 141-178.

	Definition	
	How an organisation maintains information security, complies with regulations and laws, and adheres to ethical standards when managing information.	Smallwood, R. F. (2019). *Information governance: Concepts, strategies and best practices*. John Wiley & Sons.
	The art of trusted interaction between the key stakeholders of an information management programme (IT, legal affairs, information management, privacy officers). They strive to work together to minimise information risks to the enterprise while maximising the value of information assets by building desired behaviour and promoting cross-functional decision-making.	Hagmann, J. (2013). Information governance–beyond the buzz. *Records Management Journal*, *23*(3), 228-240.
	Storage, management and provision of data within an organisation.	MinBZK (2023). *What is information management? https://www.informatiehuishouding.nl/over-informatiehuishouding.*

Table 1. Definitions of data and information management

If we take a closer look at the definitions, a number of things stand out. Firstly, we see that many verbs are the same. Actions such as storage, making accessible and management recur in both data and information management. Secondly, various definitions of both concepts include forms of *compliance* to minimise risks. For example, with regard to legislation, (ethical) standards, etc. In some cases, this is implied by the reference to policy. Thirdly and finally, the definitions themselves seem to doubt the distinction. The most striking example is the MinBZK (2023) definition of information management. The definition on their website refers to data. In addition, Seiner (2014), who defines data management, has an alternative definition that refers to information and information-related activities.

Conclusion

Although the DIKW hierarchy often serves as a guideline for distinguishing between data and information, this model proves insufficient for fully understanding complex interactions and the organisational importance of data and information. Data and information management are often seen as separate disciplines, but there is overlap in terminology and functions, particularly in tasks focused on storage, accessibility and *compliance*. This suggests that an integrated approach can contribute to improved risk management and information management within organisations. Formalising a

theory from different disciplines (such as the scientific disciplines of information science and information systems) can contribute to greater consistency and more effective use of data and information within organisations. Further in-depth research is necessary in this area.

- Data and information management are converging: although they originate from different disciplines, their functions overlap, which calls for an integrated approach.
- Definitions remain fluid: the terminology and verbs used show that the distinction between data and information management is often arbitrary.
- A common theory is needed: by combining scientific insights, a consistent and effective framework for data and information management can be created.

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Open the doors! Right to information for everyone

Sofie Bustraan

Openness is important for the functioning of our democracy. The explanatory memorandum to the Open Government Act (Woo) states that the ultimate goal of the Act is to improve the functioning of the democratic constitutional state. In carrying out its tasks, the government creates and receives information. We communicate all day long via email and apps. We write reports and memos. We send and receive letters. We take minutes of meetings and sometimes even make video recordings. We build databases, etc. All this information together shows how the government functions, what choices are made and why, what projects are on the agenda, how public funds are spent and whether this is within the legal framework and agreements made. In short: access to public information is a democratic right.

Information for everyone

The work that information specialists do is of great importance in realising access to public information. I would therefore ask you to bear in mind the democratic importance of your daily work and to go the extra mile where necessary. (For a detailed explanation, see the consolidated article-by-article explanation of the Open Government Act as amended by the processing of the Woo Amendment Act of 22 October 2021, which was accepted by the House of Representatives).

Public information must be available to everyone because:

- by publishing information, the government shows how it has performed its duties, what choices it has made and why, and that this has been done in a law , legitimate and fair manner. In this way, the government is accountable;

- by making this information public, everyone can monitor the government's actions;
- Based on the published information, citizens can, for example, know their rights and obligations, exercise their rights, make their choices in elections, and provide input through, among other things, public consultation and participation processes.
- the information made public can be used for research or for developing new services and products for the public interest.

In addition, openness can have a positive effect on the quality of government and combat corruption. You know that people are watching, and you also have more people who can contribute their thoughts and come up with good ideas.

Conflicting public values

This chapter is about openness as an important value for a democratic constitutional state. Sometimes, that same democratic constitutional state is actually better served by (temporary) secrecy of information. For example, to protect the privacy or safety of the city's residents. So I am not saying that all information created and received within the government should be made public without careful consideration. However, I do believe that openness should be the starting point and that there must be good (legal) arguments for keeping information (temporarily) secret. The Open Government Act and the Public Records Act set out the possible reasons for secrecy.

The right to information is enshrined in law. On 1 May 2021, after years of preparation, the Open Government Act (hereinafter Woo) came into force. The Woo sets out the rules for openness. The implementation of the Woo should make public authorities more transparent. Public authorities are busy implementing the Act. This includes the municipality of Amsterdam. But is implementing the letter of the law sufficient, or is more needed to realise the spirit of the law?

Open Government Act

The Woo came into force on 1 May 2021. There is much to say about the Act and its en . Below, I describe three elements of the Woo that have been central to the municipality of Amsterdam in recent years: passive openness, active openness and proper

information management (Open Government Act, chapters 4 to 6).

Passive openness

Anyone may submit a request for information, i.e. a request to disclose information. A decision must be made within four to six weeks as to whether the information will be disclosed or not (yet). In the case of extensive or complex requests, a deadline may be agreed with the applicant. In principle, all public information is open to the public, unless there is a legal basis for not disclosing the information (yet). In order to invoke these grounds, a balancing of interests must usually be carried out. Which carries more weight? The general interest of openness or the specific interest of the grounds for refusal (Open Government Act, Article 4.1 and Articles 5.1 to 5.4)?

Active openness

Active openness is the starting point. Categories have been defined that must be made public by law, disclosure that is not based on a request. For municipalities, there are eleven categories, such as administrative documents and studies.

In addition, there is an obligation to make as much information as possible public on one's own initiative, in addition to the legally required categories of information.
The articles of the law concerning active openness did not come into force immediately on 1 May 2021. The first five categories required by law must be actively disclosed from 1 November 2024. The other categories will follow in 2025-2026. The municipality of Amsterdam has opted to actively disclose all categories by 31 December 2023.

Information management

The Woo establishes the relationship with the Public Records Act. Openness is only possible if the information we create as public authorities is permanently accessible. This means that the information must be findable, available and usable, but also that it must be destroyed in a timely manner. The Woo requires public authorities to draw up and implement a multi-year information management plan (Open Government Act, Chapter 6, and Public Records Act 1995).

Archives Act

Information that has been transferred to an archive repository is subject to the public

access regime of that Act. Information that is to be retained permanently must be transferred to the City Archives after a maximum of twenty years. The Woo then no longer applies. Under the Archives Act, public access is broader than under the Woo because fewer grounds for refusal apply. Under the Archives Act, confidentiality is imposed on the entire document, whereas under the Woo, the assessment is made on a paragraph-by-paragraph basis. With the new Archives Act, the transfer period is likely to be shortened to ten years and the grounds for refusal will be more aligned.

Openness in Amsterdam

In 2018, the then incoming mayor and aldermen of Amsterdam included the ambition to be as open as possible in their coalition agreement 'a new spring, a new sound'. The guiding principle throughout the municipal organisation must be 'open, unless'. The council wants all residents to have access to important information. Council information, Wob requests and other documents must be made accessible, enabling residents to better follow policy and provide targeted input. In anticipation of the Open Government Act, the municipality wants to make more information public on its own initiative. Although the role of information commissioner is not included in the final Open Government Act, the municipality of Amsterdam will appoint an information commissioner in 2019. The information commissioner will safeguard, promote and enforce the principle of 'open, unless' in the municipality of Amsterdam (Municipality of Amsterdam, 2018).

These are admirable ambitions in Amsterdam, but the reality is somewhat different. In Amsterdam, it takes an average of nineteen and a half weeks to process a Wob request in 2020. The Wob is the predecessor of the Woo: before the Woo came into force on 1 May 2021, openness was regulated by law in the Government Information (Public Access) Act (Wob). A lot of information is redacted and there is little experience with actively disclosing information. The city council is critical, as are journalists, entrepreneurs and residents.

Foundation in order

The municipality really wanted to do better, but a solution was not easy to find . A complex set of causes meant that the Wob could not be implemented as desired. Until then, the issue had mainly been approached from a legal perspective, but that was not where the problem lay, and therefore neither was the solution. The problem

mainly lay in a combination of the fragmented organisation of public access, a lack of clarity about roles and responsibilities, a lack of insight into the workload and a focus on processing requests within the legal timeframe, a significant backlog in processing Wob requests, the lack of frameworks for handling requests, the lack of (technical) tools, the difficulty of searching for, finding and assessing information, and too little attention to and knowledge of public access within the entire organisation. In the early years, the focus was on improvements in these areas.

Programme for transparency and information management in order

In 2023, the foundations were laid, the Open Government Act replaced the Government Information (Public Access) Act for some time, and a new Municipal Executive took office in Amsterdam in 2022. The Municipal Executive then expressed its ambition to further accelerate the implementation of the Woo and, in conjunction with this, to put information management in order. The programme for transparency and information management has continued to improve, among other things, the organisation, processes, (technical) tools, monitoring and management. This ensured that by the end of 2023, the eleven legally required information categories were actively made public and that since February 2024, at least 80% of Woo requests have been processed within the legal and/or agreed time frame. Work on bringing information management up to standard will continue until at least the end of 2025. Attention must continue to be paid to maintaining the results achieved and to further improving quality.

A number of success factors

- Focus on the information needs of the applicant.
- Engage in dialogue with the applicant: find out the question behind the question.
- Discuss new requests every day to involve the right people and set the process in motion.
- Ensure clarity about processes, roles and responsibilities.
- Provide (technological) tools.
- Management information helps to meet processing deadlines; provide an easy-to-use, up-to-date dashboard.
- Invest in raising awareness of the subject within the organisation: tell stories.
- Try to organise administrative and civil service commitment
- Be ambitious: trial and error is part of the process

Is the letter of the law sufficient?

Everyone has access to information

The Open Government Act gives everyone the right to access public information. The question I ask myself is: to what extent can everyone exercise this right if only the letter of the law is enforced? How much better would the democratic constitutional state (the aim of the Woo) function if we processed Woo requests within the statutory time limit and disclosed eleven statutory categories of information on our own initiative? Article 1.1 of the Woo states: 'Everyone has the right to access public information without having to demonstrate an interest, subject to the restrictions laid down in this Act.

In order to exercise your right of access to information, you need to have a great deal of knowledge, skills and resources. For example, you need to be proficient in the Dutch language. Information is made public as it is created. This means that information is usually not written in simple Dutch and contains official jargon with many abbreviations. Information is made public via digital government channels, so you must have access to digital resources and be able to find your way online. To find the information, you need to know roughly what you are looking for, go to the right website and use the correct search terms. To understand and use the information you find, you often need knowledge of the context of the information, for example knowledge about how the government works.

The State of the City of Amsterdam report states that in 2020, 16% of Amsterdam's residents are functionally illiterate. That is 100,000 people. Many people who do not speak Dutch live in the city, such as international students and *expats*. Not every resident of Amsterdam has access to digital resources such as a computer, smartphone and internet connection, and not everyone has the (digital) skills to search for, find and use information. A large group of Amsterdammers feel distant from the municipality. In 2020, there were neighbourhoods where turnout in the municipal elections was less than 20%. I dare to conclude from this that not every Amsterdam resident is able to exercise their right to access public information (Municipality of Amsterdam, 2023b).

Different goals, different requirements for openness

In implementing the Open Government Act, we focus primarily on accountability and creating opportunities for scrutiny by journalists and citizens, for example. Information is mainly made public after the fact. By this I mean: the information has already been finalised, the decision has already been made, the project has already started or even been completed.

It requires different information, timing and methods of disclosure to enable openness to also contribute to various forms of cooperation and/or participation. If you want residents to be able to contribute ideas about, for example, the design of a neighbourhood, they need information to do so. If they receive this information after the decision has already been made, they can no longer contribute their ideas.

Openness is increasingly seen as a strategy for achieving other goals of the city. It is therefore necessary to consider how disclosure can be used efficiently. In Amsterdam, for example, openness is seen as an important pillar in the trust agenda. If you want openness to contribute to trust, especially among those groups that are most distant from and/or have the least trust in the government, then more is needed than just handling requests and actively disclosing information. It requires a more fundamental analysis of the concept of openness. One of the activities Amsterdam is undertaking in this regard is the development of an openness centre (Municipality of Amsterdam, 2023a).

Case study Amsterdam: the transparency centre

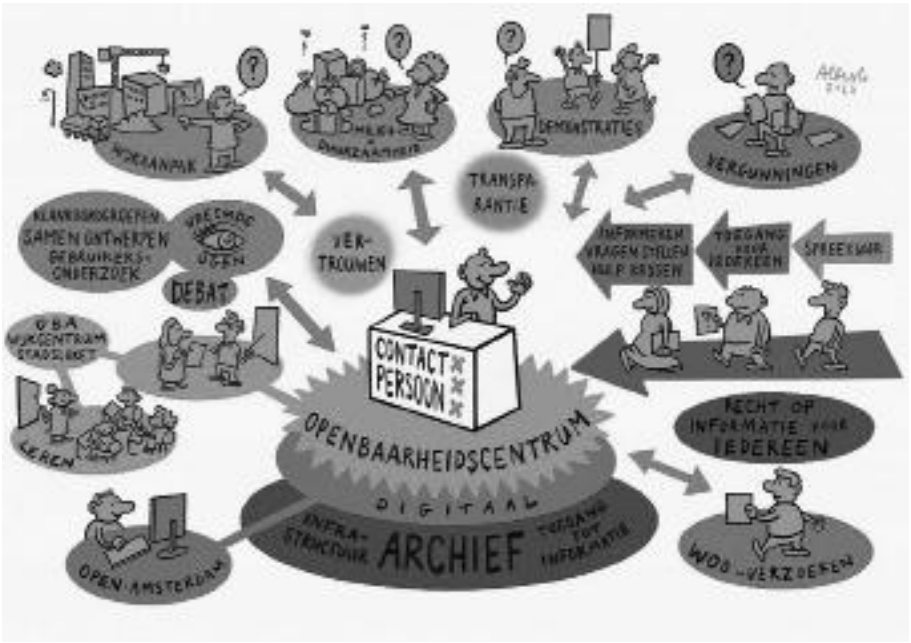

Image: Willem van Albeslo (2023) (www.willemvanalbeslo.nl)

The public access centre is intended to be the place where anyone with an information query can go for help in searching for, finding and using information, both digitally and physically. In addition, the public access centre is the place for dialogue about open government, the place to design together with users, the place for knowledge development and knowledge sharing, and the place where there is room for dissent.

The digital public access centre: open.amsterdam

Residents of Amsterdam can now consult more than 100,000 documents containing government information via open.amsterdam. The site was launched in 2020 in response to the city council's desire to make all completed Wob (and later Woo) requests public. With the introduction of the Woo, open.amsterdam became the platform for all information to be made public. All information that falls under the legally required information categories can be found here.

Open Amsterdam is now developing into the platform for all documents that the municipality makes public. If we know that there is a lot of demand for a particular theme, we try to make the relevant documents public more quickly and provide them with the right context. The leasehold file, preventive searches and participation plans are three examples of themes that can be found on open.amsterdam in addition to the legally required categories.

The website will be improved in the coming period by giving the design a *makeover* and optimising the search engine, so that you can find what you are looking for and understand what you find (Rothengatter & De Boer, 2024).

The physical public access centre

The physical public access centre is to be established in the near future. Staff will be trained to perform the counter function, so that anyone with a question at the counter can be helped with searching for, finding and using information or, for example, submitting a Woo request. In order to also engage in physical dialogue about open government, as Information Commissioner I want to organise moments when everyone can come by to share their experiences and ideas about openness. We will also develop activities where people can engage in conversation with each other and with the municipality, for example by using the lounge area or by participating in the events we organise throughout the year. Above all, the door must be open to everyone, which is why it will eventually be necessary to look at how we can expand the physical space: not only in the City Archives, but also in the city's neighbourhoods.

Together we are creating a public access centre

Different groups have different interests in public access and different needs when it comes to information and the way in which information is made public. Think of journalists, researchers and entrepreneurs. The public access centre focuses primarily on the needs of the residents of Amsterdam. What information do they need, when and how do they want to receive and use that information? Experience shows that these needs are diverse, for example information about developments in the living environment, in order to assert their rights, to participate or for research. Often, it is not information in the form of documents that is sought, but an answer to a question.

As I mentioned earlier, the public access centre is being further developed and

improved. We prefer to do this together with the residents of Amsterdam, so that the website, locations, products and services meet the diverse needs that exist in this city ( ). We conduct the discussion about the information needs of different target groups in various ways. By becoming a member of the digital community, anyone can view, contribute ideas and participate in the online forum. Documents are regularly posted on the digital forum, ideas are pitched and questions are asked. In order to take a more fundamental look at the subject of openness and what the openness centre should be, we are conducting various discussions with different groups. We do this, for example, in group dialogues, interviews and focus groups (*https://open.amsterdam/community*).

Discussions with Woo requesters: 'the door is closed'

In September 2024, I started holding discussions with Woo requesters, including residents who have submitted a Woo request to have information made public. These discussions focus on the requesters' stories. We talk about their purpose in submitting the Woo request and what it ultimately achieved for them. I will incorporate the experiences shared with me into the further development of the public access centre. The conversations so far have revealed, for example, that people are not always looking for documents, but rather seeking answers to questions and wanting to talk to the municipality. In several conversations, the statement 'the door is closed' was made. I hope that with the public access centre, we can contribute to opening that door.

Amsterdam City Archives

The Public Access Centre is part of the Amsterdam City Archives. This is in line with the changing role of the archives: they are no longer a place where information is stored, but are developing into a distribution centre that makes information accessible to everyone. Open.amsterdam uses the same technology that allows Amsterdam residents to explore the city's history at *https://archief.amsterdam*: the eDepot. With the expertise of the City Archives, we can digitally store and make accessible information from the past and present. In fact, knowledge of the past enriches our knowledge of the present. The City Archives are thus transforming into a public utility that serves the common good. Read more about this in the chapter written by Marc Holtman.

- Openness is a right, not a favour: the Open Government Act guarantees access to public information, but true transparency requires more than just compliance with the law.
- Information must be accessible and understandable: access to information means little if language, digitisation and bureaucracy create barriers for citizens.
- The Public Access Centre opens the door: with digital and physical initiatives, Amsterdam makes public information easier to find, use and discuss for everyone.

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The archive as an information utility. Sustainable access to information for everyone

Marc Holtman

Archive institutions are still often seen as the final link in the information chain. The place where information is stored and managed centrally in accordance with the Public Records Act. In other words, the archive as a secure, static vault. In today's rapidly developing digital world, this image no longer corresponds to reality. In recent years, archival institutions have focused on digitising their paper collections, with online facilities suitable for a wide audience. At the same time, we are seeing a sharp increase in archives that have been created digitally and transferred to archival institutions in accordance with the Archives Act or by private archive creators. Almost without exception, these are archives containing recent information. This has an impact on the type of user who requests and uses this information, and therefore on the requirements that can be imposed on consultation facilities. In government organisations, we see challenges in the area of sustainable accessibility and openness, as required by the Woo. The question is what this changing internal and external world means for the role and function of archive institutions.

Public utility

At the end of 2023, the KVAN (Royal Association of the Dutch Archival Sector, the trade association for archivists) published a white paper entitled ' ' (*The archive as a utility*). *The archive as a utility* (see: *https://www.kvan.nl/themas/het-archief-als-nutsvoorziening*). This paper elaborates on a new concept for archival institutions, in which the archival institution is proposed as a distribution station that facilitates all kinds of uses for a diverse group of users. The utility is a metaphor. A utility

provides products or services that serve the public interest, such as electricity or gas. An archival institution serves the public interest by providing access to information and supplying information. The thesis developed in the white paper is that the basic infrastructures required for this are already available or will be realised at archive institutions. These infrastructures can be used as a connecting link between the information management of the archive creators and the citizens seeking information. In this way, archival institutions fulfil a bridging function between the creation of information on the one hand and providing access to this information on the other. Or, to remain in the terms of public utilities, archival institutions function as distribution stations for information in support of various forms of use.

From the outside in

The concept of public services starts from the perspective of the outside world. Although the citizen seems to be central as a concept, in reality the citizen is still too often left out in the cold. Information and application architectures in government are often designed and organised from the perspective of internal processes, and too little from the perspective of the use of the information after the process has been completed. In the concept, the chain is turned on its head and the user is central. The heart of the utility is the archive institution's e-depot.

The change has its origins in ongoing digitisation and the way in which information is recorded in contemporary information systems. The boundaries between metadata and data are blurring, information is becoming available more quickly and volumes are increasing exponentially. From a citizen's perspective, the importance of clear, sustainable consultation environments is therefore greater than ever. With their knowledge of sustainable accessibility and the availability of the necessary infrastructure, archive institutions are well equipped to offer solutions to these challenges.

Sustainable accessibility forms the foundation for this, with standards that are aligned with the needs of citizens in . A study conducted by the Amsterdam City Archives shows how important this is. ‘You only know what you want when you know what is available’ is one of the quotes from this study. It is not self-evident that citizens searching for information know where to find it and how to interpret and evaluate what is on offer.

Digital and searchable

With the increasing availability and searchability of digital information, the number of applications is also growing. Today's users are no longer researchers who come to the reading room, but citizens or civil servants who search for information from different perspectives. These users want access to information without getting lost in a maze of web pages and want to be able to query and use the information according to their needs. It does not matter when or for what purpose or under what law the information was created. The applications vary widely, with the strength lying in the integrated querying and combination of information.

In the concept of public utility, the information is available in digital form. This is implicitly true for modern, digitally created information. However, archive institutions also manage kilometres of paper archives. By scanning archives and making them available online, sources can be easily distributed and reused. The large-scale digitisation of paper sources has thus enabled a great deal of new research.
Although scanning makes documents easier to consult, often no more is known than what is apparent from a brief description such as 'documents concerning the sale of land' or 'correspondence 1932'. Information about all kinds of events, people and locations contained in the documents is only accessible by reading the text. In this case, conducting (historical) research requires specific knowledge and skills on the part of the user.

With the development of Handwritten Text Recognition (HTR), it has become possible to make handwriting searchable by word. Whereas in the early years the models could only be applied to a single handwriting style or a specific period, models can now be combined and a single model can 'read' a wide range of texts. Form elements such as deeds and tables are now also recognised. When using HTR technology, the question is no longer whether, but when a source will be made searchable. The number of publications that use available HTR transcriptions (e.g. from notarial archives) as a starting point for research is increasing rapidly.

After the text has been transcribed automatically, new-generation LLM (*Large Language Models*) and associated AI technology can be used to add structure, extract entities and add context. This further optimises the accessibility of digitised sources. By using AI technology in this way, the power inherent in LLM models is harnessed

in a way that truly adds value.

At the same time, this approach makes it possible to look at scanning processes differently. Whereas scanning used to be the primary product, it becomes a by-product when HTR and entity extraction are applied. This means that other (greener and cheaper) storage solutions can be sought and existing quality standards for the quality of the scans can be reconsidered. This makes it possible to digitise more archive material at lower costs.

By offering the information via a search engine that searches everything, the present and the past can be linked. This makes it much easier than before to apply historical information to current issues. Examples include the restoration of bridges and quay walls (using the original drawings), climate research (based on historical rainwater levels in the canals) or research into the spread of infectious diseases (using hospital records). But it is also useful for residents who want to know the history of their own address, primary schools that want to put together an educational programme, or knowledge platforms such as Netwerk Oorlogsbronnen (War Sources Network), which make history accessible to a wide audience on the basis of themes. The digital availability of this information, in the form of Linked Open Data, forms the foundation for this.

Past and present

The archive as a public utility manages and provides information in various ways for a range of purposes. This can be done using a traditional search environment, but also via an API that is queried by other environments. The information made available does not have to be limited to historical or documents and files transferred in accordance with the Public Records Act. For many citizens, the reason for creating information will initially be of little relevance in their search for information. It is much more important that information can be queried, found and used in an easy, unambiguous way. In addition to information that has been formally transferred in accordance with the Archives Act, the utility also provides access to information from private archives, or information that is offered through laws other than the Archives Act. The utility service thus provides the possibility to set up digital channels for querying and consulting information in its entirety. Regardless of the reason why the information was created, by whom or when. With this approach, legislation

as laid down in the Archives Act and Woo is less of a trigger for action and functions primarily as the framework within which action is taken. This ties in seamlessly with a number of comments made by the KVAN on the new Public Records Act (see: *https://www.kvan.nl/themas/informatie-archiefwet-standpunt-bestuur-kvan-archiefwet-2021/*).

By acting as a public utility, archival institutions reinforce their existing role as a pillar of the principle of the democratic right of access to information for all. This principle is expressed in a contemporary information reality that is almost entirely digital. If properly implemented, an archival institution as a public utility contributes to a transparent and reliable government. The information provided is available and usable by anyone, anywhere, at any time.

Woo as a flywheel

With the Woo coming into force in 2022, governments are obliged to actively publish information. Initially, the starting point was that this would take place on a new national platform to be created. Ultimately, this took on a much more limited form.

A number of archive institutions in the country have therefore taken the initiative to facilitate local authorities with a channel on which Woo information can be published. The Amsterdam City Archives was the forerunner in this regard and, with open.amsterdam, has set up an online environment that has been live since 1 May 2022. In addition to the mandatory categories, this channel also publishes current topics in the city, such as the redevelopment of the Shell site and the leasehold dossier, . Information is provided with editorial context, and information from the past and present can be queried in its entirety. Citizens do not need to wonder how the law works and what information is offered through which service desk.

The publication of Woo information by an archival institution and the associated services therefore fits seamlessly into the concept of the archive as a public utility. Although the information is published under a different law, it is ultimately information that must be permanently accessible and for which high-quality information services must be provided. This offers opportunities to integrate traditional services with a function as a public access centre, where citizens can go with all their information questions relating to public access. The archive then becomes a centre for

history and public access. This centre is being realised in Amsterdam in collaboration with citizens. In this way, a service is being created that meets a wide range of information needs.

The publication of Woo information by archival institutions can serve as a catalyst for a number of other developments. Although the Public Records Act prescribes a period of twenty years (and, with the entry into force of the new Public Records Act, ten years) for transfer, this is a long period for digital information. For many government organisations, it is a challenge to store closed information in a source system for a long period of time, or to transfer it when migrating, when an existing system is replaced. Early, and possibly smooth, transfer or relocation to the archive institution's e-depot is one way of overcoming this. This could be applied not only to government information, but also to private archives. In this way, for example, communities can be facilitated to open up their own archives via the archive institution's infrastructure.

People-centred

Although the use of modern technology provides unprecedented access to historical and current information, technology alone is not enough to achieve full accessibility. Information created by governments is not necessarily understandable to the uninitiated. Historical information also often requires context to be understood. Archival institutions can add that context with digital means, but a supplement to that, with tailor-made assistance from specialists, remains necessary. That specialist does not necessarily have to provide the concrete answer to a research question, but does support the search for answers.

In the coming years, traditional volumes of paper-based information will level off, while digital volumes will increase exponentially. This will also increase the volume of information that no longer has a representative in the paper-based reality and exists purely in digital form. Although the findability of this information is potentially many times greater than that of paper, there is also a risk of fragmentation in providing access to this information. For example, someone researching their own living environment will find it difficult to understand why a Woo request, a construction file and the archive of the construction project, all linked to a single location, have to be found in three different places.

Connection

The archive as a utility is a concept that encompasses many aspects and will not be realised in a short period of time. An important aspect on which the utility concept is based is connection. This refers not only to the connection between information, but also to the connection between the actors who play a role in the information chain. In order for the utility to reach its full potential, these actors will have to grow closer together. It is necessary to look beyond the boundaries of existing sectors and actively seek each other out. By combining knowledge and skills, we will be able to realise solutions that offer real added value for citizens. In doing so, we can use modern technology as a means of achieving and ensuring optimal accessibility.

- Archival institutions can transform themselves into information utilities that operate as distribution stations for providing sustainable access to information to citizens.
- To do this, we will have to think from the outside in and literally put citizens first.
- This involves safeguarding digitally born information for tomorrow, as well as digitising paper-based history and making it searchable using modern technology.

3

Where are we headed?

Introduction to Part 3

When reading part 3, the title of Javier Marías' novel *Zo begint het slechte (*Thus Bad Begins) springs to mind. The novel unfolds like a mirror on truth, power and the elusive dynamics of human relationships. The novel explores how the past and future are intertwined, how decisions — big and small — determine the course of a life, and how information, or the lack thereof, can steer destiny. In that sense, his work touches on the issues that are central to this part of the collection: *Smart Humanity*. How do knowledge and decision-making influence society? What role do ethics and responsibility play in times of change? Is it all bad, or is there a silver lining?

The third part highlights the way in which information, knowledge and decision-making shape our society and what this means for information professionals. In a world where transparency and control clash, questions about human values, perspectives for action, ethics and the consequences of choices are central.

For example, in *Towards an effective and ethical government in the digital age*, Kees Verhoeven argues that control without democratic countervailing power can undermine fundamental rights. In *Value-driven co-creation in IT*, Petra van Driel and Marlies van Steenbergen argue that decision-making should not be determined purely by systems, but should be guided by human values.

The human dimension and the right to information are recurring themes in this collection. Daniël Smits and Ronald Israels discuss in *Human by Design* how bureaucratic processes can overlook the individual, with distressing consequences such as the Benefits Affair. *Stand up for the fundamental right to information* by André Plat calls on information professionals to protect this fundamental right.

This collection also offers perspectives on the future. *The library of your entire life* by Martijn Aslander and Wouter Bronsgeest emphasises how personal knowledge management is becoming essential in a world of exponential information flows. Denis Doeland outlines in *AI in your digital transformation* how new developments are influencing our work and thinking. Yet there is hope: by making conscious and ethical choices, we can embrace progress without losing our humanity.

Aaron Mirick shares our concerns about the downside, but also indicates that an active attitude is desirable. Felienne Hermans points to a pattern that software development is less neutral and inclusive than we assume. A conscious is something that (IT) professionals can do more with. Maurice Goudsmith outlines how waste problems and digitisation solutions are a consequence of our consumerism. Jos Baeten outlines the all-too-familiar challenge that scientific knowledge is often publicly funded but not accessible — and what can be done about it.

Just as Marías' novel shows how hidden forces and decisions shape our lives, the last part of the *Smart Humanity* collection invites us to reflect on the world we are creating. The future is not only determined by systems or technology; it is what we make of it.

Towards effective and honest government in the digital age

Kees Verhoeven

A chapter on balancing procedures and value-driven approaches as keys to the responsible public use of digital technology.

Changes and visions

The introduction of digital technologies such as computers, the internet, smartphones, social media and, of course, artificial intelligence has radically changed our world since the end of the last century.

This has always been accompanied by great optimism (New Economy! Arab Spring! Magical Models!) and Amara's Law, which states that we overestimate the impact of technology in the short term and underestimate it in the long term. In this regard, I remember well the confident predictions that newspapers, books and even city centres would become a thing of the past as a result of the internet revolution. These visions did not come true because new technologies rarely completely replace existing structures, but rather force them to the periphery, where they — more resilient than expected — find a new place.

The government is also changing under the influence of digital technology. In this chapter, I explore how this is happening, what mechanisms are behind it, what the opportunities and threats are, and what this means for the information profession and knowledge workers in public service.

Historical context

The gradual emergence of an increasingly complex living environment with ever greater and faster information flows on the one hand, and the reorganisation of

public administration in our country on the other, form the seed for the problematic combination that the Social and Cultural Planning Office pointed out at the end of 2023: high expectations and low confidence in the government among citizens (SCP, 2023). How did this come about?

In the 1980s, the Cold War of clear blocs and physical dividing lines came to an end and the internet conquered the world with its virtual connecting power. During this period, digitisation and globalisation went hand in hand and liberalism had become the leading ideology.

This had major consequences for the organisation of the government. In the collection *Niemand regeert (Nobody Rules),* former parliamentary journalist Marc Chavannes describes how, under the Lubbers and Kok cabinets, thinking increasingly shifted towards market thinking, privatisation, automation and efficiency (Chavannes, 2009). According to the philosophy of New Public Management, the government had to be 'managed' like a company in order to optimise the performance of 'BV Nederland' (the Netherlands as a company). New computer systems played a major role in this.

In the liberal and optimistic 1980s and 1990s, a separation between policy and implementation took place, which — with some delay — led to the notorious gap between government and citizens. The irony is that policymakers want to close this gap and are eagerly turning to digital tools that are by definition distant and can therefore have an additional alienating effect.

This paradox shows that national governments face new challenges as modest but sovereign links in the integrated 'global village' of the digital age. A common thread that can be found in many Western democracies is what I call the 'spiral of disappointment'. This stands in sharp contrast to the 'cool country' that former Prime Minister Rutte was so fond of talking about.

Before I elaborate on this, it is necessary to first say something about the relationship between digital technology and human psychology. This is because social changes and the current political culture — in which governments are digitising their policymaking and implementation — cannot be viewed separately from changes in human

behaviour.

Technology and psychology

Contrary to what we have long thought and claimed, humans are emotional and irrational beings. Historians emphasise that humans are repeatedly guided by primal instincts, psychologists have shown that humans make errors in thinking in response to their environment, and neurologists have mapped out that human choices are driven by neurotransmitters such as dopamine.

In addition to the age-old human environment with situations, events and other people, the industrial revolutions of the past centuries have brought about more and more inventions and techniques that respond to our psychology. This is particularly true of digital technologies such as big data, social media and smartphones.

Cleverly *framed* by their inventors, each of these technologies begins with an adjective that reflects their intended effect but in reality has the opposite effect: 'big' data models can actually lead to narrow thinking and tunnel vision; 'social' media is often the scene of antisocial behaviour; 'smart' phones actually make us dumber (and more crooked).

A crucial insight is that things like web design, notifications and algorithms ensure that digitised information not only influences people in terms of content, but also in terms of process. This happens largely unconsciously, causing us to make irrational choices such as quickly clicking on online offers, constantly searching for new messages in mailboxes and app groups, or lingering on platforms with useless content. This is at the expense of our labour productivity, the growth of which has stagnated in recent decades, especially in Europe (ECB, 2024).

The conclusion of more than fifty years of digitisation is that the proper use of digital technology does not happen automatically, and this principle applies not only at the individual level but also at the level of businesses and governments. While digitisation in companies mainly serves efficiency goals, governments are also motivated by social engineering, which, due to the increasing availability of data and computing power, can take on the character of a desire for control. This is an understandable mechanism, but one that has the potential to damage the democratic constitutional

state. Let us now look at the social context in which this is happening.

The spiral of disappointment

The globalised and digitised — and therefore complicated — world causes many citizens to feel uncertain, which is also described as unease, unrest and the *fear of falling*, as Huub Buijssen points out in his book *Verborgen psychologie achter het populisme (The hidden psychology behind populism)*. People are increasingly wondering whether they will be able to hold their own amid major transitions and geopolitical shifts and whether their children will enjoy the same prosperity as they do.

In search of stability, they naturally look to the national government and the welfare state. But although politicians continue to make big promises during national elections, the influence of the national government is waning. Due to the interplay of international dynamics and administrative restructuring described above, the European Union, multinationals, local authorities, civil society organisations, scientists and judges have gained increasing influence over policy-making and implementation in our country.

Examples supporting this analysis include the exclusive trading powers of the European Commission, the growing influence of technology companies, consultancy firms and banking institutions, the decentralisation of spatial planning and youth care, the broad polder agreements on prevention and the climate, the OMT during the coronavirus pandemic and the nitrogen ruling by the Council of State.

Such developments may well fit within the framework of our democratic constitutional state, which is based on the separation of powers. However, as long as national politicians continue to act as if they can solve the major issues of migration, energy, public housing and social security on their own and then fail to deliver, mistrust will continue to grow, as we have seen during previous cabinets.

Now that I am halfway through my argument, it is good to reflect on the situation in which increasing mistrust and the growing divide in the digital age are influencing the actions of politicians, administrators and civil servants. This touches on the foundations of our democracy and presents the digital government with new dilemmas. In the following, I will first discuss the democratic foundations and then the actions

of the digital government.

From trias to unitas politica?

In his book *Artificial Intelligence and the Rule of Law,* Professor of Digitalisation and Democratic Rule of Law Reijer Passchier points out that it is primarily the executive branch – 'the government administration' – that benefits from the possibilities of digital technology (Passchier, 2021). While executive organisations such as the Tax and Customs Administration and the Employee Insurance Agency (UWV) are using data and algorithms to build 'decision warehouses', he observes that the States General and the judiciary are lagging far behind in terms of digitisation.

This leads to an imbalance in the trias politica, a trend that former National Ombudsman Alex Brenninkmeijer previously referred to as 'unitas politica', or a democracy in which the (digital) government is becoming increasingly powerful (Brenninkmeijer, 2012).

Of course, the scale of the executive branch plays a role in this, as does the fact that its remit is more akin to assembly line work than the *case-by-case* work of the judiciary, which is much smaller in size and relies heavily on care and caution. Or the more incident-driven supervisory role of Members of Parliament, who only have a few staff members at their disposal. In my experience, the relative small scale and dominant short-term approach of parliament stand in the way of the structural integration of digitisation into its remit. This is true both in terms of content (the theme still has low priority) and process (parliament still meets physically every week to vote on hundreds of motions by a show of hands).

While this is understandable, it does not alter the fact that it is risky. Contradiction, countervailing power and checks and balances are core principles of our democracy that must remain intact in the digital age. Parliament has (too) few resources to properly understand the much-needed digitisation; it is difficult to interpret a good vision of the future and then support the right developments (through hundreds of small motions and laws). In addition, the controlling power is increasingly in the grip of symbolic politics, image-building and superficial thinking. Now that parliament is increasingly unable to counterbalance this, the critical eye must come from policy officials, including the growing group of knowledge workers and IT professionals.

I will conclude with this new responsibility, but before I elaborate on the brakes and adjustments, I will analyse the tendency to press the public accelerator pedal ever deeper. I will do so on the basis of the duo of social engineering and customisation.

Social engineering

Although ideologies are on the wane and vision is being loudly exchanged for pragmatism, every politician has bogeymen and ideals. And these lead to social engineering thinking, supported by a strong need for control and control- . This is timeless and has led, among other things, to the welfare state. Although it can be a good thing, it has a tendency to go too far.

In the complicated world we live in, social engineering has taken on two extra dimensions: holism and dataism. Holism, or integrality, is the idea that everything is connected and that issues should be approached in a coherent way (across domains). A common complaint in the field is that administrative compartmentalisation and bureaucratic barriers stand in the way of good policy, although there are also dissenting voices, such as Paul Frissen's book *De integrale staat* (The Integral State), which warns that the drive for coherence threatens the rule of law (Frissen, 2023).

Dataism expresses the idea that the large amount of digitised data and data models based on it not only improve our insights but also offer the possibility of predicting or influencing people's behaviour.

The combination of holism and dataism explains the urgent desire for data sharing in order to continue to keep a close eye on society. This desire is now emerging at all levels of government. The Association of Dutch Municipalities points out the importance of this for the social domain, healthcare and safety (Sonnenschein, Versteeg, Kruijff (2023). Under the heading 'building blocks for a modern digital government', implementing organisations mention this in the *State of Implementation 2024* and, as part of their 'Acceleration Approach', the Network of Public Service Providers even collected all the bottlenecks in data sharing (State of Implementation, 2024; NPD, 2024). Publications such as these demonstrate how strongly the need is felt.

The collection, exchange and processing of data can therefore serve good purposes,

but it must be done responsibly. And that requires a well-considered approach rather than hasty action. In other words: malleability has its limits and requires careful application and proper governance.

Customisation

The stormy rise of Pim Fortuyn in 2002 turned traditional media organisations and established political parties upside down. Since then, journalists have dutifully produced items focusing on the *vox populi*, and politicians have been talking about customisation. The scandals surrounding childcare allowances and gas extraction in Groningen have given this a further boost.

Of course, there are good intentions behind credos such as 'putting the citizen first' and 'human scale'. The problem is that customisation actually means 'making exceptions', which not only conflicts — in principle — with the equal treatment of citizens and a level playing field for all companies, but also — in practice — makes implementation difficult. We have seen this in attempts to introduce income-related wealth tax, specific VAT rates and personal pension pots. Before we start talking about 'ICT in government', we need to realise that politicians make the laws (and the exceptions), after which the executive organisations have to translate them into processes and IT systems. The more complex the policy, the more error-prone the execution and implementation become.

It is all quite possible, but — apart from the government's outdated IT systems — it is difficult, while everyone seems to agree that legislation and regulations need to be simplified. Instead of making firm promises about these kinds of issues, legislators, policymakers and the government should be realistic about the feasibility and enforceability of policy, as the secretaries-general emphasised once again in their letter to the formateur during the formation of the government (SGO, 2024). In addition, the National Audit Office recently stated that the need for customisation is decreasing as a result of good regulation (ARK, 2024).

Effective and honest

How can we achieve good legislation and regulation in the multifaceted public domain, which is full of treacherous pitfalls? And what contribution can knowledge workers and IT professionals make? These are the pressing questions I will attempt

to answer in this chapter.

As a diagnostic conclusion to the above, I argue that although the digital government has good intentions, it often takes the wrong actions. This is inevitable where people do the work, especially now that the government is eagerly seeking the difficult combination of putting people first and sharing data among themselves.

In my opinion, two approaches can provide guidance in this area of tension: balancing procedures and value-driven thinking.

By the former, I mean organising countervailing power, supervision, dissent and doubt to prevent the tendency to go too far digitally. Parliament and the judiciary must rein in the algorithms of the digital government, supervisory authorities and advisory bodies must be able to overrule the computer system, and civil servants must be able to express their concerns freely and safely if legal principles such as the principle of legality, presumption of innocence, proportionality, purpose limitation and data minimisation are at stake. These forms of delay lead to more sustainable decision-making and, in the longer term, good opportunities for improvement and even acceleration.

In the second case, I emphasise that facts (taken out of context) do not speak for themselves, that (a historical selection of) data never tells the whole story, and that (simplified) models do not accurately reflect reality. That is not a problem, because a map is also a simplification of the world and yet extremely useful. However, it is crucial to use such a tool with extreme care, otherwise you will lose your way.

To this end, it is necessary to frame the 'data-driven' nature of the 'modern digital government' with value-driven principles. Because, as the Scientific Council for Government Policy already described in 2011 — when I was still a very young Member of Parliament — in i-Government, the use of digital technology can change the relationship between public values such as security and privacy, with potentially adverse consequences for citizens and therefore society (WRR, 2011).

In other words, digital applications must be both effective (productive) and ethical (integrity) as a condition for public use. It is increasingly up to information specialists

and IT professionals to make an active contribution to this. In the interest of a well-functioning democratic constitutional state in the digital age.

- Digital control measures require democratic countervailing power: without opposition and oversight, there is a risk that the government will absolutise the outcomes of digital technology and undermine fundamental rights.
- The government must accept the limits of customisation and feasibility by seeking a good balance between individual human scale and system-driven efficiency. Models and rules should not be all-determining, but too many exceptions undermine feasibility.
- Data use must be value-driven, not just efficient: in a digital government, technological effectiveness is only sustainable if it is framed by public values and constitutional principles.

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Value-driven co-creation in IT: conceptual research and conclusions with recommendations for practice

Petra van Driel & Marlies van Steenbergen

The development and application of automated and digitised processes towards transformative information technology – including artificial intelligence (AI) – presents a paradox in society. The emergence of big data and AI and the increasing digitisation of services in recent years are giving new impetus to the digital transformation of government. Experiments with AI are being conducted in various areas of application, and new possibilities are helping citizens and society. However, the downside is also becoming apparent, such as the perceived lack of clarity about how decisions are made and the possibility of automatically linking data about citizens (Van Driel, 2020). This chapter explains the underlying administrative processes from a 'vertical/horizontal' perspective and explores the value of transparency. It examines two opposing visions of administration: vertically controlled by the government or focused on communication and cooperation with the government (horizontal).

What is happening at what level?

When applying the 'vertical/horizontal' perspectives, the three-way division into a) politics, b) legislation and regulations, and c) society can serve as a useful starting point (WRR, 2021 (2)).

Politics

At the political level, there is an imbalance in the trias politica due to digitisation in the executive branch. Digitalisation is disrupting the balance between the legislative, judicial and executive powers (Passchier, 2020). This is due to the progressive

application of technological possibilities within the Dutch government without the corresponding administrative frameworks, because the appropriate legal developments are lacking. The WRR (2021-2) states that this situation poses a risk to the balance of state tasks.

Legislation and regulations

Vulnerabilities arise in the concepts of human rights in legislation and regulations. Consider, for example, the relationship between privacy and transparency, access to justice and the role of the judiciary, and profiling. Mandatory frameworks for state tasks may help in cases of (imminent) human rights violations. Human rights provide a context for determining how to organise society. The starting point here is that human dignity must not be compromised. Characteristic of this human dignity is reciprocity and respect in relationships – in which there is no subjugation of one person to another.

Society

Technological applications in administrative decision-making are causing problems for citizens. A society based on the rule of law and culture is characterised by political and social considerations surrounding the development and application of technology. The result is a visible cultural distinction between situations in which technology helps to promote fundamental human rights and situations in which technology works against them.

The WRR (2006; 2021-2) also recognises the above perspectives and provides a framework from a horizontal and vertical perspective: 'The complexity of the administrative and political landscape in the Netherlands does not have to be a problem in itself. On the contrary, it offers opportunities for social learning processes in which politics — horizontally and vertically — plays a creative and decisive role.' In other words: how do we find a dynamic balance between the horizontal and vertical perspectives in modern digitalised societies? This requires research into themes relating to various legal principles.

Theoretical framework

Digitisation in the field of public administration in the Netherlands has a particular impact on the executive branch of the trias politica. From a political science

perspective, it is preferable to speak of a 'balance of power' rather than a 'separation of powers' between: legislation, administration and the judiciary. The primary responsibility for our legislation lies with the legislature (government and States General), but law is also shaped by judges. The judge administers justice, but law is also shaped by parliament, the executive and judges (Rosier, 2010). At present, neither the legislative nor the judicial branch is implementing the possibilities offered by digitisation (Passchier, 2020). This means that the trias politica must rely on the current, existing system for the necessary flexibility. This is necessary in order to re-establish the (human) values for which it was invented. According to Passchier (2020), the visibility of human legitimacy can be increased by imposing requirements on digitisation within the government through the judiciary.

Two concepts are relevant in this context: the rule of law and the constitution. The definition of the Dutch rule of law implies that the government itself is also subject to the law, even though that same government holds the position of legislator and law enforcer. The obligation implied by the rule of law is realised through a constitution. This consists of the constitution itself, but also of the coherent whole of legal and non-legal norms, principles and established practices. The result of this totality is that government power finds its structure on the basis of the protection of fundamental human principles (Passchier, 2020).

The main difference between the horizontal and vertical perspectives is the element of creativity in the preparation of the decision-making processes of government and parliament. In the horizontal variant, this creativity consists of critical consultation in the initial phase. In the vertical variant, a politician is a decision-maker who allows creativity during the decision-making process. Certain characteristics, attitudes and behaviours are appropriate in the public interest, and actions are limited by the constitution. The distinction between vertical and horizontal is necessary in order to assess politics as a whole. Moreover, when viewed from the outside, it is mainly the vertical vision that is seen and recognised (WRR, 2006). This means that there is a difference between the implementation of political decisions by government institutions and the evaluation of the legitimacy of the implementation (Van Driel, 2019).

The aforementioned dichotomy between the vertical and horizontal perspectives becomes more pronounced when decision-making is automated, because automation

reduces the time and space for horizontal reflection. The general expectation is that processes should be clear and visible in order to be accountable to society. This is part of the vertical perspective: citizens are subject to government, authorities, employers or other hierarchical authorities. In reality, all kinds of underlying processes are also needed to gather the information, knowledge and experience required to make the right decisions. This is the horizontal perspective: stakeholders work together in a network structure and strive, each from their own responsibility, towards a common goal (WRR, 2006; Van Driel, 2019). Hierarchical regulation and control (vertical perspective) can be automated to a considerable extent. Deliberation among equals (horizontal perspective) is much more difficult to automate (Grant, 1996).

When everyone everywhere shares the same values, we speak of uniformity. The opposite of uniformity is ethical relativism: the belief that there is no such thing as a universal norm or value. Different cultures have different beliefs and practices, which leads to different values. Ethical relativism is based on tolerance for all these different perspectives: the result of this perspective is the universal value of tolerance for other cultures, groups and individuals. Ethical absolutism, on the other hand, believes that values are universally valid and provides an answer to the question of what is right or wrong — for everyone, everywhere and at all times. Extremely religious groups tend to act and think in this way. Omitting the horizontal perspective from the equation threatens the ethical aspect of the application of the law, because we end up on one side of the dichotomy. The other side is then no longer readily recognisable.

The use of technology in public administration requires vigilance: what happens when we try to mould laws and regulations that are subject to interpretation into automated systems and processes based on a binary reality (Emmerig, 2021)? Compared to the vertical perspective, the horizontal perspective leaves more room for context-specific and ethical considerations that are indispensable in times of rapid change. This certainly applies to the integration of artificial intelligence (AI)-based automation into government decision-making (Council for Public Administration (ROB), 2019).

Case 1: Values and beliefs in a digital context

When a value becomes highly important over time, it becomes a right or is

incorporated into the legal system in some other way. Anything that is recognised in the form of a legal right is then considered a value. In this case, law means the interplay of values that are recognised and written into legislation and regulations (positive law). For example, a dog is currently equated with a product in law. This means that consumer law applies. Organisations with websites/social media that offer dogs at cost price (online sales) are also actively monitored. On the one hand, the buyer/owner can claim for defects and proper functioning of the animal for a certain period after purchase. On the other hand, certain organisations are not profit-oriented and their aim is, for example, to rehome animals with the support of digital (communication) tools and in a personalised context. In this situation, both the buyer and the seller are only partially responsible.

There are also elements where the influence of one on the other plays a role, or where both parties (and the animal itself) have (had) little reasonable influence. Think of circumstances in which the animal ends up, before and after the purchase, origin, life expectancy, character, upbringing. All these elements and often situational circumstances mean that considerations regarding the equivalence with a non-living product constitute a grey area and cause moral dilemmas in practice. *In this case*, the supervision of compliance with consumer law in a digitalised context determines which values and beliefs apply to the policy in its implementation. Due to situational circumstances, the rules are established step by step, rather than based on a more theoretical elaboration of the aspect of effectiveness from a legal perspective.

Case 2: Values in social constructions

Valuing something is much more than expressing a preference. Value is not only felt and thought of as a morally justified vision, it also influences the actions of individuals and/or groups (Spiekermann, 2016). How strongly something is valued depends on the culture of a group or society at a given moment. Values are therefore meaningless without people who act on them. Consider values in natural law, which are universal and apply to everyone. Non-moral values such as property and status are facts that are considered valuable in our society as ' '. Non-moral values are important because they form a framework and identify the lives we lead, while at the same time telling us about the lives we should lead according to society. Moral values are about considering expectations of how we should behave in relation to other people and in response to that behaviour. Moral values are used, among other things, to correct

actions or to criticise people's actions. Therefore, the impact of a value depends on society itself, cultural and historical influences, and the type of people in that society.

Case 3: Values and process formation based on perspective

If something is valuable to someone, there is a connection to a specific and personal list of intrinsic values. Example: while working on this article, we are constantly considering how the value of privacy adds meaningful value to this article. Privacy is an extrinsic, instrumental value that is related to intrinsic values: knowledge, freedom and security (Spiekermann, 2016). The risk of creating a list of values as an overview and as a product is that important concepts may be excluded. Ethical innovation, on the other hand, is known for its mechanism of inclusion.

Automated decision-making in a digitalised context (with standard 'lists') can be applied at an individual level to decide whether someone is eligible for a particular treatment. Examples include receiving government benefits or being hired as a self-employed person for a specialised, specific and temporary assignment within that government. What these situations have in common is that human considerations are removed from the decision-making process as much as possible (Bovens & Keizer, 2020). This becomes problematic in cases of false positives and false negatives. Even if the rules are applied lawfully, individual and specific circumstances may still justify exceptional treatment. A lawful decision may not be fair because it exceeds a moral standard. In labour law, for example, all circumstances of the case must be weighed. It is not enough to take into account the intention of the parties (actual agreements) as laid down in a contract (Supreme Court, 2020). The difference between being an employee and being an entrepreneur becomes clear in everyday practice in the workplace. A properly structured flexible shell of an organisation has a legitimate interest. The greater the difference between an employee and an externally hired worker, the smaller the chance that it is a fictitious employment relationship.

Direct 'black-and-white' application of the legislation on the assessment of employment relationships leads to injustices in automated implementation processes, because the intention of the legislator and daily practice in the workplace disappear with its creativity. From a legal realist perspective, law is what is created by court rulings, whereby a higher level of law is created for application in practice. Think of cases of interpretations where the distinction between 'the letter' and 'the spirit' of

the law plays a role. The assessment of the employment relationship is not about the intention of the parties, but about the intention of the legislator with a view to transforming socio-economic effects: to what extent does what is laid down in the contract fit in with the practice of an individual situation – with a view to the legal description of the employment contract? Exceptional circumstances will often not be identified by an automated system. When automating (horizontal) checks and balances in our tax and social security system, explicit and special attention must be paid to important, situational, 'holistic checks' in government decision-making.

Conclusions

The current digitisation of the executive power creates the risk that the horizontal perspective will disappear. This also jeopardises the space for ethical deliberation where necessary and required in view of the principles of the Dutch constitutional state (trias politica). As part of the public sphere, the discussion about technological developments must be related to the public interest. This discussion must be organised on an ongoing basis: the question is whether we are (still) creating the world in which we want to live (Joosten, 2020). Reasonableness is receiving renewed attention.

The answer lies in alternating between vertical and horizontal perspectives at an increasingly lower level. This can be achieved by alternating *top-down* regulation in its application with horizontal forms of cooperation. Digitisation is more suited to the vertical perspective, automating those parts of the rules and regulations that can be automated. A digital tool can be used for assessment and advice. This advice must then be regularly reflected upon during the process. This creates room for interpretation by deskun ds – room that usually exists from a legal perspective. Consider, for example, policy-making around animals as products. It works to accept a digital and/or binary outcome based on two extremes as a proposal rather than as a definitive outcome.

In this context, the WRR (2021-1) refers to a system of co-creation: humans with machines. This implies systematic collaboration, rather than replacing human intelligence with artificial intelligence. It follows that ethical pluralism is a possible perspective from which to view the complex issues surrounding the consequences of choices in automation, digitisation and transformation. On the one hand, this

perspective touches on ethical absolutism, because it also embraces universal values. On the other hand, it involves ethical relativism, because there are cultural differences regarding the importance of universal values. The importance attached to those universal values then determines what is considered morally acceptable according to the standards applied.

Finally, the WRR sees the use of AI in the context of the labour market as a challenge. It asks the question: 'How do we make sure it works?' (WRR, 2021). Spiekermann (2016) argues that the creators of technological innovations must give the users of their products a choice. This means that users have the opportunity to adapt and configure a technological solution, while at the same time respecting personal and unique values.

Recommendations

There are plenty of AI Ethics initiatives. These mainly produce abstract ethical principles. Mittelstadt (2019) argues that this is not enough to guarantee ethical AI because these principles do not provide sufficient guidance in practice.

Firstly, it is necessary to highlight the underlying dilemmas and differences in values. Consider the example of the law in which an animal is equated with a product. The influence of digitisation on consumer law and possible controls on its digital implementation can lead to an unrealistic picture of reality. The horizontal aspect, with legal-ethical deliberation, plays an important role in questions about the applicability of consumer law to animals. Consider, for example, considerations in relation to life and death and clinical pictures. The recommendation is to recognise the horizontal perspective as important in the exercise of government controls on compliance with laws and regulations. If this is not possible due to digitisation, it will have impact on the personal values of citizens and government employees, including well-being, human dignity or autonomy, and on public values such as justice and trust.

Secondly, it is advisable to initiate a paradigm shift: after all, ethical pluralism is at the heart of a vertical/horizontal perspective on collaboration in complex situations related to automation, digitisation and transformation. It is therefore necessary to give trust to citizens who are part of society. By involving them more where possible, trust in the government can be restored. In addition, digital decision-making systems

and accompanying user guidelines can be introduced that record the history (intention/motivation). These guidelines are also intended to prevent the law from being interpreted by people who are not well versed in it. By recording them, the interpretation of decisions can be better traced.

Thirdly, it is advisable to use the legal system to create room for ethical and legal considerations in the interpretation of the law. Digital tools should only be used if explicit moments of reflection are built into the process, and not otherwise. Users of technological systems would do well not to blindly trust the answer provided by the technological system. Automatic decision-making affects the implementation of the law, in particular the public value of trust. An immediate effect is that citizens begin to distrust the government and how society responds to government decisions. Consider the importance of the lawful application of the law and of checks on the implementation of the so-called self-employed persons act, which is currently being revised. The motivation of the legislator and the application of the law by the judge give an idea of the direction in which the value of equality is becoming meaningful in modern, individual work situations. It is a shock to society when people experience that the democratic government can harm its citizens. Automatic decision-making not only reduces existing trust, it also reduces the government's own ability to show trust towards its citizens (Zuboff, 2017). This is precisely what the horizontal perspective adds to decision-making.

Finally, the recommendation is to invest more time and energy in building effective cooperation between humans and machines, rather than automating decision-making with the help of AI. This means that the right collaborations betwe s and humans must be constructed and that there must be room to consider the problems that have led to the recognition of personal and public values. Adding the horizontal perspective to decision-making restores balance and contributes to resolving the paradox in society.

- Digitalisation requires a balance between control and cooperation: government decision-making is not fully automated — human reflection and ethical considerations remain essential.
- Technology is value-driven, not the other way around: without horizontal

cooperation, automation threatens to undermine public values such as justice and trust.

- Humans and machines in co-creation: instead of full automation, the focus is on collaboration between humans and AI to keep decision-making careful and transparent.

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Human by Design

Daniël Smits & Ronald Israels ( )

In recent years, it has repeatedly become apparent that the use of information systems and registers, both in the public and private sectors, often falls short in terms of the human dimension. Examples such as the Benefits Affair and the Robodebt scandal illustrate the harmful consequences of automation without sufficient attention to the human side. Information systems and registers, which are often designed to promote efficiency, can unintentionally lead to unjust situations when errors or bureaucratic rigidity hit people hard.

The growing dependence on information systems calls for a new approach, which we summarise here as *Human by Design*. This concept states that human considerations must be central from the design phase onwards, similar to previously established principles such as *Privacy by Design* and *Security by Design*. The aim is to develop information systems and processes in such a way that they do justice to the complexity of human situations. This includes understandable communication, careful data sharing and room for human decision-making.

The human dimension and the application of information systems

Media reports regularly show that things often go wrong with the human dimension, both within and outside the Netherlands. Some examples are the Benefits Affair, the SyRI scandal, the sole earner problem, Bunq's compensation policy, the British Post Office scandal in England, Robodebt in Australia, NAV in Norway and MiDAS in Michigan.

A brief explanation of these examples:

- In the benefits scandal, citizens were severely punished for making minor mistakes. After making (minor) mistakes or being misinformed by, for example, childcare centres, citizens had to repay the entire benefit, including fines, on the

basis of the strict fraud policy desired by politicians and its strict implementation.

- SyRI was a legal instrument (system) used by the government to combat fraud, which the court later ruled did not comply with Article 8 (the right to protection of personal data) of the European Convention on Human Rights.
- Thousands of households are living below the poverty line because the rules on benefits, allowances and taxes unintentionally conflict with each other. The so-called single-earner problem has been known since 2016, but it was not until early 2024 that the Rutte IV cabinet announced it would take action, following an article in *NRC* and questions in parliament. A definitive solution in which the Tax and Customs Administration automatically pays out the correct amount of benefits will not be in place until 2028 at the earliest. Until then, local authorities will have to track down these households manually (*NRC*, 24 June 2024).
- In mid-2024, Bunq's compensation policy in cases of fraud such as *phishing* and helpdesk fraud received negative publicity (*NRC*, 21 June 2024). Victims complained that they received poor assistance from the bank. Bunq only communicates via chatbot. Banks are not legally obliged to compensate customers who are victims of *phishing*, as customers disclose their login codes themselves. Bunq's services were more vulnerable than other banks to the loss of large amounts of money in a short period of time, as the bank has no transfer limit.

Things also regularly go wrong outside the Netherlands.

- In the British Post Office scandal, the culprit was an accounting programme that caused cash shortages at thousands of Post Office branches due to a bug. As a result, thousands of people were wrongly accused of fraud.
- The Robodebt scheme was an unlawful method of automated debt assessment and collection used by the Australian government agency Services Australia to replace a manual system for calculating overpayments, automated debt assessment and collection from recipients of social security benefits.
- The Norwegian Labour and Welfare Administration (NAV) involved incorrect inter f EEA regulations and the wrongful accusation and conviction of citizens of social security fraud in relation to sickness, disability and care benefits.
- MiDAS (Michigan Integrated Data Automated System of the Michigan

Unemployment Insurance Agency) also wrongfully accused thousands of unemployment insurance claimants of fraud, resulting in the seizure of money and other assets.

Dutch citizens want the government to make its working methods more humane. Civil servants work in the public interest for our society and must treat all people with fairness, equality and respect. However, these government employees regularly see that this is precisely where the problem lies. Their employers require them to process many matters as quickly as possible, which puts them under a lot of pressure. But citizens also demand this; no one is happy about higher costs or queues. As a result, civil servants have little opportunity to really help individual citizens. Citizens also expect the authorities to actively seek out those who break the law. Citizens who make mistakes but do not deliberately break the law can suffer as a result: they are quickly fined or given a mark on their record.

The need for a human approach concerns citizens, civil servants and employees in the business sector alike. In all these examples, little or no account was taken of the human dimension. People were seen as numbers and the sanctions were disproportionate to the accusations (Rouwhorst, 2022), caused by unregulated algorithms in the public sector (De Winter & Winter, 2023) or the unfriendly treatment of phishing victims (Bunq).

In its report *De gebroken belofte van de rechtsstaat* (The Broken Promise of the Rule of Law, 2024), the State Commission on the Rule of Law made ten proposals to ensure that the rule of law better reflects reasonable expectations, especially for citizens in vulnerable situations. These proposals aim to take the human dimension into account more effectively.

The human dimension and registers

There are also plenty of situations where the fault does not lie with the citizen at all. This problem is exacerbated by the careless creation and use of registers.

The government and the business community make extensive use of registers. The best known are the basic registers, which are used by all government institutions on a mandatory basis and without further investigation in the performance of public law

tasks. Examples of basic registers are the Personal Records Database, the Trade Register and the Vehicle Registration Database.

In the coming years, the Basic Registers System will be further developed into a Federative Data System (*www.digitaleoverheid.nl*). Without going into further detail, it should be clear that registers are widely used and that their use will continue to increase in the future.

The use of registers has many advantages, but also places high demands on their use and management. Registers and information systems are increasingly linked, while no one can say exactly where which data is used or shared (Widlak & Peeters, 2018). Let alone that we are able to correct any errors. This can also lead to errors that affect people. Correcting these errors is sometimes virtually impossible because systems are not or insufficiently equipped for this.

Registers are also frequently used in the semi-public sector, the business community and healthcare. Examples include: the BAR (lawyers), the BKR foundation, the CIS foundation (for insurance), the DSI register (financial sector) and the UZI register (healthcare). Two of these are explained below:

- The Credit Registration Office (BKR) manages data on citizens' credit, payment arrears and debt assistance. Lenders use the BKR, for example, to determine whether it is responsible to grant a new loan. Currently (mid-2024), citizens are experiencing problems due to a negative registration with the Credit Registration Office, even after they have repaid their debts in full. The Dutch Data Protection Authority (AP) has criticised this and is insisting that all data be deleted as soon as someone is debt-free. This is also a legal right. In the GDPR privacy law, this is called the 'Right to erasure (right to be forgotten)' (Art. 17).
- Insurers can check the CIS database to see which claims a citizen has registered. The participating insurer that places a registration in the CIS database is responsible for its content. The television programme *Kassa* discovered that the CIS Foundation's database not only contains claims, but also records data from people who have only made an information request. This incorrect registration led to insurance requests being wrongfully rejected.

All this sharing of information also has advantages and makes it easier to find

solutions. But it also entails responsibilities and obligations. Often there is no single clear cause of the problem, but several. IT is often the solution used to solve a problem, but it can also be the source of new problems.

Human by Design

All these examples show how important it is that we start working and thinking differently in IT. This new way of thinking is summarised here as *Human by Design*. This is analogous to the change in thinking that has been successfully enforced in recent decades, summarised as *Privacy by Design* (due to legislation) and *Security by Design* (due to threats).

Human by Design requires that, from the initial phase (the first sketches), consideration be given to how systems can be developed in such a way that they are in line with human complexity. For example, by enabling customisation by civil servants or employees, whereby both human and automatic decisions can be corrected. It is important here not to start from the perspective of the solution, but from the perspective of the human being. An example:

Incorrect	How can we make this website usable for everyone who submits an application?
Correct	How can we ensure that all people in the target group can submit an application?

The second question encompasses the entire target group. In this case, for example, it also includes people who cannot or do not want to use a website. Or people who are afraid to submit an application because of mistrust. Or people who are at risk of exclusion or racism. In many cases, therefore, more thought needs to be given to the differences between the people who belong to the target group. In short, in many cases a broader perspective is required.

Human by Design is therefore the collective name for numerous human aspects that must be taken into account in practice. The question in practice is how broadly or narrowly to define the subject of the human dimension within your own organisation. Ethics, sustainability and the responsible use of algorithms are also examples of aspects of the human dimension and therefore of *Human by Design*.

Things need to change: more human

Communicate in understandable language. Citizens are sometimes severely punished for making a small mistake. This is despite the fact that even specialists find it far from easy to fill in the required forms without making mistakes. Careful application of the human dimension is often not easy. In many cases, a distinction must be made between citizens who accidentally get lost when filling in the forms and fraudsters who deliberately commit fraud. For example, by providing forms with checks that help citizens avoid common mistakes.

Only share data if this can be done carefully. It is unacceptable for an organisation not to know what data it has, where it comes from and with whom it has been shared. An organisation that records data is also responsible for informing all parties involved. In addition to being a principle of proper ICT governance, this is also laid down in legislation (e.g. the GDPR). If a change in the registration results in changes to rights or obligations, those involved must be proactively informed.

Make decision-making human. When decisions with far-reaching consequences for people are made, there must always be 'meaningful human oversight**'.** What is 'far-reaching' and what is 'meaningful' must be defined in advance on a case-by-case basis. And if an error or correction of an error leads to disadvantages for the citizen, a reasonable solution must be offered. This is by no means always easy, especially in far-reaching cases such as the unjustified deportation of a foreign national or the unjustified removal of a child from their home. But even simpler issues can require some thought: for example, if someone has been wrongfully denied insurance, removed from a waiting list or had a parking permit wrongfully revoked (and since given to someone else).

Tools for implementation

The general principles of proper ICT (analogous to the general principles of proper governance) are a useful tool for implementing *Human by Design*. Since 2023, the EU has had a directive in place: the European Declaration on Digital Rights and Principles.

Another example is the Dutch Practical Guideline 3414 (NPR 3414), to which the KNVI and the authors of this chapter have contributed. This NPR is a practical tool

for implementing *Human by Design* from a *gover* nance perspective. This NPR discusses *'Governance* of the human aspects of IT' and describes a list of relevant points for attention and management guidelines.

By adding questions related to *Human by Design* to implementation tests, it is possible to determine at an early stage whether new projects, policies and legislation will result in undesirable side effects on a human level. In other words:

Could the project, policy or legislation put people (employees or citizens) in a difficult position?

In addition, civil servants from implementing organisations and executive staff in the business community must have the option of issuing a red card. They can issue this card when policy or regulations are unenforceable and/or unconstitutional and/or the IT systems designed and/or applied for this purpose do not work properly and citizens or employees may be disadvantaged as a result. Preferably as early as possible in the process, for example during the implementation test.

- The human dimension often goes wrong when information systems are applied.
- Things need to change: they need to be more human. So: communicate in understandable language, only share data if this can be done carefully, and make decision-making human.
- *Human by Design* takes the human perspective rather than the (IT) solution.
- Make use of available tools such as NPR 3414.

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Stand up for the fundamental right to information

André Plat

Access to information is a fundamental right, according to the *Manifesto of Information Professionals for the Government*. What does that mean for the profession? A call to action!

If access to information is a fundamental right, then that applies to everyone. However, as the Manifesto states: 'Large groups of people have an information disadvantage (think, for example, of people who are not digitally literate, have low literacy skills, have a disability or do not speak the language). Or consider the information disadvantage between the 'author', your colleague, your manager or your customer of your (government) service. That is why it is necessary to design information systems according to principles that put people and future generations first.' This immediately creates rights, responsibilities and obligations for all those who are part of our information society.

Why a manifesto?

In an interview in the trade journal *Od* – a platform for information professionals in government – Plat and Bronsgeest talk about the Manifesto (Nieuwenhuijsen, 2024). 'The Manifesto contains principles that guide the way we as information professionals do our work,' says Bronsgeest. 'We must do our best to make and keep information accessible to everyone and thus make the world a better place. That means information professionals must take action. And nail the Manifesto to the door!' Plat agrees: 'Information professionals must be less modest. We are literally sitting on "gold": we can and must take a directing role, be more proactive and assertive.'

The Manifesto lists four principles: systems must serve people, technology must be

usable by everyone, ethics take precedence over resources and power, and the spirit is more important than the letter of the law. Plat states: 'If we really want to meet the many requirements and be inclusive, for example, we need to go back to the drawing board.' 'For example, we will have to look at work and all kinds of processes differently,' adds Bronsgeest. 'Information professionals can help with this. With this Manifesto, our professional organisation is supporting this.'

Although the Manifesto comes from the professional group of information professionals, it is certainly not intended for internal use only. 'It is, of course, excellent that we discuss this among ourselves and share knowledge and experiences, but it must also happen on a broader scale. There are many more people than just information professionals who deal with information and access to it. Our world is highly competitive and dynamic. In addition to information professionals, there are all kinds of project and programme managers, policy officers, management consultants, registrars, administrators and, ultimately, consumers, as well as refiners such as publishers/journalists and so on.

The KNVI therefore advocates greater cohesion in information management. Too many people too often work at cross-purposes. And purchasing a nice software package is not enough. To keep information accessible, for example, you need a good archive, under an innovative architecture. Let everyone involved in information management work together. The Manifesto also states that we must pay attention to all kinds of aspects, from legislation to information processing and security. This requires a multidisciplinary approach on the part of the authorities, which serves the information society.

We are currently seeing information management slipping down the administrative agenda. That is why it is time for us to make our voices heard, to stand up and get involved. For example, by contributing as public authorities to actively publishing information and keeping it accessible to everyone. We manage information containing important data and facts: this is the new gold. Let's make sure that information benefits everyone more than it does now.

As information professionals, we must ensure that information and knowledge can be exchanged in a controlled manner between people and organisations that have an

interest in it. It is our job to record authentic information with the accompanying context correctly once and for all, to keep it accessible in a sustainable manner and to use it (or have it used). The systems we use must also be secure. This reduces the chances of disinformation being spread effectively. In this way, information professionals contribute to an inclusive, prosperous and sustainable society.

The Manifesto

Large groups of people have an information disadvantage (e.g. people who are not digitally literate, have low literacy skills, have a disability or do not speak the language). It is therefore necessary that we design information systems according to principles that put people and future generations first. In this Manifesto, we distinguish four such principles:

- systems must serve people;
- technology must be usable by everyone;
- ethics take precedence over resources and power;
- the spirit is more important than the letter of the law.

That is why we prefer:

- A focus on 'people first' over 'data and information first' over 'documents first'.
  In addition to data and information, people must be central, because they are the ones who work with the information and help shape their future with it. People are the most important factor in recording and (re)using information. It is essential that this is done properly at source, even when it comes to informal information channels (such as social media and electronic messaging services), where information professionals are not always directly involved. Information professionals therefore help everyone to become as digitally fit as possible, i.e. digitally skilled and information literate. The technical facilities that support this must therefore serve people.
- Focus on the application of techniques that everyone can use, rather than on technology itself
  Information technology must be user-friendly, because everyone should be able to act independently as much as possible. Facilities must support this, *plug* & *play*. This means that facilities are designed from the perspective of the people

who use them: smart tools that help you in the process, rather than enforced and prescribed tasks within fixed processes. No pre-imposed indexes, but systems that follow the workflow of individual people and help to record information and make it searchable and keep it that way. The starting point is: what information will be needed in the future?

- Focus on ethical dilemmas over resources and power
  If we put people and the human dimension at the centre, we must make the most of our inventions for the benefit of humanity. The human dimension is about good conversation, about the right use of technology, and not about power. Information professionals ensure that decision-makers have the right information and provide the source against which decisions and choices can be tested. Information professionals provide support throughout the chain, paying attention to aspects such as:
    - legislation;
    - the rule of law;
    - decision-making;
    - process implementation and control;
    - information processing;
    - security;
    - access;
    - requirements with regard to monitoring, reporting and archiving.

  This requires a multidisciplinary approach and cooperation between professionals. Information professionals therefore highlight ethical dilemmas and make them open to discussion. The possibilities for the use of technology are endless.
- Focus on fairness over legality
  Laws change over time, as does society's world view. They are the result of a political process and are therefore inconsistent and difficult to implement. Human rights, including digital human rights, provide a permanent framework for legislation and regulations. It is up to the government and society to interpret the intention of the law. Information professionals support them in this. They help to record relevant information from and for the government. They interpret the context of that information from various perspectives, such as the legislator,

social organisations, ombudsmen and citizens' initiatives. A multidisciplinary approach leads to better service provision to citizens and businesses. Information professionals are tasked with continuously evaluating the application of information on the basis of results, impact and reflection. In this way, we continue to learn, improve and change.

A closer look at the general information law

Many laws regulate and determine a great deal about information. Think, for example, of forms and processes that work with data. Whether and how decisions are made (decision rules) and to what extent this is done automatically. How long information is stored or within what period it must be destroyed. The attempt to bring coherence to this is supported. The scope is still somewhat limited to central government, which may be realistic — it already seems difficult enough — but will that give the information society what we need? The author of this article does not think so.

The Government Commissioner for Information Management has committed to a general information law. The idea behind this is to bring more coherence to existing legislation and regulations. Many laws regulate and provide for many 'good' things. More coherence can be brought to all these different laws and regulations by paying attention to, among other things:

- the rights and obligations of residents, entrepreneurs, institutions/companies and the government, and
- their responsibilities and powers in order to be able to focus more specifically on facilities, standards and the planning and accountability thereof.

This will also enable us to start focusing on people and types of work, rather than government organisations or facilities. This can be achieved by using archetypes – loosely translated: the basic work processes in the chains of (government) organisations and their stakeholders – which are brought under architecture.

I find it unfortunate that the scope of the general Information Act is limited to government organisations, as the information society is interdependent. In addition to information as a raw material for smooth service provision, consider also the fight against fraud. A vision of a single information management system for the (national)

government may already be a bridge too far and difficult to comprehend in current practice. However, this does not take into account important stakeholders in the information society that matter, such as private energy companies in the energy transition and software companies that 'unburden' municipalities and, for example, public libraries. Multinationals such as Google, Microsoft and Apple are also insufficiently involved in this process to properly fulfil their role and social responsibilities in the predominantly costly provision of services.

Right to information in the constitution

One of the possibilities for repositioning the mutual relationships between citizens, entrepreneurs and 'our' government as part of a more mature information society is an amendment to the constitution. Our constitution is also a dynamic document. Amendments require care. For decades, we have been amending our fundamental rights in order to embed important elements in our society. Think of the additions in the areas of work, income and housing.

The information society benefits from establishing this fundamental right. After all, if we have that agreement with each other, then rules and standards can be determined that apply to everyone. Possibly also a package of provisions that goes with it. After all, the private market and globalisation still do not sufficiently guarantee affordable, sound and well-secured provisions that can withstand a knock or two.

A fundamental right to information could, for example, be incorporated by extending the fundamental right to privacy of correspondence to include the right to and protection of information, thereby making it a general principle for private individuals, public authorities and all participants in our society. Another option would be to incorporate the fundamental right to information in a more general sense and to bring the provisions of other articles more into line with each other.

The National Archivist has previously advocated for the fundamental right to information by stating that it is already a fundamental right. A more recent development is that the oath of office for civil servants now also includes a provision that every civil servant must handle information properly, as part of a broader task to work on the basis of equality (e.g. equal access to information), justice and respect, and to work even more clearly than before in the general interest of society.

Significance for the profession

A plea for more integrated support for our colleagues, management, board and the information society from all disciplines within the KNVI, optimally tailored to the needs and requirements of customers at both the micro (individual) and macro (other) (government) organisation levels. The professional group must take a firmer stance in our internal world and towards the outside world and must offer our (staff) services and facilities in a more integrated manner.

Together, we can strive to include the fundamental right to information in our constitution. The professional group can also organise itself better to choose our destination together and show solidarity with each other in order to include everyone to the best of our ability and as much as possible.

Finally, a question for the reader: what strategic questions do you ask yourself? What must, can and do you want to mean or contribute in this regard? With whom do you do this, and what is your first step?

- Information is a fundamental right, not a privilege: access to information must be guaranteed for everyone, regardless of skills, resources or background.
- Information professionals must take action: the profession must proactively contribute to accessibility, ethics and cooperation within the information society.
- Anchor the right to information in the Constitution: a solid legal foundation provides a basis for inclusive, secure and reliable information provision.

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The library of your entire life

Martijn Aslander & Wouter Bronsgeest

2024 will go down in history as the year AI broke through to the general public. When this book is published in 2025, we will be in the midst of a dizzying series of developments that are difficult to interpret. In Europe, we are waiting to see which way the wind blows and are mainly engaged in discussions about ethics, while the two other economic superpowers are investing massive amounts of money and capacity in even more powerful and faster models, seemingly without regard for the consequences. The outcome will have many implications for the information sector, but as far as we are concerned, it is anyone's guess what that outcome will be.

Fortunately, a sentiment we are hearing more and more often in Europe is the need for control, and especially control over your own data. The amount of information continues to increase, as does its speed and the number of information channels. The impact of this on our mental health and effectiveness is unprecedented. The legendary duo Van Kooten and De Bie coined the term 'information fatigue syndrome' back in the 1990s.

Dealing with information

Strangely enough, the average person has never learned how to deal with information. In fact, everyone just does their own thing and invents their own way, within the possibilities offered by the available hardware and software. There is quite a difference in how this is done between generations. People who were already working with computers in the 1990s and before use tree structures with folders and documents. The youngest generation mainly does this on smartphones and the web, with virtually no basic knowledge of computers and files.

In larger organisations, information is mainly viewed from case systems and

document systems. The need of employees to be able to properly organise all the information and knowledge that comes their way on a daily basis is completely overlooked. And in our opinion, that is problematic. In the information society, we simply cannot escape information skills. And contrary to popular belief, it is not included in any curriculum. The term 'information skills' has been reduced to the ability to recognise fake news and assess sources, and perhaps a few computer or tablet skills here and there.

A task for information professionals

Reduced information skills are a risk – for people and society. This presents a clear task for information specialists of all shapes and sizes. These information specialists will have to serve information amateurs on three levels:

- Create facilities that make it easier to store knowledge quickly, intuitively and in a retrievable manner.
- Help non-specialists to work with these tools – and learn from their application. Many libraries in the Netherlands are already doing this through initiatives such as the Digisterker Foundation.
- As an information specialist, keep up with your own field, because information specialists also need to have both feet firmly planted in their field and in the society around them.

The employers of these (information) specialists are used to looking down from above. And it is precisely in this approach that we fall short. Most attempts at knowledge management have failed miserably. That makes sense. Give people a tool that is slow to use and offers no immediate benefit, and they will ignore or sabotage it. Give people *tools* and hands that are fast, intuitive and offer personal benefits, and they will embrace them in a flash. Then you have to make sure that those tools also communicate with each other, otherwise you will have as many tools as you have people in your organisation. So something is needed to organise this properly within organisations. Existence, design, operation – and also: policy, framework and implementation. But we have experience with this within the profession. The trick is to set it up in such a way that it provides maximum support to knowledge workers both inside and outside your organisation.

Personal Knowledge Management

For about three years now, we at the KNVI have been working on a rapidly growing, emerging phenomenon called Personal Knowledge Management (PKM), together with the Digital Fitness Foundation. This interest group holds meetings every two months at Utrecht Centraal station on the ability to deal with personal knowledge and learning how to do so. And since 2024, the KNVI has been a partner of the European PKM Summit. Amateurs and experts from more than twenty countries come together here for two days to exchange knowledge and experiences. And to philosophise, spar and experiment with the ability to deal with personal information. The landscape of tools for dealing with this effectively is expanding rapidly.

What invariably stands out is the need for control over your own data and information, as well as over the sustainability of its storage. These experts have now learned a great deal about relying on *proprietary* systems, which are not very future-proof and make you dependent on large providers. This community, which can also be found online, offers a wealth of freely accessible knowledge, experience and insight.

Organisations talk a lot about innovation, sustainable employability and lifelong learning. The job for life is an artefact from a bygone era (Aslander et al., 2022). It is strange that if you have been in a job for five years and have built up information, knowledge and contacts, you cannot take them with you to your next job because the IT infrastructure does not allow it in any way (and your employer usually doesn't either).

It already existed

The insights and developments surrounding PKM are not new *in themselves*. Since the late Middle Ages, through *commonplace* books, people have been storing, retrieving and combining knowledge. This was reflected in the emergence of marginalia, for example, the personal notes that people made in books at that time. It was also reflected in the creation of indexes in notebooks to help retrieve topics.

Since the Enlightenment, with predecessors such as Francis Bacon, René Descartes, Carl Linnaeus and Denis Diderot, more structured forms have been developed to acquire and preserve knowledge. This can be seen in Linnaeus' index cards, in

encyclopaedias such as Diderot's, and in scientific journals.

As the amount of available information increased during the Industrial Revolution, new methods were needed to structure all that knowledge. This led to the Dewey Decimal System, and at the same time Niklas Luhmann was working on the Zettelkasten method, a revolutionary way of linking notes together.

All this linked information ultimately led to the invention of hypertext in the 1960s, with widespread application on the web only coming in the 1990s. Between the 1980s and 2000, we saw the rise of personal databases, *mind mapping* and wikis.

It explodes

And for the past five years or so, with the emergence of new *tools* that go beyond the dogma of the document (Aslander, 2020), you see that many millions of people worldwide are rethinking personal knowledge and information.

It is as if all the knowledge of the past five hundred years is merging. The number *of tools* and insights on how to apply all this is really exploding. More and more people are realising the power of being able to manage your personal information and knowledge. And that is truly personal. Organisations have not really noticed this yet. They prefer to take a top-down approach based on management and control. How does it benefit the organisation? And we prefer to have one *tool* for everyone, because that is easy and clear.

But with the number of information channels still increasing and the amount of information growing at a dizzying rate, the top-down approach to knowledge capture is the wrong one. If individual employees enjoy handling and capturing information and become skilled at it, then everyone wins. We would even go so far as to say that if the largest organisations in the United Kingdom facilitated individual employees in recording their personal information, they could operate with significantly fewer employees.

The average employee loses approximately six hundred to seven hundred hours per year due to the consequences of not being able to handle information. And this is time saved.

Not to mention the enormous amount of speed we could gain if people could access their information more quickly and handle their knowledge more effectively. There are two relatively small organisations in the Netherlands that are doing exceptionally well in this area. Voys, a voice-over IP company in Groningen, and Wigo4it, a cooperative of the four largest cities. In these organisations, knowledge and information are recorded and exchanged much more quickly. They have a completely different IT policy than larger organisations.

For a fraction of the money and staff, they get much more done, and of much higher quality. Organisations are busy organising; it is no coincidence that these words are similar. And organising consists of exchanging, gathering and sharing information and communicating with each other. The *tools* should facilitate this. And if those *tools* lose sight of the individual employee or do not even serve them, then you automatically end up with a lot of hassle.

In many places, we see that individual employees who record their own information more intelligently and quickly are much more effective than those who have adapted to the imposed systems. We think that gives us food for thought. So it's time to put PKM higher on the agenda and take swift action.

- PKM is an essential skill in a world where information is growing exponentially.
- Young people and a changing world: without PKM, you will miss the boat in terms of your personal overview of knowledge, skills and contacts, as well as your opportunities on the job market.
- Want to work more efficiently? Introduce PKM to create time and space within the organisation.

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AI in your digital transformation: vision, direction and application

Denis Doeland

Artificial intelligence (AI) is developing rapidly and is well on its way to fundamentally changing not only the way we work, but also the way we think and collaborate. From automation to strategic decisions, AI is playing an increasingly important role in how organisations create value. This chapter offers an in-depth look at the future of AI, how humans and machines can work together in harmony, and the opportunities and challenges that lie ahead. Discover how AI can strengthen your digital growth and why organisations need to act now to stay ahead in this technological revolution.

From analogue to digital: AI as an accelerator of digital capability

Over the past two decades, the transition from analogue to digital has been the driving force behind technological and economic transformations. Companies, brands and organisations that embrace this shift have been able to transform markets and seize new opportunities. This transition is supported by the emergence of digital ecosystems, where data, content and connections form the basis of economic value. The core message of my first book, *VanAnaloognaarDigitaal.nu* (From Analogue to Digital, 2013), is clear: to be successful in this day and age, organisations must understand how to build and manage their digital capital. In essence, digital capital is the sum of all digital activities and resources that contribute to the success and value of an organisation in the modern, digital economy.

In my book 'Digital Capability' (2018), the concept of digital capability is further elaborated: digital value is created by utilising data, developing content and optimising the relationship with fans and customers within a digital ecosystem. This vision revolves around the intelligent use of technology to create connections with fans and

strengthen those connections. It is no longer just about the products and services that an organisation provides, but above all about the way in which that organisation creates value within the digital landscape. The value of these fan relationships is expressed in the concept of Digital Capital.

Artificial intelligence has become an indispensable accelerator in this context. AI plays a crucial role in converting data into valuable insights, personalising content and improving relationships with fans and customers. AI also makes it possible to operate at scale, automate processes and make strategic decisions based on *near real-time* data analysis. This strengthens the digital capabilities of organisations in an unprecedented way.

While in recent years we have seen how social media, *big data* and *cloud computing* have shaped the digital playing field, AI is now at the heart of the next phase of this evolution. This technology can optimise existing processes and also creates new opportunities in other ways. AI forms autonomous systems that can make decisions independently and act proactively.

In this era of digital transformation, organisations that can effectively deploy AI are better equipped to embrace the challenges and opportunities of the future. AI is not just a tool – it is an essential part of building digital capabilities and a catalyst for innovation, growth and sustainable competitive advantage.

A vision for AI in the medium and long term

The future of AI is not about completely replacing human work, but about a deep collaboration between humans and machines. This collaboration goes beyond automating simple tasks and focuses on enhancing human capabilities. Instead of replacement, the power of AI lies in augmentation: AI takes over repetitive and routine tasks so that people can focus on more creative and contextual activities. This era calls for a new way of thinking, in which humans and AI work together to achieve better outcomes.

At the heart of this future collaboration are so-called 'human+AI systems'. In these systems, humans and machines reinforce each other, combining their unique strengths to achieve results that were previously unthinkable. This requires effective

collaboration and clear communication between humans and AI, with human intuition and insights continuing to play a crucial role. *Soft skills* such as emotional intelligence, creativity and critical thinking are therefore becoming increasingly important. Organisations and people who continue to develop these skills are better able to thrive in an AI-driven world. In the age of smart machines, smart people make the difference.

At the same time, ethical considerations are an important element in the further development of AI. Questions about bias, transparency and accountability must be carefully addressed. The benefits of AI must be shared widely and inclusively so that all layers of society can benefit from technological progress. Only by developing AI in a responsible manner can we ensure a future in which humans and machines work together optimally.

The accelerated evolution of AI: from support to autonomous action

The world of artificial intelligence is moving at a rapid pace from support to autonomous action. Whereas until recently AI was mainly used to optimise existing processes and automate repetitive tasks (such as in the automation of simple processes or customer service), we are now seeing a shift towards AI systems that can operate independently. In the near future, these 'AI agents' will not only provide advice, but will also be able to perform more complex tasks and even make decisions without human intervention.

Many organisations use AI to improve operational efficiency and reduce costs. Think, for example, of the creation of 'digital employees' who take over processes and enable automated customer service. However, around 40% of companies are still in the early stages of experimentation and exploration. The *early adopters*, who are already investing in AI, are beginning to see the significant benefits. This gives them a competitive advantage that is difficult to ignore.

The next phase in the race for AI is characterised by autonomous AI agents that function in ecosystems and independently take over our *workflows*. These agents not only provide support, but can also proactively perform tasks and make decisions. This fundamentally changes the way we work and live. Although this development is

promising, it also brings new risks, such as issues surrounding data security, privacy and the reliability of generated information.

That is why I emphasise the importance of ethical regulation and global cooperation to ensure the responsible development and implementation of AI. Organisations must not only be flexible enough to keep up with AI models, but also have robust processes in place to manage risks. Success in this race will be determined by those who seize the opportunities now, overcome barriers and invest in the right people and technologies.

AI in practice (1): applications today

AI has now found its way into countless sectors, including marketing, where it is used to automate tasks, optimise processes and generate valuable insights. The power of AI in practice lies in its ability to alleviate repetitive tasks and support strategic decisions with data analysis.

In marketing, we see AI being used for various purposes:

- Content creation: AI can generate, summarise and translate text. It can also create and edit images, audio and video, and even convert audio to text and vice versa. This versatility enables marketers to produce high-quality content faster and more effectively.
- Content distribution: AI assists in planning and optimising content, personalising it for specific target groups and search engines (SEO). By using AI in content distribution, content can be delivered at the right times and through the right channels.
- Online *advertising*: AI can accurately target audiences, personalise advertisements, optimise advertising space, and continuously test and optimise campaigns for better results.
- Customer service: AI-driven chatbots are able to automatically answer customer questions, solve problems and collect feedback. This leads to an improved customer experience and increased efficiency within the service department's processes.
- Data analysis and strategy: AI can process large amounts of data to identify trends, consumer behaviour, and market developments. This results in data-

driven strategic decisions that provide a competitive advantage.

AI in practice (2): hybrid teams and efficiency

An interesting example of how AI is changing the daily practice of content marketing can be seen at NXTLI, a content marketing agency that uses AI to improve both the efficiency and quality of their work. NXTLI embraces the idea of hybrid teams, in which human employees and AI systems work together. This approach offers advantages that go beyond simple automation, with the aim of increasing productivity and creativity.

NXTLI has developed a range of AI tools, each specialising in a specific aspect of their work. For example, Ian, an AI chatbot, plays a role in customer service by being available 24/7 to answer frequently asked questions and provide basic information. This helps the organisation make customer interaction more efficient and accessible. His 'colleague' Pia assists in drawing up content plans, taking into account important dates, goals and strategic priorities. By automating content planning, human marketers can focus on more strategic and creative tasks.

For social media content, Liza is used to write social *media captions* based on the appropriate *tone of voice* and strategy. This makes it possible to publish quickly and consistently across multiple channels, while ensuring brand identity. In addition, there is Kai, an AI copywriter that produces blogs, landing pages and SEO-optimised texts. This AI helps to create large amounts of content that aligns with the content strategy of clients, without compromising on quality and style.

The technology behind these systems uses *machine learning*, specifically techniques such as vector *embeddings*, to extract meaning from text and provide relevant answers or suggestions. As these AIs process more interactions, they learn and improve their performance. This means that AI not only takes over repetitive tasks, but also gets better and better at delivering relevant output.

The advantages of this hybrid approach are clear. AI tools can automate tasks such as content planning and text creation, giving human colleagues more time to focus on strategic thinking and creative processes. In addition, AI chatbots ensure constant availability of customer service, which increases customer satisfaction. However, the collaboration between AI and humans is not just about efficiency: it enables people

to operate at a higher level and make the most of their unique skills. It makes their work more enjoyable, easier and more challenging.

This development shows that AI is not intended to replace human employees, but to support them in their work. The use of AI in hybrid teams offers opportunities for organisations that want to innovate and optimise their marketing processes without losing sight of human creativity and strategy.

Successful AI implementation: what should you pay attention to?

Successfully applying AI requires more than just technology. It requires clear instructions and the ability to make AI work effectively with people. The following factors are essential for successful AI implementation:

- Clear instructions: AI models function best when they are given clear, precise commands. Using examples and breaking down complex tasks into smaller steps helps to achieve better results.
- Experimentation and training: By experimenting with different AI tools and techniques, companies can discover which solutions work best within their specific context.
- Retaining creative core: Although AI can play an important role in automating tasks, organisations must continue to focus on their creative core. AI serves as a complement to human creativity, not a replacement.
- Transparency and trust: organisations must be transparent about their use of AI and monitor the authenticity of their processes. The trust of customers and employees is essential for the long-term successful deployment of AI.

To effectively implement AI, organisations can use the RACE framework, which clearly defines the Role, Action, Context and Execution of AI instructions.

Steps for AI adoption

For organisations considering implementing AI, there are some concrete steps they can take to maximise the impact of AI:

- Establish an AI steering group: this team is responsible for developing and guiding the AI strategy within the organisation.
- Develop an AI policy: this helps to implement AI in a responsible and ethical

manner.

- Invest in AI training: by training employees in the use of AI, the organisation can make optimal use of the technology.
- Map out work processes: identify where AI can add the most value.
- Experiment with AI tools: test different AI solutions to determine which ones best fit the business objectives.

The key to success in AI lies not only in the technology itself, but above all in people's willingness to adapt to new ways of working and take responsibility for integrating AI into their processes.

Reflection: the downside of technology and ethical considerations

Although the promise of AI is enormous, there are also critical considerations. Increasing automation and the emergence of autonomous AI agents bring not only benefits but also risks. Consider, for example, as mentioned earlier, data security, privacy issues and ethical issues such as bias in AI models. The reliability of AI-generated information remains a major concern, especially now that AI is increasingly making independent decisions that can have a major impact on people and organisations.

In addition, the increasing dependence on AI raises questions about the future of work and the role of humans in a technology-driven world. In order to maximise the benefits of AI without ignoring the risks, an ethical, transparent approach is essential. This requires regulation and cooperation between companies, governments and researchers to implement AI in a responsible manner. Something that every individual can already start doing.

Conclusion and recommendations

The evolution of AI offers unprecedented opportunities for companies that are willing to invest in this technology and the necessary expertise. Organisations that are already committed to AI will gain a significant competitive advantage in the future. In order to use AI effectively, it is essential that organisations invest in technology, while also training their employees and developing a robust AI policy. In this era of smart technology, human skills make all the difference. This is not only good news, but also an encouragement to continue developing.

- Human+AI collaboration: the future of AI lies in the synergy between humans and machines, with AI enhancing human creativity and strategic thinking.
- AI ethics and regulation: successful implementation of AI requires an ethical approach, transparency and global cooperation to share the benefits widely.
- Data and decision-making: AI offers organisations the opportunity to make data-driven decisions, but it is essential to ensure the reliability of AI output and manage risks.

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The downside of digitisation

Aaron Mirck

Digital technology makes our lives easier, the internet has turned the world into a *global village*, and social media has made it easier for artists to break through. Every day, I enjoy the benefits of digital technology when I send messages to friends abroad, discover new music through smart algorithms, and no longer get lost in unfamiliar cities. But digitisation also has a downside. Digital technology has changed our behaviour, both offline and online, and not always for the better. The power of large technology companies is worrying; only a handful of companies determine what content is and is not allowed on social media. Even more worrying is the way these companies treat the environment, the rule of law, user privacy and the conditions of workers in the global south. The latest addition to the tree of digital promises, artificial intelligence, only seems to accelerate these developments. Concerns about the downside of digitisation are well-founded, but worrying is not a very active attitude. In this piece, I will focus specifically on the use of the internet. I will look at the less attractive aspects of the internet and offer an alternative. By taking an active role in the future of technology, believing in social change and acting accordingly, a different future is conceivable.

Digital technology is changing our behaviour

Imagine you are sitting in a restaurant with a colleague or good friend. While you are enjoying your main course, your table companion takes a stack of letters from his bag and starts sorting them. He then takes a pen and paper out of his bag and writes a reply to one of the letters he has brought with him. All this happens while you are eating. You would be surprised if this happened to you. I hope so, anyway. If not, you need help other than this article can offer. The strange thing is that since the smartphone has become commonplace, we do indeed exhibit this behaviour. If

you walk into a restaurant today, chances are you will see several people sending apps and emails (digital letters) on their smartphones, sometimes while their table companions are eating. This is very strange behaviour, which has become increasingly normal in recent years. This is because digital technology is changing our behaviour. There are numerous examples of this. Just think of the coarsening of debate on social media, politicians who prefer to stare at their smartphones rather than follow debates in the House of Commons, and the increasing number of public figures who receive death threats. In court, those who make death threats say they do not consider the fact that they are dealing with real people, which means they forget they are talking to a human being rather than a social media account.

In other words, technology obscures. A smartphone prevents us from making eye contact with the person we are conversing with, causing us to literally overlook the other person. Technology allows us to behave in ways that we previously considered abnormal. Such as showing your holiday photos to complete strangers, which is the most normal thing in the world on Instagram. Before we all started texting en masse, did we ever leave a conversation midway because we were distracted by more important matters (*ghosting*)? Did people used to send analogue photos of their genitals to women who weren't interested (Overmars)?

Users as customers

Digital technology has not only turned modern man into a digital chav. The way in which the largest digital technology companies treat their users and society is just as alarming. There is a well-known joke about IT professionals: which two professional groups refer to their customers as users? Drug dealers and software developers. Both sell a product that is as addictive as possible, so that users continue to use it for as long as possible and as much profit as possible is made. Injecting and swallowing became scrolling and streaming. Our attention is drawn, directed and sold online to the highest bidder. It is a billion-pound business that ensures that the brightest minds of our time are not concerned with real problems, but with optimising online user experiences and digital marketing campaigns. This is not without effect. Every day, Dutch people spend an average of two and a half hours on social media, enough time to learn one and a half new languages or watch *Game of Thrones* ten times – all episodes, all seasons. Half of our free time is spent on screens (not sports, but Netflix, television and social media), leaving us with insufficient

time for friends, family and hobbies. For more information on this topic, read *The Age of Surveillance Capitalism (*Shoshana Zuboff, 2019*)* or watch the Netflix documentary *The Social Dilemma*.

Today's largest technology companies use their billions in profits to lobby and buy up competitors, further strengthening their position of power. Competition is sorely needed, however, so that more ethical alternatives can emerge to the platforms that currently control the internet. Over the past few decades, tech companies have operated according to the motto *'go fast and break things*'. Democracy, the media, the rule of law and minority rights proved to be annoying obstacles that prevented entrepreneurs and their investors from achieving the promised returns. Looking back at the Cambridge Analytica scandal, the erosion of journalism, the storming of the Capitol and the genocide in Myanmar, a common thread emerges: tech companies that are unaware of their social role and (therefore) do not invest enough in content moderation. Speaking of content moderation, platforms such as Instagram and YouTube outsource this work to workers in the global south, who are paid a pittance to filter the most horrific images from our *timelines* and, for example, to tick the difference between child pornography and extreme violence. This work often leads to trauma and, unfortunately, there is rarely sufficient care for these workers. It is reminiscent of the *sweatshops* that produce cheap T-shirts and trousers. Because people want to enjoy free social media or cheap clothing, workers in hot countries are poorly paid for work that we would rather not do ourselves, as Hanna Bervoets wrote in the poignant Book Week gift *Wat wij zagen* (What We Saw, 2021).

Pollution

There is another way in which digital technology is reminiscent of the mo -industry: it is extremely polluting. Our digital lives already account for as much emissions as the aviation industry, namely four per cent of all CO2 emissions. Digital technology will cause even more emissions in the coming years and is expected to be responsible for fourteen per cent of all emissions. The main cause of this is the rising popularity of AI. Google's CO2 emissions have risen by around fifty per cent in the last five years, while Microsoft's have risen by thirty per cent since 2020, as AI becomes increasingly popular. Each request to ChatGPT is estimated to generate more than 4 grams of CO2 emissions, the same amount as the production of a plastic bag. By

2027, ChatGPT alone could use as much electricity as the entire United Kingdom. In addition, there are a handful of competing AI companies trying to develop equally advanced AI technology and are therefore responsible for approximately the same amount of electricity consumption and CO2 emissions as ChatGPT creator OpenAI. Generative AI will be used to create more and more content and make social media more effective, causing us to buy even more stuff we don't need. Capitalism and global warming are rapidly increasing thanks to AI, despite Sam Altman's promise that it should be a piece of cake for ChatGPT to solve the climate problem. If the infinite promises of AI companies are marketing gimmicks, then they are transparent. If they are sincere, then we are dealing with *founders* with a messiah complex, which is more worrying. History teaches us to fear men with power and resources who believe they know what is good for the whole world.

Making a difference

Enough doom and gloom, time for solutions. Change is possible, as practice shows. Diversity used to be something for softies, but nowadays almost every company has a strategy to be more inclusive. Not so long ago, Doutzen Kroes was reviled for speaking out against Black Pete, but now the caricature is virtually a thing of the past. Sustainability seemed to be reserved for hippies, but nowadays every serious company thinks about the environment. Even Shell is a very green company, if I am to believe their website. It turns out that if enough people care about something for long enough, it can make a difference. Nowadays, this is called moral ambition, and marketers have christened it a *purpose*, but there is another, perfectly good Dutch word for it: a calling. My calling is to put 'more conscious use of technology' on the map, as happened earlier with diversity and sustainability. Because we become more productive when our attention is no longer stolen by technology companies, the environment and society benefit from more ethical technology, and because our democracy cannot withstand social media in its current form (see also: *Democracy crashes* by Kees Verhoeven and *The tech coup* by Marietje Schaake).

If we want more ethical technology, legislation is needed to oblige tech companies to treat people, the environment and society in a more responsible manner. It must become easier to develop alternatives, so that neighbourhoods no longer automatically unite in WhatsApp groups and Googling is no longer synonymous with online searching. In addition, awareness is needed. It is time for Max Havelaar technology:

technology without a negative impact on the environment, democracy, society or people. If Max Havelaar technology is to have a chance of success, it is important that more people know about the less attractive aspects of the internet. And we can all play a role in this.

Let's take an active role in the future of the internet. Michiel Schwarz wrote the essay *The Future is a Verb*, which is well worth reading and argues that the future is not so much predictable as imaginable. Elon Musk shows us a possible future by fantasising about living on Mars, making it more likely. After reading this chapter, take a minute to think about a different internet, one that is not ruled by a handful of Americans, one that is more ethical, sustainable and democratic. Ask yourself what it would take to make this future possible and try to act on these principles yourself when developing, outsourcing or purchasing a technological project or product. Tell someone else about the digital future you desire. That utopia is conceivable and achievable, if we want it to be. Tomorrow started today.

- Technology is changing how we interact with each other, and not always for the better.
- Large technology companies put their own interests above those of users, the environment and society.
- Change is possible if alternatives are given more opportunities, more legislation is introduced and awareness is raised.

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Lack of an inclusive perspective in software development

Felienne Hermans

Software is eating the world **is a slogan often heard in Silicon Valley and beyond, and has proven all too true in recent years. Banks, hotels, shopping, mobility, education, countless sectors have been digitised to a great extent, with both positive and negative consequences. But who are the decision-makers in the digital world?**

Citizens in neighbourhoods where *dark stores* or wheeled suitcases appeared were not allowed to have a say in the matter, and others were powerless against discriminatory software in the Benefits Affair. Almost everyone uses social media on a daily basis, which is programmed to make people addicted. Governments often have great difficulty regulating software due to a lack of knowledge and speed. Power therefore often lies in the hands of software developers, who shape the world with apps without consent and outside of regulation. Who are the creators of software, what do they think, and how do their thought patterns impact the software they create and, in turn, the world?

What do software developers believe?

This question may seem strange, especially to people who make software themselves, because they are often 'rationalists', people who believe that reason is the greatest source of knowledge. Software, they often argue, is neutral. It is people who cause problems, so the more we leave decisions to machines, the more neutral the decisions are and the better for everyone. Examples such as the Benefits Affair clearly show that software discriminates 'correctly' and how dangerous it can be to sideline people. And that is just one example from the Netherlands; there are countless others, such as chatbots that portray women and men very differently in their *embeddings*, algorithms that judge people with accents much more negatively, or image

recognition software that does not recognise black people.

In this chapter, I examine what software developers believe, why they believe it, and how it influences their products.

Software is neutral

A linguist friend of mine from VU University Amsterdam recently gave a guest lecture to computer science students about bias in *large language models*. Be careful, he said, the patterns that we humans enter — a doctor is a white man and a cleaner is a woman who speaks the dominant language poorly — come out of the systems automatically, and greatly magnified, as beautifully described in Shannon Vallor's book *The AI Mirror*. His linguistics students always found his lectures logical, but the computer science students came up to him after the lecture and said, 'But sir, isn't that what people think? So isn't it actually a good thing that the software is taking over? The world is what it is, and the systems can't do anything about that.

Programming is mathematics

But why do computer scientists see systems as neutral, and their behaviour as a law of nature, rather than a social construct? There are, of course, countless reasons for this, which interact in complex ways, but for me there is one that stands out: the place of computer science in the university, and thus in our collective consciousness, even far beyond the university. Computer science is a science subject! It is so logical that people nowadays often forget to ask themselves why this is the case and whether it is correct. 'Computer science stems from mathematics' is something you often hear at university, but what does that mean?

In the early days of programming, in the 1950s and 1960s, when computers first entered universities, they did not yet have their own academic discipline. In the early days, the field was diverse, with figures such as linguist Noam Chomsky and Herbert Simon, originally a political scientist, who won both a Turing Award and a Nobel Prize in Economics. If you try to imagine a political scientist winning the Turing Award today, you immediately realise how much our field has changed.

In theory, computer science could have ended up anywhere back then; the field of formal languages is closely related to (natural) linguistics (which you can perhaps

best see in the Netherlands in the interests of Hugo Brandt Corstius), but some areas of computer science fit in with sociology (how does this change the world?), the humanities (how does this affect people?), or even philosophy (what is thinking, and how does a computer do it?). However, in most cases, it became a science.

I believe there are three reasons for this:

- In those days, computers were mainly calculators, and science subjects had a lot of calculation problems: they were the first to see the usefulness and wanted to appropriate the machines.
- At that time, science and technology research groups also had more money than the 'softer' subjects. Putting yourself in a group with powerful subjects that were seen as difficult gave you informal power and budget.
- Despite their prestige due to the difficulty of their subject, mathematicians struggled with the perception that they were not always seen as useful by society. For them, the practical applications were a godsend. That elegant theory we came up with? It also has similarities with computers! Dijkstra, who we can consider the father of computer science in the Netherlands, already said: computer science is where *an inventive and effective mathematician can find challenge and bring his [sic] abilities to bear*.

Computer science thus became 'mathematised', and this was so successful that we can no longer imagine anything else. And then it is only a small step from treating the behaviour of the computer as a law of nature, because if you sleep with the dog, you get fleas, and if you sleep with the scientists, you get their philosophy of science for free. In the natural sciences, they study nature, which is what it is.

Activism has no place in IT

The example of the computer science students who found the bias in LLMs to be a consequence of reality is not *a one-off*, but a familiar pattern. In a fascinating study of the factors that contribute to choosing or not choosing to study IT, one of the most correlated factors was describing yourself as a social activist. At a young age, people realise that there is no place in IT for those who want to make the world a better place. This stands in sad contrast to computer science programmes, which are all too eager to promote themselves as places where the world is changed, but rarely engage in research that critically examines society (administering a questionnaire is not

mathematics, of course). The result of this self-selection is that the students who remain believe that the world is already fine as it is. And if they didn't already believe that, they learn it during their studies, which, as mentioned, consist largely of mathematics and software, supplemented here and there with a course on history that is taken seriously by almost no one, neither the students nor the lecturers.

Every ten years, the ACM (Association for Computing Machinery), the professional association of computer scientists, publishes a summary of computer science curricula worldwide, which, remarkably, does not include any courses on the philosophy of science or research methods. Even thinking about how we should conduct research is considered too 'soft'. A recent proposal by myself and a colleague to include a research course in a computer science bachelor's programme, with examples from across the field, was immediately rejected. No, research in computer science is so different, because it is mathematics! If we expose students to all kinds of research, they will only become confused.

A dangerous cocktail

All this leads to a dangerous situation: IT professionals have an excessive amount of influence on society, through the creation of software and by controlling the discourse on software. Because they are placed in the sciences, they see themselves and their work as neutral, and people who do not experience it that way do not feel at home in the IT world, and their education does not provide them with the tools to look at the world differently.

This leads to software that cannot actually be inclusive. I encounter examples of this time and again in my own work. Perhaps the simplest and most striking example is that of Arabic numerals. Some Arabic-speaking cultures use Arabic numerals, which are not our characters, but very different ones:
1 + 1 is ١ + ١.
Okay, that still looks quite similar to 1 + 1, but for a computer, the Arabic ١ (called wahed) is of course very different from our 1, because it is a completely different character. Computers cannot handle these numbers; no programming language in the TIOBE top 10 can calculate with them. You get an error m , and not even one that says: please note, I do not understand Arabic, but usually something like *illegal character* or *unexpected symbol in expression*.

Since I started working with non-English programming languages, something that happened to come my way, I have told hundreds of programmers about this, and almost no one knows that these numbers exist (except, of course, people who come from that culture themselves), and even if they do know the numbers, they have never thought about it being awkward or unfriendly.

When I presented a *paper* at a conference last year on the awkwardness of Arabic numbers and all kinds of other factors that English-language programming languages lack, such as gender, accents or different plurals, the most common question was: 'But why is it difficult to create an Arabic programming language?'.

It's the old joke about the mathematician who wakes up in a burning house, lights a match, blows it out, and calmly goes back to sleep. After all, the problem isn't serious; it can be easily solved.

An IT culture that doesn't even know that there are other number systems (there are dozens of others besides Arabic, used in Hindi, Japanese or Thai, for example) and that (therefore) does not support them is asking for inclusivity problems higher up in the *technology stack*. Software, and nowadays AI systems, all rely on *operating* systems and programming languages that are already not inclusive, so there is little hope that the tower built on top of them will be.

- Software is not neutral: IT professionals see code as objective, but ingrained assumptions and bias make software discriminatory and exclusive.
- IT lacks an inclusive perspective: the dominant science culture excludes social and philosophical reflection, leaving systems with blind spots.
- Limited diversity leads to limited software: from Arabic numerals to gender and language — when developers fail to incorporate diversity, software reflects that shortcoming.

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Women in IT: a code for success?

Guido Ongena, Mirjam de Haas

& Mieke Braadbaart

In the Dutch IT sector, the proportion of women in technical positions will have fallen to 19% by 2023. Diversity is essential for innovative ideas and better alignment of technology with users. The sector is struggling with a labour shortage, and more women could solve this problem. Historical figures such as Ada Lovelace and Grace Hopper have made important contributions. However, barriers such as stereotypes and a lack of role models still hinder the advancement of women. Companies and educational institutions can contribute to gender equality by promoting diverse cultures, increasing the visibility of female role models and formulating policies to embed diversity in a sustainable manner.

Introduction

By 2023, the percentage of women in technical positions within the Dutch IT sector had fallen to nineteen (Taskforce Diversity & Inclusion, 2023). This is worrying because information technology has a major impact on society. For technology to be well suited to its users, its developers need to be equally diverse. In teams with greater diversity, the wishes and requirements of the users of the systems can be better understood and therefore better taken into account. This results in IT facilities that are better suited to what users actually need.

Numerous studies show that diversity has a positive effect on productivity in the workplace. The findings are clear: diversity pays off. Teams that have a good balance of men and women, different ages, and, people from diverse cultural backgrounds often generate more creative and innovative ideas. Moreover, more diverse teams offer more role models, which encourages the influx of talent from underrepresented

groups. This is particularly important in sectors such as IT, where there is a significant shortage of personnel. A higher representation of women could contribute to a faster solution to this problem. History shows that women have been indispensable to important innovations in information technology. Women such as Ada Lovelace (1815-1852) and Grace Hopper (1906-1992) are important historical figures. Ada Lovelace, a mathematician who is often considered the first programmer. Grace Hopper, a naval officer and mathematician, was a pioneer in the development of computer technology. She helped develop the first commercial electronic computer and played a crucial role in the development of one of the first programming languages (COBOL).

After Ada Lovelace and Grace Hopper, there are countless women who have demonstrated the importance of gender diversity in the IT sector. Examples include Fei-Fei Li, a leading pioneer in the field of artificial intelligence and founder of ImageNet, Sheryl Sandberg, former COO of Facebook, and Marissa Mayer, former CEO of Yahoo. Reshma Saujani, founder of Girls Who Code, has encouraged countless girls and young women worldwide to consider a career in technology.

There are also historical examples of women who have played an important role in the Netherlands. A group of twelve women (known as the Van Wijngaarden girls) were some of the first computer programmers in the Netherlands. In the 1950s, they worked on the PTERA computer and contributed to the engineering of the Fokker F27, an innovative aircraft at the time. Their work highlights how women made an essential contribution even in the early days of IT.

Before industrialisation, women worked from home in the family business. With the advent of factories in the 19th century, men began to work outside the home more often, while women were mainly engaged in housework and caregiving, which increased their economic dependence. From the 1950s onwards, women were often dismissed when they married, further limiting their economic independence. Although this description is a simplified representation of complex social changes, in all EU Member States women still work less than men on average, earn lower hourly wages, hold fewer management positions and are more likely to do unpaid work.

At birth, girls and boys have potentially equal interest in technology. By the time they

reach adulthood, for every ten men working in technology, there are less than two women (*EW-Installatietechniek*, 2024). Girls have stumbled over seven hurdles along the way, as identified by the VHTO. As a result, girls do not make sufficient use of their talent or interest in technology. By removing certain hurdles from the environment, such as expectations about toys, attributing characteristics (such as being pretty or acting tough) and role models, we can reduce these barriers.

Closing the pay gap, introducing quotas for women and making it possible to combine a career with a family can help. In the case of part-time work, inequality often still exists. Part-time work – according to a traditional business model – is often still not possible in the IT sector because working less would result in lower returns, while secondary jobs are accepted. Pursuing gender equality, as in Iceland, can also help. The IT sector is still unfairly associated with technology and programming zeros and ones. Due to the many developments in IT, new, versatile jobs are created every day.

Where do we stand?

Despite various initiatives, the percentage of women in the IT sector remains relatively low in the United Kingdom, below the European average. A large proportion of women trained in IT do not start a job in the field. Those who do often leave the sector quickly. Only thirteen percent hold a senior IT position, which indicates that, in addition to the influx of women, there are also bottlenecks surrounding the advancement and retention of women in the sector (Taskforce Diversity & Inclusion, 2023). Effective interventions are needed to break the vicious circle.

Causes and solutions

In the Netherlands, various initiatives have been set up to attract and retain more women in IT. Examples include SheSharp (network for women in STEM), Code to Change (training agency for digital skills), Women in Tech, CodePact and the VHTO. These organisations focus on getting girls and young women excited about technology and IT, for example by using role models and organising specific programmes aimed at reducing the gender gap.

Education

This practical experience is also reflected in education. Few women choose to study IT. The proportion of women is higher at universities, but very low at colleges and vocational schools. At Utrecht University of Applied Sciences, we have had the

Women in IT (VICT) initiative since 2022. VICT(orie) takes initiatives with, by and for female students, future female students, women working in IT and employees. Examples include placing more women together (25%) in classes (as opposed to an equal distribution across all classes), introducing all new female first-year students to each other, introducing secondary school pupils to IT (such as guest lectures by female students and participation *in Girls' Day*), networking events for female students, future female students, women working in IT, a large presence of female students at open days and online visibility through web pages and social media.

Corporate culture

However, the Dutch Inclusivity Monitor shows that more than 40% of tech companies have not yet taken concrete steps to promote diversity and inclusion. This emphasises the importance of not only recruitment, but also the advancement and retention of women in the workplace.

In the workplace itself, women report that they often experience obstacles and stereotyping. Women report that they have to work harder to gain the same recognition as their male colleagues and that they are sometimes not seen as full partners, but rather as support staff (Chrigui, Koene, Van der Toorn, & Ellemers, 2023), which contributes to a less positive working environment. Organisations therefore need to do more to integrate diversity into their culture so that female employees feel valued and respected.

We also see few women in senior IT positions. In addition, only a small percentage of organisations have explicit targets for the advancement of women to senior positions and management roles. As a result, women find that once they are in, they cannot advance any further and ultimately leave the organisation. To achieve sustainable diversity, companies must create an inclusive working environment and formulate targets that are not only aimed at attracting female talent, but also at retaining it and enabling it to grow through on.

What now?

In order to bring about change in the diversity landscape in IT, action will need to be taken from different perspectives. This needs to be done in terms of culture, education, employers and policy, as we will discuss below.

Culture

Breaking through gender stereotypes and prejudices will attract and retain more women in the IT sector. This can be achieved by increasing the visibility of female role models. Companies and educational institutions must actively put female leaders and professionals in the spotlight so that young girls and women are inspired to pursue a career in IT. In addition, organisations should organise awareness campaigns and training courses to combat gender bias and stereotypes. Creating an inclusive culture that celebrates and values diversity is essential for attracting and retaining female talent.

Education

Opening up educational pathways for women through innovative and inspiring educational strategies and initiatives. Schools and universities should develop programmes that get girls and young women excited about technology and IT. This can be done through workshops, mentoring programmes, and partnerships with companies that offer internships and practical experience. It is also important to train teachers and adapt the curriculum where necessary to ensure diversity.

The working environment

Creating work environments that attract, retain and allow women to advance through policies that promote diversity and equality. For example, companies can offer flexible working arrangements to make it easier to combine work and family life. In addition, clear career paths should offer opportunities for advancement, and active efforts should be made to close the pay gap. These measures not only benefit women, but also improve the working environment and satisfaction of all employees. However, it is important to recognise that these generic measures alone are not sufficient to bridge structural inequalities.

Monitoring the situation — for example, by using the Dutch inclusivity monitor — helps to hold companies accountable and promote transparency on gender policy, but also to provide insight into where companies stand and where improvements are needed.

Policy advice and areas for improvement

To increase the number of women in the Dutch IT sector, companies need to develop

an integrated diversity policy that not only focuses on recruitment, but also supports progression and retention by setting SMART goals and evaluating them regularly (Chrigui, Koene, Van der Toorn, & Ellemers, 2023). In order to truly create a level playing field and help women develop and remain within organisations, companies should consider introducing initiatives aimed at addressing systemic inequalities, such as mentoring programmes for women or networks for women (Women in IT), in addition to the above measures. Offering specific bias leadership programmes and training courses can also contribute to more women in senior positions (Chrigui, Koene, Van der Toorn, & Ellemers, 2023).

- Diversity is not a luxury, but a necessity: more women in IT leads to more innovative solutions and a better alignment of technology with society.
- Barriers inhibit inflow, advancement and cause women to leave the IT field: stereotypes, a lack of role models and an inaccessible corporate culture perpetuate gender inequality.
- Action is required at all levels: education, employers and policymakers must work together to structurally promote and maintain diversity.

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Taking a critical look at our consumerism and processing

Maurice Goudsmith

Getting people to buy stuff is a science. Planned obsolescence plays a big part in this for sellers: products that can't be fixed are part of the business case for a lot of manufacturers. Some striking examples often make the newspapers: with around 8 billion people currently living on the planet and an estimated 9 billion by 2030, 100 billion items of clothing are already being produced each year and 13 million mobile phones are thrown away every day. Buying is a drug with all the consequences that entails. This chapter provides insight into government policy and then explores the challenges of sustainable procurement and waste reduction. It does not stop at its own sphere of influence: there are many challenges in the waste chain when it comes to the sustainable processing of discarded raw materials, including a lot of *e-waste*.

Procurement strategy of the Dutch government

The government implemented the 'Procurement with Impact' procurement strategy in 2019. This strategy stems from the government's policy to reduce primary raw material use by 50% by 2030 and to be fully circular by 2050 (based on the theme of circularity). In order to determine the impact of this policy, the government is following the leverage points (Figure 1) for the circular economy goals.

Figure 1. Source: PBL

With this procurement strategy, the central government aims to reduce its ownership of goods and, indirectly, of raw materials. The alternative is to use a rental, lease and/or deposit scheme. This means that the necessary raw materials remain the property of the producer, who is obliged to reuse them after use.

If the central government does have to take ownership of the products, it will use them for as long as possible (e.g. by repurposing and repairing them). If the products are no longer usable after their economic and/or technical life span, they will be recycled as sustainably as possible.

But how does an organisation know whether it is meeting its circular objectives? To determine this, it is important to gain insight into the impact of business operations, both in terms of purchasing and disposing of goods. Data management plays an important role in this. With the help of information professionals, more and more insight is being gained in this area. Transparency in the flow of goods throughout the

organisation provides insight and presents choices to management. After all, the difference between what you purchase and what leaves your organisation is the yardstick for how circular you are. In other words, how you prevent waste from being created. In addition, the analysis of this data provides valuable information for benchmarking similar companies and formulating realistic objectives.

Research has shown that the amount of commercial waste produced by the central government has not decreased in recent years (Figure 2). The impact on the environment has therefore not really changed. The size of the government organisation has grown somewhat in recent years (particularly in 2022 and 2023), but that does not explain the increase in waste.

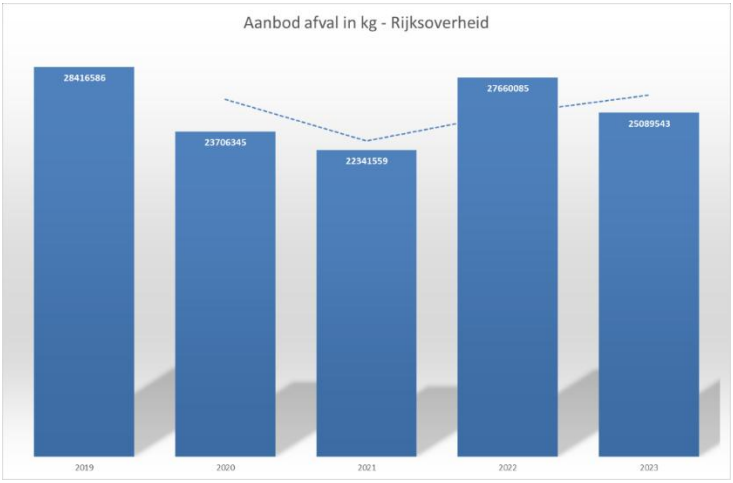

Figure 2. Source data: Waste Management and Raw Materials Management, Central Government, March 2024

Commercial waste

Commercial waste includes all waste streams generated by a company. Most of it arises from its own operations, but the central government is also confronted with waste over which it has no control. This concerns waste that arises from seizures (such as drugs, dangerous fireworks, opiates and goods on which no tax has been paid) and accounts for approximately ten per cent of all waste disposed of by the central government.

The National Waste Plan 3 (LAP3) stipulates that companies must separate their waste. Depending on the culture of an organisation and its commitment to the Sustainable Development Goals (SDGs), in practice waste is often seen as a necessary evil and a write-off.

Despite the many investments made to change employee behaviour, even the national government is still unable to produce less residual waste. As a result, more than sixty percent of all waste is incinerated. The remaining percentage is recycled. Recycling also releases emissions and causes damage, albeit less, to the environment and human living conditions. After all, recycling is not just about reuse, but also, for example, the mechanical processing of waste, the washing or heating of components to separate specific substances, and the transport and storage of all these materials. In other words, the recycling chain is also complex and sometimes difficult to monitor due to the many stakeholders and processing and trading companies involved. These organisations often operate in a broad European context, which means that recycling flows regularly cross national borders, adding to the complexity.

In 2023 (Central Government, 2023), CO2 processing emissions (incineration and recycling) amounted to 33.5 kilotonnes. 33.5 kilotonnes is ten per cent of the CO2 emissions of the municipality of Amsterdam or 270,000 return flights between Amsterdam and London. The challenge facing the central government is to reduce its waste in the coming years (by purchasing differently or not at all) and, if waste is still generated, to separate it properly so that it can be recycled.

In order to be less dependent on human behaviour, various innovations are already available for separating waste at source. For example, there is already a waste unit (office) that uses artificial intelligence (AI) to screen waste and then dispose of it in the correct bins. Apart from the currently high costs and some teething problems, this seems to have potential.

Image 1. Source: Milieuservice Nederland

Post-separation of waste by the waste industry not only results in higher costs for some waste streams, but also lower yields. For example, streams contaminated with wet components are difficult to separate. This results in the loss of recyclable materials.

To limit transport journeys, compactors and smart waste units are equipped with sensors that can be used to determine remotely when they need to be emptied. The vehicles used to collect waste are equipped with weighing systems that automatically transmit the weights, address and customer number digitally to the administration for registration and invoicing. However, weighing is a precise matter, which can also lead to errors if, for example, a vehicle is not completely stationary. In other words, it is still a vulnerable process at this point in time.

The waste industry

The feasibility study Tendering for single-stream waste (Deloitte, 2019) shows that

there is a perverse incentive in the waste industry to trade waste at the highest possible yield or the lowest possible cost. In practice, this means that price always plays a role in processing and that sustainability or the preservation of materials is not always the preferred option. A single stream consisting of one type of material or one type of product, for which recycling is desirable and technically possible, is therefore not always profitable.

Because the chain for the disposal and processing of waste raw materials has proven to be insufficiently transparent and various incidents have occurred in recent years, the national government decided to intervene in the chain in 2019. This was done by separating the logistics part from the processing part where possible (Figure 3). This system allows the national government to determine where its waste is processed and thus gain insight into the impact on people, the environment and raw material consumption. Implementation began in 2023.

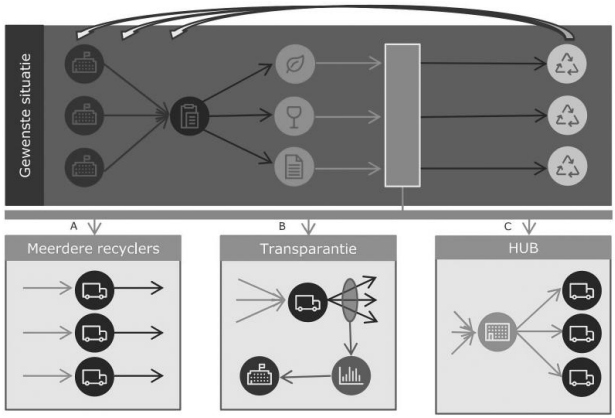

Figure 3. Source: Feasibility study on tendering for single waste streams, March 2019 – Deloitte

Measuring the impact

The central government wants to be able to determine the impact of its waste on people, the environment and raw material consumption. This is in preparation for the Corporate Sustainability Reporting Directive (CSRD). The CSRD is a new European directive that requires companies to publish sustainability reports.

To make this possible, measurements are taken at two levels:

- Waste logistics (objectives from Greendeal 173), with a focus on:
    - CO2
    - NOx
    - Particulate matter
    - Energy consumption

- Processing, with extra attention to:
    - Greenhouse gases (water vapour, carbon dioxide (CO2)
    - Methane
    - Nitrous oxide (distik nitrogen monoxide) and ozone)
    - NOx
    - Particulate matter
    - Energy
    - Additions, recycled raw materials supplied and waste

Advanced and calibrated measuring equipment is used to measure these elements. For example, an NDIR sensor, or infrared sensor, is used to measure CO2. This measures the amount of infrared light of a specific wavelength that is absorbed by the surrounding air.

Midpoint-to-endpoint factors (characterisation factors) are used to convert the measurements to the three *endpoints*:

- Raw material use
- Human health (impact on humans)
- Freshwater ecosystems (impact on the environment)

The *endpoints* are published annually and tested for feasibility using a benchmark. The technology required to achieve this demands a high degree of accuracy. In addition, clear agreements must be made about the method of measurement and the setting of standards.

Critical and strategic raw materials

The supply risk is high for raw materials that are crucial to the European economy, such as green technology, telecommunications, medical applications, defence and transport. Scarcity plays a significant role here, but China's role is also essential. China has a significant share in the supply of almost all of these raw materials and, in some cases, has become an important supplier to the European economy.

The European Council therefore adopted the European Regulation on Critical Raw Materials (Figure 4) in March 2024. In response to this regulation, the Dutch government has established an action plan for its procurement organisation. It is important to look for alternatives and, if that is not possible, to register the materials so that they can be secured after use.

Although it is not always easy to monitor the entire waste processing chain, the government is working on monitoring waste that contains critical waste materials, in particular waste from telephones, ICT components, computers and laptops. A select number of companies process this waste and extract critical and strategic raw materials from it. At present, however, the cost-benefit analysis is not always positive. Fortunately, developments are progressing rapidly, so it is expected that more and more of these raw materials circulating within the Netherlands or Europe will also be reused.

Figure 4. Sourcewww.consilium.europa.eu

There are a number of management dilemmas in the field of critical materials that all governments are paying attention to:

- Are there alternatives to critical and strategic materials?
- How can we ensure that future scarce and strategic materials can also be traced back to products that are already in use?
- If these materials are incorporated into products, how can they be recovered for reuse after their economic or technical life span?

We must address the above dilemmas in the coming years in order to minimise our dependence on these raw materials.

- The world of our waste still holds many potential improvements and challenges. Some of these can be addressed through technological solutions, but this is also vulnerable. The recycling industry is struggling because virgin materials compete with recycled materials, making investors cautious.
- Virgin materials are materials that have never been used or processed before.
- Geopolitics and the power to control raw materials will change this significantly in the coming years.
- It is therefore very unwise not to invest now in technological solutions to secure our raw materials.

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Access to scientific knowledge

Jos C.M. Baeten

The digital revolution should have made access to scientific knowledge easier and cheaper. This chapter explains why this has not yet happened and provides guidance for the future.

Introduction

Before the digital revolution, if a scientist wanted to publish his research results, he would write his text on paper, using a typewriter (which could be quite a challenge with mathematical formulas or figures), and send it to the editors of a scientific journal. The editors then assessed the text by asking other scientists (anonymously) for their opinion and suggestions for improvements. Once the article had been accepted after the necessary revisions (a process that could easily take a year or more), the editors sent it to the publisher. The publisher typeset and formatted the text, the proofs were corrected, and then the article could be printed in the next issue of the journal. That issue was then sent to all libraries that subscribed to the journal, and the author also received a number of reprints for their own use.

Now, after the digital revolution, the entire process has been digitised, and paper is no longer involved. A scientist can use an advanced word processor such as LaTeX to create the most complex formulas and images and the most beautiful layout, an editorial team handles the entire review process and communication with the reviewers via a digital platform, and the publisher only has to convert the article into the desired formatting and make it available on a website. Much faster, easier and cheaper, thanks to digitisation. In addition, articles can be made easier to find and search, and meta data can be generated. Why, then, do all academic institutions spend astronomical sums on an oligopoly of commercial publishers for the publication of scientific articles?

Analysis

Before the digital revolution, publishers were traditional book printers, often family businesses that worked closely with scientists to create beautiful products. After the Second World War, a process of concentration and economies of scale gradually took place, leaving only a few large corporations, for whom shareholders and management bonuses are much more important than scientists. The best-known examples in Europe are Elsevier (listed as RELX) and Springer Nature (originally the German Springer Verlag) (*https://www.manners.nl/best-betaalde-ceo-nederland-glenn-fogel-booking/*). They realised early on that academic institutions had made themselves dependent on their journal titles and systematically increased the subscription prices of those titles well above the inflation rate. This allows these companies to achieve profit margins of thirty to forty percent on scientific publications (*https://fd.nl/bedrijfsleven/1501806/de-lange-mars-wetenschappelijk-publiceren-zonder-betaalmuren*).

But why is science dependent on these specific journals? Well, these titles (such as *Nature*) have prestige, which is expressed in the so-called Journal Impact Factor, and for a scientific career, for promotion, publications in top journals are very important. The scientific world has rebelled against the dominance of these journals, and gradually the Journal Impact Factor is becoming less important. It should be realised, however, that the system is not so easy to change, that the vested interests are considerable, and that many key scientific figures are simply paid by the commercial publishers. A promising development in the Netherlands is the Erkennen en waarderen (Recognition and Appreciation) project, which should lead to a fairer assessment and evaluation of scientists (*https://www.nwo.nl/erkennen-en-waarderen*). Even if this succeeds in the Netherlands, we are not there yet, because science is an international enterprise, and most scientists pursue an international career. That is why the dominance of journals such as *Nature* is still very strong.

There has also been an uprising against the fact that scientific journals are behind a paywall, meaning that the general public does not have access to scientific results, while scientists and publications are often funded by taxpayers' money. Negotiations between commercial publishers and the academic world have determined that it is possible to make scientific articles freely accessible to readers by shifting the funding to the authors. An author who submits an article to a journal pays a so-called Author

Processing Charge upon acceptance, which is settled in the general agreements between publishers and academia, the so-called *big deals*. These *big deals* mean that for scientists in most wealthy Western countries, the vast majority of publications are *open access*, i.e. freely accessible to everyone. However, academic institutions pay a high price for this: *big deals* involve high costs for Author Processing Charges. The actual costs of publishing an article are no higher than €100, but publishers readily charge Author Processing Charges of thousands of euros (*https://www.mathoa.org/about/fair-open-access/*).

What happens next? Possible solutions

I am exploring a few avenues that may offer some relief.

Firstly, the academic world could stop entering into *big deals* with commercial publishers. This would mean that publications would once again disappear behind a paywall, and institutions themselves would no longer have access to the publications, nor to previous publications. You could call this the nuclear option: the system would be blown up in one fell swoop. However, this has already happened on a limited scale, with limited success (*https://insights.uksg.org/articles/10.1629/uksg.521, https://direct.mit.edu/qss/article/4/2/325/115608/No-deal-German-researchers-publishing-and-citing*). It does free up a huge amount of money, which can be used to support new initiatives and new journals.

Secondly, there is the so-called Green Route. In the sciences in particular, it is common practice to publish articles in a public repository, known as a *repository*, before submitting them to a journal. Many institutions have their own *repository*, the best-known international one being arXiv, where any writer can post an article free of charge that can be read by anyone for free. However, it has not yet been reviewed by a reputable journal, so you cannot rely on the quality of the article. The article can then be submitted and reviewed by a journal. The final publication in the journal (the so-called Version of Record) may then disappear behind a paywall, but it is possible that the latest author's version (i.e. after review, but before formatting by the journal, the so-called Author accepted manuscript) will remain in the *repository*. For many scientists, this is good enough, and it does provide a solution, but many still attach importance to the 'official' version. This means that this solution is not adequate. Commercial publishers also try to retain authors by offering services such as citation

counts and analyses. These services are also available on a non-commercial basis, but this requires a little more effort on the part of the author or his institution.

Thirdly, the establishment of new *open access* journals is not in the hands of the large commercial publishers, who are replacing their journals. This process has been going on for decades, and gradually these journals are gaining more prestige and market share. There are also examples of journals where the entire editorial team has left a commercial publisher and started a new open access journal themselves (*https://www.roo-ryck.org/_files/ugd/d58ca7_fa3646281e7c4784b66d91564ac846c7.pdf*).
We distinguish between Gold Open Access, which is free for readers but requires authors to pay an Author Processing Charge, and Diamond Open Access, which is free for both readers and authors, with funding arranged in a different way. In the case of Gold Open Access, the Author Processing Charge must of course be reasonable, without profit or with low profit margins. A Diamond Open Access journal built on *repositories*, so that the publications remain there (including the Version of Record), can be realised at very low cost (*https://www.episciences.org*).

Many governments, the EU and other international institutions are doing more and more to promote open access publishing and are also providing funding for this. For example, funding bodies are increasingly requiring that scientific publications resulting from their grants be open access (*https://www.nwo.nl/en/open-access-publishing*). Recently, a global alliance was established to promote Diamond Open Access and provide incentives for new Diamond Open Access journals, under the auspices of UNESCO (*https://www.unesco.org/en/articles/announcing-global-diamond-open-access-alliance*).

Conclusion

A lot is happening in the world to increase access to scientific knowledge and make it available to everyone. The digital revolution has certainly increased the possibilities for this. However, much remains to be done before access is universal and free of charge. The role of large commercial publishers is certainly not over yet and remains very important for the time being.

Interest in *open access*, and, more broadly, *open science*, has grown enormously

among scientists and scientific institutions. Changing the publication process is a slow process, but it is certainly making progress.

Senior scientists, who no longer need to work on their careers, can set an example here. They can publish their scientific articles exclusively in Diamond Open Access journals, thereby retaining the rights to their articles. I will therefore not transfer the rights to this article to a publisher.

Conceptual framework

Open Access:	Scientific articles are freely accessible to readers.
Green Open Access:	Scientific articles are freely accessible in a public *repository*.
Gold Open Access:	Scientific articles are freely accessible to readers; authors pay an Author Processing Charge.
Diamond Open Access:	Scientific articles are free for readers and authors.
Journal Impact Factor:	A measure of the quality of a scientific journal.
Version of Record:	Final version of an article, published in a journal.
Author Accepted Manuscript:	Final author version of an article, prior to publication in a journal.

- Open access is essential, but not yet a given: commercial publishers keep scientific knowledge behind paywalls, despite digital opportunities for free access.
- New publication models are breaking the status quo: Diamond and Gold Open Access offer alternatives, but vested interests are slowing down the transition.
- Senior scientists must take the lead: by consciously choosing open access, they can help change the scientific publishing culture.

Appendices

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In 2013, he was appointed professor at Steinbeis University in Berlin and, in 2015, lecturer at Rotterdam University of Applied Sciences. His scientific research focuses on topics such as information interoperability, the (industrial) Internet of Things and Cyber-Physical Systems, consensus algorithms, federative cloud/edge developments and cybersecurity. In recent years, he has attempted to analyse developments in quantum informatics and quantum computing. Within the field of digital transformation, he is increasingly concerned with questions about what this digital transformation means for the 'being' of humans in a digital world.
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Inge studied Cognitive Psychology and International Business Studies (Maastricht University) and holds a PhD in Educational Sciences (University of Amsterdam). She has won several important grants, including a VENI, an ORA and an ERC starting grant. She also

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Dr. Erik-Jan Smits conducted doctoral research into children's logical reasoning abilities. Since then, the question of how we can understand each other has remained a recurring theme in his work. In the years following his PhD, his focus shifted from conversations between children and their teachers or parents to conversations between, for example,

'techies' and healthcare workers, counsellors and orthopedagogists, or policymakers and healthcare organisations. After completing his doctoral research, Erik-Jan worked for 15 years in various capacities (consultant, process supervisor, team leader, innovator) in the healthcare sector. This has given him an 'insider's view' of a large number of healthcare organisations. He is convinced of the opportunities that ICT can offer and of the need to make greater use of the experiences and research into (the implementation of) people-oriented ICT in the constantly changing environment of healthcare. With this motivation, he has been leading the research activities within the CHE that take place at this very intersection since 1 May 2022.
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Gabrielle Speijer works as a radiation oncologist at the Haga Hospital in The Hague, which is part of a partnership with the Leiden University Medical Centre in Leiden. She is active in various organisations dedicated to improving health. For example, she is a representative on the Science and Innovation Council of the Federation of Medical Specialists (FMS), board member of the Dutch Association for Radiotherapy and Oncology (NVRO), board member of the Law-IT section of the Royal Dutch Association of Information Professionals (KNVI), member of the editorial board of ICT&health, member of the advisory board for Value Based Healthcare, trainer in the Black Belt, and member of the advisory board of the Standing Committee of European Doctors (CPME). After being recognised as a 'Future50 Global Clinical Leader' by the Healthcare Information and Management Systems Society (HIMSS) for her contemporary interpretation and integration of the Hippocratic Oath, she founded the company CatalyzIT with the mission of raising awareness of this topic. Its core activities are speaking, publishing, advising and training (prospective) doctors.
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About the KNVI

The KNVI, the Royal Dutch Association of Information Professionals, was formed in January 2017 through a merger of the Ngi-NGN, the KNVI and the SOD.

The Ngi-NGN professional association has its origins in the Dutch Calculator Society, founded in 1959. This merged with the Society for Automation, founded in 1960, to become the Dutch Society for Informatics (NGI). Later, NGI, VRI (founded in 1984) and NGN merged to form Ngi-NGN. One of the founders of the association was Aad van Wijngaarden (1916-1987), a Dutch computer pioneer. Every few years, the Centre for Mathematics and Computer Science (CWI) awards the prestigious Van Wijngaarden Medal to leading scientists in the field.

The original KNVI was founded in 1912 as NVB, the Dutch Association of Librarians and Library Officials. When it acquired the designation 'Royal' in 2012 on the occasion of its 100th anniversary, it was a good moment to update the name and thus do more justice to the changes within the profession. At the end of 2012, the members chose a new name: Royal Dutch Association of Information Professionals. The KNVI was born.

The Association for Documentary Information Provision and Administrative Organisation (SOD), founded in 1931, joined the KNVI. Over the years, the SOD association has developed into a knowledge network for information and archive management. This is a very interesting field, precisely because of the far-reaching digitisation within organisations. As a result of digital working, the archive specialist has developed from a 'reactive executor' to a 'proactive director'.

The KNVI in 2025 is an ecosystem in which information professionals from all fields

can come together to realise optimal solutions for society. It is set up as an independent platform where colleagues, interested parties and stakeholders in the field of information management, information provision and information technology can come together. The association's structure takes shape in interest groups and events throughout the Netherlands, which offer members relevant information, inspiration and innovation. The KNVI provides relevant content through four trade journals: *IT-Infra newsletter*, *InformatieProfessional* (*IP*), *Overheidsdocumentatie* (trade journal *Od*) and *AG Connect* (magazine, website and intelligence platform).

Information plays a leading and innovative role in the development of people and society. What connects the members of the KNVI — as Information Professionals 3.0 — is their desire to continue to develop, both within their field and within society. The KNVI sees it as its task to promote this development of information professionals by collaborating, facilitating, meeting each other, focusing and leading the way.
All of the association's various activities support the five ambitions set out in the KNVI's strategic plan:

1. Is **the leading platform** in the Netherlands for professionals in information management, information technology and information provision, where every professional in these disciplines feels at home.
2. Promotes the **development of information professionals**.
3. Contributes to the **substantive development of the domains** of information management, information technology and information provision.
4. Identifies, structures and sets the agenda for **themes** that are important in the Netherlands, Europe and internationally for the development and positioning of the field.
5. Is a **well-known player** in the field in the Netherlands; its opinion and that of its members is valued and respected.

The KNVI has introduced *Smart Humanity* as a multi-year theme. Defining this theme is a task that the KNVI has taken on: the concept is being further developed with various scientists and *practitioners*, including by organising events for the professional group and publishing various books and articles on the subject. It is the deepest

conviction of the association's board that humanity has a duty to itself to make the most of its own inventions for the benefit of humanity. In other words, information professionals create technology and help to implement it. They are creators, users and educators. They facilitate access to information for other people and organisations. People are therefore central to the professional organisation: they must remain standing amid the disruptive waves in society and cope with the social and ethical consequences thereof.