AVOKI

• Work 4.0

# Spotless technology and the future of knowledge work

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# Introduction

*"The most important contribution of management in the 20th century was to increase manual worker productivity fifty-fold. The most important contribution of management in the 21st century will be to increase knowledge worker productivity – hopefully by the same percentage."*

Peter F. Drucker, in "Management challenges of the 21st Century", 1999

It's been nearly 25 years since the legendary "father of management" Peter Drucker challenged management to revolutionize knowledge work – aiming for a fiftyfold increase in productivity, just like we've done with manual work in the last century.

At Avoki, we're fueled by this challenge. We firmly believe that leveraging IT and spotless technology is key to make that leap. IT enables ground-breaking innovations that transform the way we work and compete.

We're on a mission to create a world where work flows effortlessly, anytime, anywhere. But we're at a crucial juncture in the digital revolution – artificial intelligence and the digitalization of our world are pushing us to the breaking point.

That's why we've teamed up with Kairos Future to explore the most important key shifts in knowledge work today. In this report we delve deeply into the future of knowledge work, its rapidly changing nature, and what managers must consider when devising a strategy for the upcoming decade.

We're genuinely excited about the possibilities ahead, and we hope you are too. Let's dive in, embrace the shifts, and revolutionize the way we work together!

## Methodology

The report is based on a combination of global AI-assisted trend research on tech and the future of knowledge work, along with insights from a survey. The questionnaire was distributed to 148 C-suite executives in Sweden, 22 were screened out or did not complete the survey.

The survey was designed based on Kairos Future's database of trends and developments, with the executives rating the importance of technologies, developments, and trends to their own organization.

Throughout the report, top performers are referenced in the data. Top performers refer to approximately 25 percent of companies in which respondents rate themselves as highly competitive compared to industry-peers in several performance dimensions, such as innovation, employee retention, or profitability.

In contrast, low performers refer to approximately 10 percent of companies that rate themselves as less competitive across all performance dimensions. It has been shown that self-reported estimates of an organization's performance are a strong indicator of real-world competitiveness (by among others Venkatraman and Ramanujam[I]), and by comparing the extremes of self-reported performance, this report can show patterns emerging of which technologies correlate with competitiveness, though it cannot definitively prove causation.

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# Introductory overview of the report

This report concerns the future of work as shaped by technology. Knowledge work is ever more dependent on technology, and likely more so in the future, which in turn means that spotless technology becomes crucial for every manner of organization handling information. In an era of artificial intelligence and increasingly remote and digitized work, technological errors cost time, money, goodwill, and endanger not only the bottom line of an organization but also its branding, culture, and identity.

This fundamental change of knowledge work is also driven by changing work-life attitudes and values, with rising expectations for independence and remote work. Finally, a new geopolitical situation impacts almost all aspects of business and societal life, not least security. Coming together, this leads to higher levels of uncertainty and turbulence in most industries, forcing businesses not only to innovate and transform at a higher and faster scale, but also adapt to the resulting work-life trends described in this report.

In order to tackle the challenges of future technology and to understand what is happening in the realm of knowledge work today and in the future, the report initially lays down four key drivers of change – ongoing megatrends and forces that require little introduction, and which affect the entire world regardless of industry and geography. These in turn manifest seven key knowledge work trends.
Finally, the report concludes with five keys to success.

The report's structure and outline are illustrated by the model below, which also serves as a summary of the key findings.

## Four drivers disrupting work

Before diving into knowledge work trends and success factors, let's take a quick look at four contemporary drivers transforming work, offices and work-life.

### Work as you want

Work is becoming increasingly customizable, and work as you want has become the new normal. With remote work, new and more flexible agreements, and changing norms around work-life – and to some extent, changing social contracts between employee and employer – the nine-to-five on-location office seems ever more distant. Not only is work flexible in space with remote meetings and solutions, it is also flexible in time with the ability to work anytime work is needed, sometimes to the benefit of employees and sometimes to their detriment, in an always-online era where it is difficult to shut off work entirely. Add to this the increasing use of consultants, gig economy workers, and hired services, and work is becoming increasingly shaped by new values. Work as you want is the norm in the future – the only question is whose want, as new norms and social contracts are negotiated between organizations and employees.

### Tech on steroids

Technological acceleration is moving so fast it seems every year there is a new innovation hyped in the media, ranging from remote meeting software to the blockchain to generative AI. Further afield from knowledge work, innovations are also happening rapidly in biotech, in aviation, and in materials technology. Tech is super-charged right now, and the rapid advancement drives several trends in knowledge work that relate to the uncertainty of cutting-edge technology, but also the widespread adoption of more mature, established innovations. Good examples of the latter are video meetings and virtual workspaces, which have been around for decades but reached broad adoption in the last few years, leading to more hassle-free remote collaboration.

### Cold War II

Geopolitical tensions are heating up worldwide, and there is more and more talk of a deglobalization or at least slowbalization, a slowdown of the globalization process, in which supply chains are "de-risked", removed from potentially volatile or belligerent parties. Whether this will escalate into a situation like the Cold War remains to be seen, but certainly there are tensions between the world superpowers which put strain on supply chains and in turn affect a lot of organizations and businesses downstream. Add to that the risk of cyberattacks and deliberate sabotage, and the fact that tech has become the "new geopolitics", and the risks caused by a Cold War II scenario will inevitably color the future of knowledge work.

### Business disrupted

Lastly, many industries are being disrupted by new technology sparking new ways of working and new business models. Digitalization and new technology permits experi-mentation with the methods of work as well as the tools, which in turn allows for entire new industries to emerge and disrupt old ones. Good examples in the past include the music industry and streaming services taking over from cable television, and in the present with EV manufacturers disrupting the auto industry, but no industry is immune to these disruptive forces, and all sorts of organizations must be aware that competi-tion often arises suddenly from far outside well-known fields and domains.

## What about sustainability?

From having been a niche concern at the dawn of the millennium, to gaining traction in the mid-2000s, sustainability is now at the heart of most business strategies and most national agendas. Sustainability permeates almost every trend and every development in the future of not just knowledge work, but the future of the human race; and for this reason the report contains no shift or trend describing sustainability in and of itself.

The topic has grown beyond being a trend or megatrend into simply being a fact of life. Though legislation is catching up and tightening with initiatives such as the EU Directive on corporate sustainability reporting (CSRD[II]), for most organizations sustainability reporting is already the norm.

That being said, sustainability still does impact all seven of the key trends in the next section of this report. Devices and automation need to account for recycling and energy expenditure (AI models are presently not cheap in terms of electricity), business models need to align with sustainability goals, and the needs of individual workers must be balanced against questions of waste and energy efficiency.

How to effectively integrate a detailed sustainability strategy into all aspects of an organization's everyday business falls outside of the scope of this report, but will be a necessary component in adopting the keys to success described herein.

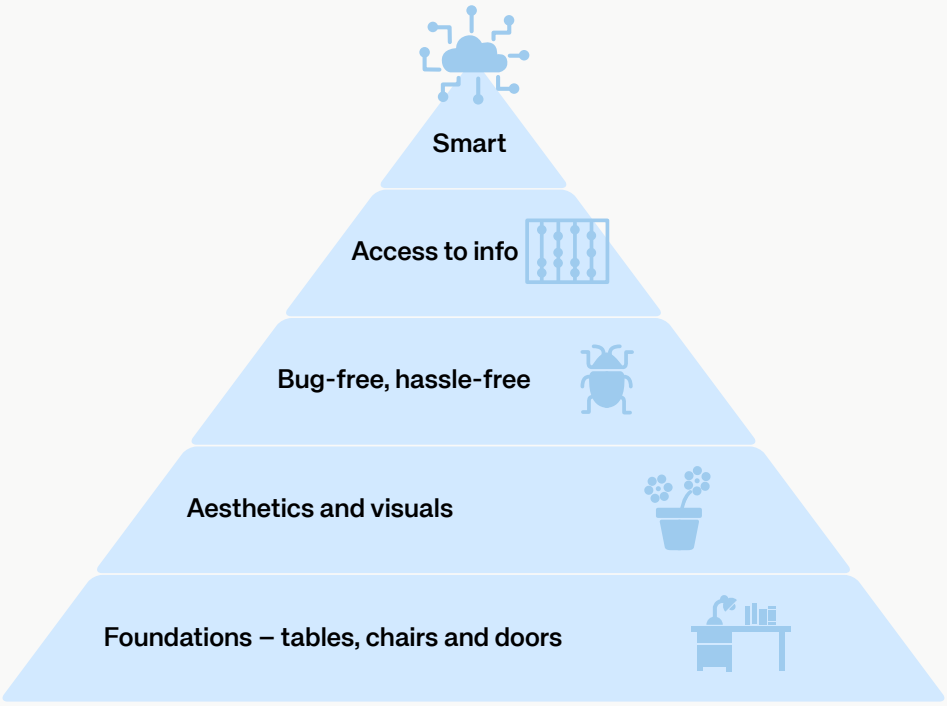
# 01. Ergonomics goes digital

***The workplace used to be a physical place, with expectations for the physical work environment. Today, it is much more. The modern workplace is both physical and digital, local and distributed. With the digitalization and distribution of the office, comfort and accessibility are no longer just physical issues but also digital – a functioning, accessible digital workspace is critical to the future of knowledge work. Consequently, digital ergonomics becomes as important as physical ergonomics. The spot-free digital working environment with features like single sign-on systems, smooth exchange of information, and other quality of life improvements are taking a center stage in the office of the future.***

### Time to put digital ergonomics first

With work taking place in increasingly virtual spaces – whether remote meetings, "metaverse" interactions, shared digital workspaces or documents accessed from the cloud – there is a growing need for what we call digital ergonomics, the practice of making digital spaces more accessible for everyone using them. Comfort is rarely considered in the context of virtual environments – but is just as important as in physical spaces. The illustration below shows the "pyramid of needs" for modern virtual workplaces, with physical ergonomics such as keyboards and chairs far from unimportant – but other aspects are just as important.

The first step remains the physical foundations, "classical" ergonomics. But survey data show that aesthetics and more abstract comfort is as important. On top of these basic steps, the successful organization focuses on being bug-free and hassle-free, before moving on to more advanced technological solutions. The top two steps of the pyramid are easy access to information, followed by a "smart" office which is integrated not only across the organization but also outside of it. The ability to safely share information with actors outside of the organization is, as will be illustrated later in the report, a key component of peak digital ergonomics, rendering access to information and collaboration as hassle-free and comfortable as possible.




*The pyramid of needs for digital ergonomics. Physical ergonomics and comfort are a foundational hygiene factor, followed by aesthetics and visuals that are the next layer of the pyramid. Digital ergonomics is defined by the top three steps. Those who have mastered digital ergonomics are almost 50% more likely to be top performers, compared to those who only have physical ergonomics in place. The top step, labeled "smart", is the ability to share information with anyone who needs it, at any time.*

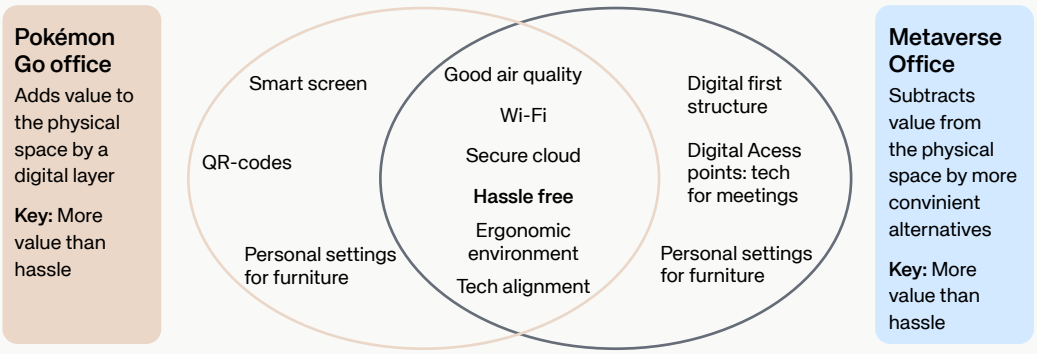
**Those who have mastered digital ergonomics are almost 50% more likely to be top performers, compared to those who only have physical ergonomics in place.**

### Metaverse and Pokémon Go offices

For a few years now, "metaverse" has been an important part of the discussions about the future of work – lately alongside generative AI. But perhaps the reason the metaverse faded from public view isn't that it is unrealistic, but because it is already here. A metaverse designed as a platform on which users can collaborate freely and openly is realized today by cloud-based document management integrated into a platform which permits chatting and remote meetings, and there are already plenty of such platforms. Such an office is digital-first, and in this case the digital solutions subtract value from the physical office by adding more convenience.

On the other hand, the physical office can be enhanced by digital layers. Think of Pokemon Go, the game that swept the world a few years ago, in which an AR digital interface was added onto real world locations to make them more compelling, useful and interesting. The "Pokémon Go"-office might include smart screens, QR-codes, AR information, or simply an office with digital conveniences.

The critical aspect is accessibility and digital ergonomics enabled by spotless technology. That is to say, the physical office might be digitally enhanced with improved access points and information availability, or the digital office might be enhanced through the physical comfort of, for example, seamless remote work.



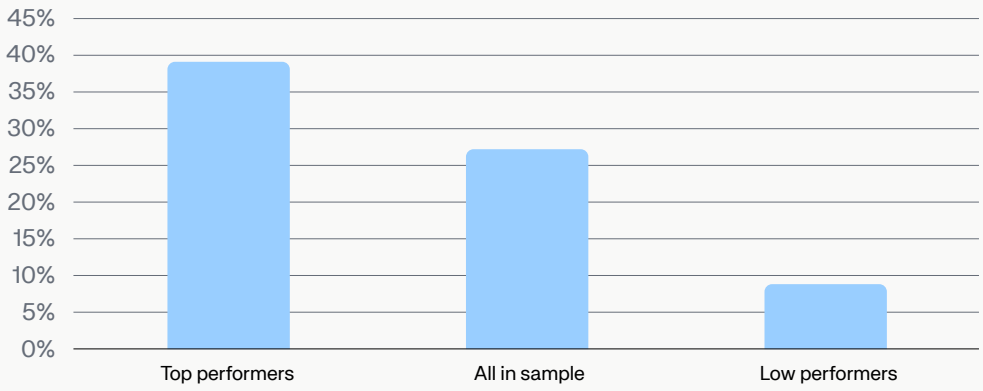

*The two sides of digital ergonomics: Adding value to the physical space by a digital layer, or adding value to the digital space by introducing convenience of access and ease of use.*

### Spotless technology is crucial

From survey data it is clear how valuable digital ergonomics can be. Services like single sign-on that avoid wasting time on multiple logins, automated timekeeping and easy document sharing, all these save organizations valuable time – but even more crucially, they avoid frustration. Digital ergonomics is all about avoiding repetitive and mentally exhausting tasks, to free up time, and creative energy for something more valuable.

Survey data is more than clear on this point. What seems to be the most critical performance driver is “freedom from technical trouble like freezing computers”, when the business leaders independently rate a series of tech-related factors and their organization’s performance compared to industry peers.

**Freedom from technical difficulties**




*The importance of digital ergonomics. Among top performers, over one-third of the respondents report freedom from technical difficulties in everyday worklife. In the total sample, it is somewhat fewer – but among the worst-performing organizations, almost no one reports having spotless technology.*

**Failing tech drives people away**

Spotless technology is also critical to employee satisfaction. In a survey conducted by Kairos Future and Pion Group in 2022[III], employees typically report even more frustration with technical difficulties than managers. Furthermore, employees reported twice as much job satisfaction in a hassle-free environment compared to one with technical difficulties on a daily basis, and were far less interested looking for new jobs. Amongst people experiencing technical problems on a daily basis 60% were planning to leave for a new job within a year, compared to 25% among those who almost never experienced problems with technology. This clearly shows the need for digital ergonomics in today's virtual workspaces.

**On the horizon: The supercharged learning office**

Learning on the job is important – maybe the most important aspect of modern knowledge work – and making this easier through well-designed spaces is crucial to employee retention. But it applies just as much to digital spaces. Later in this report, the need to become a learning organization is emphasized, and part of this is a pivot towards learning offices – educational workspaces, whether physical or digital.
If ergonomics is going digital, perhaps we might see a shift where this also includes learning and skills development to a much more comprehensive degree, where partnerships with various AI-powered digital learning platforms allow for virtual onboarding processes and skills development.
Few offices have this type of partnership today, but with an ever-growing need for highly skilled workers, designing environments (both digital and physical) for learning is likely to become a bigger part of knowledge work across the board, especially if carried out with the right partners.

# 02. Devices go human

***Historically, people adjusted to their tools of work – and after a long work life they were shaped by their desks, machines or shovels. Today, and more so tomorrow, machines are adapting to humans. Devices and tools are becoming human-centered, with interfaces more user-friendly. Ease of access is becoming key. Information available in dashboards is one of the cornerstones to making the user the main character; more sophisticated applications like augmented reality are on the horizon and already in use in some industries. AI chatbots and no- or low-code environments are other ways in which humans and human modes of communication become the epicenter in the future landscape of digital tools.***

**Computer – talk to me!**

The MS Office365 suite comes with the possibility to create robot process automation in a drag-and-drop interface. Many control their smart homes with a voice assistant. Websitebuilding no longer requires html-coding. For years, low- or no-code environments has been on the rise, making sophisticated technology available to a wider range of people. Computers are beginning to talk like people do, centering the human experience in what has previously been an inaccessible and highly technical field.

As a consequence, technology has become democratized. Consequently, using technology has become less of a specific and more of a general skill. Now the next stage is here, natural language. We no longer need to learn the language of computers to instruct them. They have learned our language, and we interact with them like we do with humans – whether that be chatbots, voice controlled homes, or simply convenient and better-designed user interfaces.

**The evolution of devices**

We can likely expect devices to become more human-friendly in the future. The history of mankind is a long process of adapting to our tools, and adapting our tools to us. In line with the digital ergonomics discussed in the previous chapter, more ergonomic, user-friendly devices are likely to be the future, freeing us from screens and keyboards to permit more work to be done via voice commands, eye movements, touchpads or other innovative solutions.

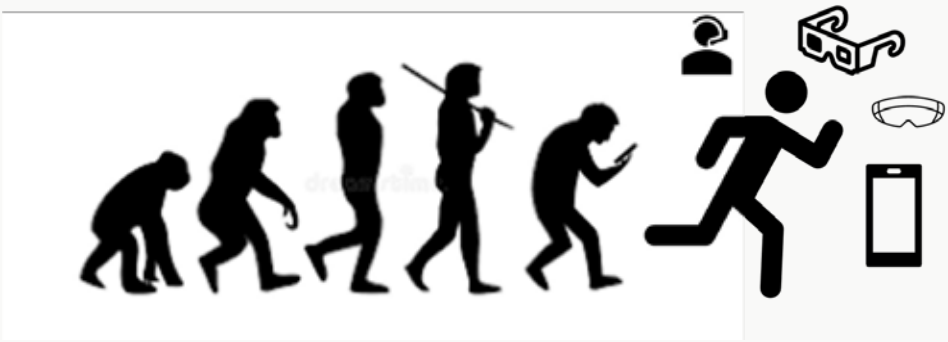


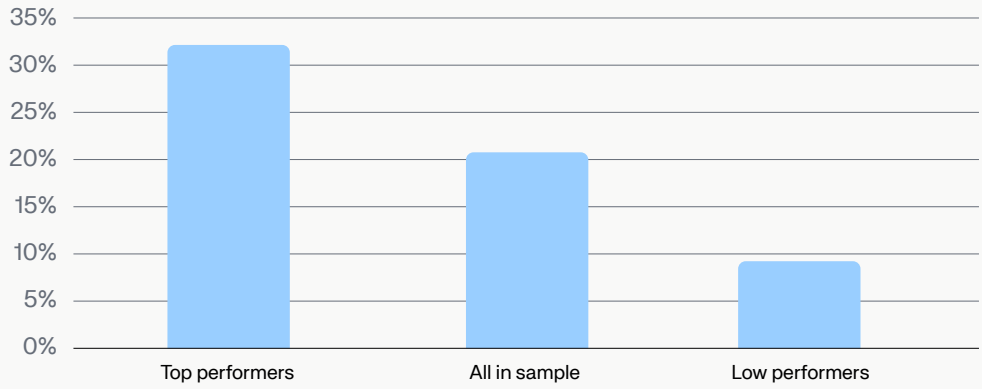
*Illustration of the evolution of humans and their tools. We began walking upright and using tools, and have now sunk back into crouching again over phones and keyboards – but with human-centric tools, we can adapt our devices to suit our mental and physical health better.*

**Information at your fingertips**
Information is key to informed and data-driven decision-making, a key performance driver in most industries. But to make such informed decisions, information must be available and easily interpreted.

Human-centered dashboards seem to be key to that, and a differentiator.
Among top-performing companies, one-third have access to dashboards providing information in real-time to managers and employees. Among organizations in general, only one-fifth do, and among low-performers fewer than one-tenth have implemented such solutions.

But how will information like this be accessed in the future? Will we still use the screen, the mouse and the spreadsheet? Probably not. More sophisticated methods are increasingly becoming available, and top-performing organizations are faster at adapting these, as well as at using them more productively.

**Percent of organizations with dashboards giving real-time information and decision making recommendations**




*Comparison of organizations across three blocks – the top performers, the low performers, and all organizations. Among top performers, over 30% use dashboard solutions; among all organizations it's about one-fifth, and among the worst performing organizations only 9% have some kind of integrated dashboard solution.*

## Already AR ready

Today, most people use their phone or laptop to access their digital world. But would the phone with a tiny screen be the device that the digital world would be built around if we could do it all over?

Perhaps not. Meta, the company behind Facebook thinks not. Meta and many others aspire to replace the smartphone with Augmented and Virtual Reality devices that lets us see and touch the digital in a more immersive manner. In 2023 Meta partnered with RayBan to create AR-glasses that lets the user leave the phone in the pocket, one example of such advanced interfaces. Google tried a similar solution several years ago. That didn't fly. This time it might. With wireless earbuds and a smartwatch, a great number of people already make calls, dictate emails and more. These access points to virtual worlds makes us AR-ready, even if they are not AR in themselves.

**On the horizon: Cyborgification**
A recurring theme in fiction is that robots take over. Perhaps a more likely development is that the difference between human and machine – between physical and digital – blurs. Wearables continue to enhance and digitize the human experience. Devices serve as a portal to digital worlds as well as to our biology.

When it comes to apps, most people keep their data siloed – their biomarkers do not mix with email from work or social feeds. We keep parallel avatars of ourselves simultaneously. And since we do seem willing to share sensitive data the question isn't so much trust as it is a question of not letting one actor know it all about us. Perhaps the diversity of the ecosystem is a version of integrity in itself? The question is: How will we move beyond the smartphone? Perhaps the devices of the future will be more integrated with humans than we expect. The "cyborg" office worker may not be far off into the future.

# 03. Automation goes smart

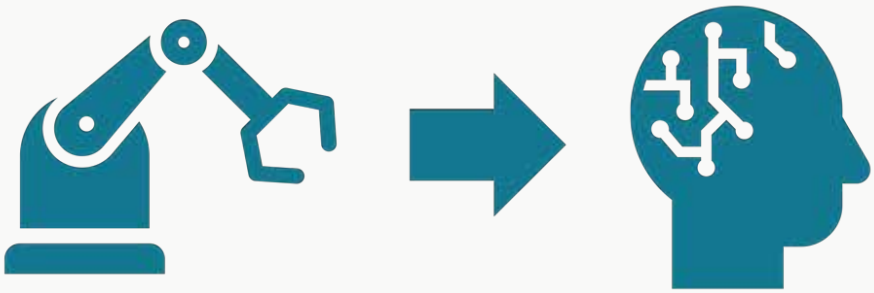
***Historically, automation has primarily been applied in factories or on simple repetitive administrative tasks. With the rise of large language models and generative AI that is changing. Automation now spreads rapidly across office work, targeting also more complex knowledge work. As a consequence, office workers are teaming up with knowledgeable digital co-workers, and eventually becoming managers of armies of bots. Rather than being repetitive, automation is becoming generative.***

**Generative AI – fastest-moving revolution in history**
The last day of November in 2022 was historic. That day, OpenAI released ChatGPT to the world. One month later 100 million people across the globe already had tried the new technology out. Six months later, already 26% of Swedish knowledge workers were using generative AI at work, most of them on a daily or weekly basis, and many in violation of internal politics.

## 32%

*Of excecutives are using generative AI at work*

**The end of the beginning**
Despite the revolutionary pace with which generative AI has conquered the world, we are still at the beginning – maybe at the end of the beginning, but still in the beginning. With the integration of large language and multimodal models into standard software suits such as Microsoft 365, the technology spread will accelerate. This is nothing less than a revolution. It means, that automation has spread from physical labor to office knowledge work, to writing articles, coding and analyzing medical data in a laboratory setting.



*Automation is shifting from physical work to knowledge work, at a drastic pace.*

## Productivity booster at large

Over the coming years, generative AI is expected to change most industries as well as office and knowledge work in fundamental ways. Being a bystander in the AI-race is therefore a dangerous choice.

One reason for this is productivity. Recent studies show that writers become 60% more productive with the assistance of ChatGPT[IV], whereas coders get a 128% productivity boost with Github Copilot[V], a coding assistant. In both cases, without prior training.

In a recent study by Kairos Future in June 2023[VI], knowledge workers said they saved on average 26% time by using generative tools for a range of standard knowledge work task, including writing, coding, planning, attending and documenting meetings. That equals a productivity boost by 35%. If those 35% would be representative for all job, and if the productivity gains could be transformed into growth and GDP, it would mean a GDP-leap on the same level. Investment bank Goldman Sachs is not that optimistic, but still estimates that generative AI will add 6–7% in global GDP until 2030[VII].

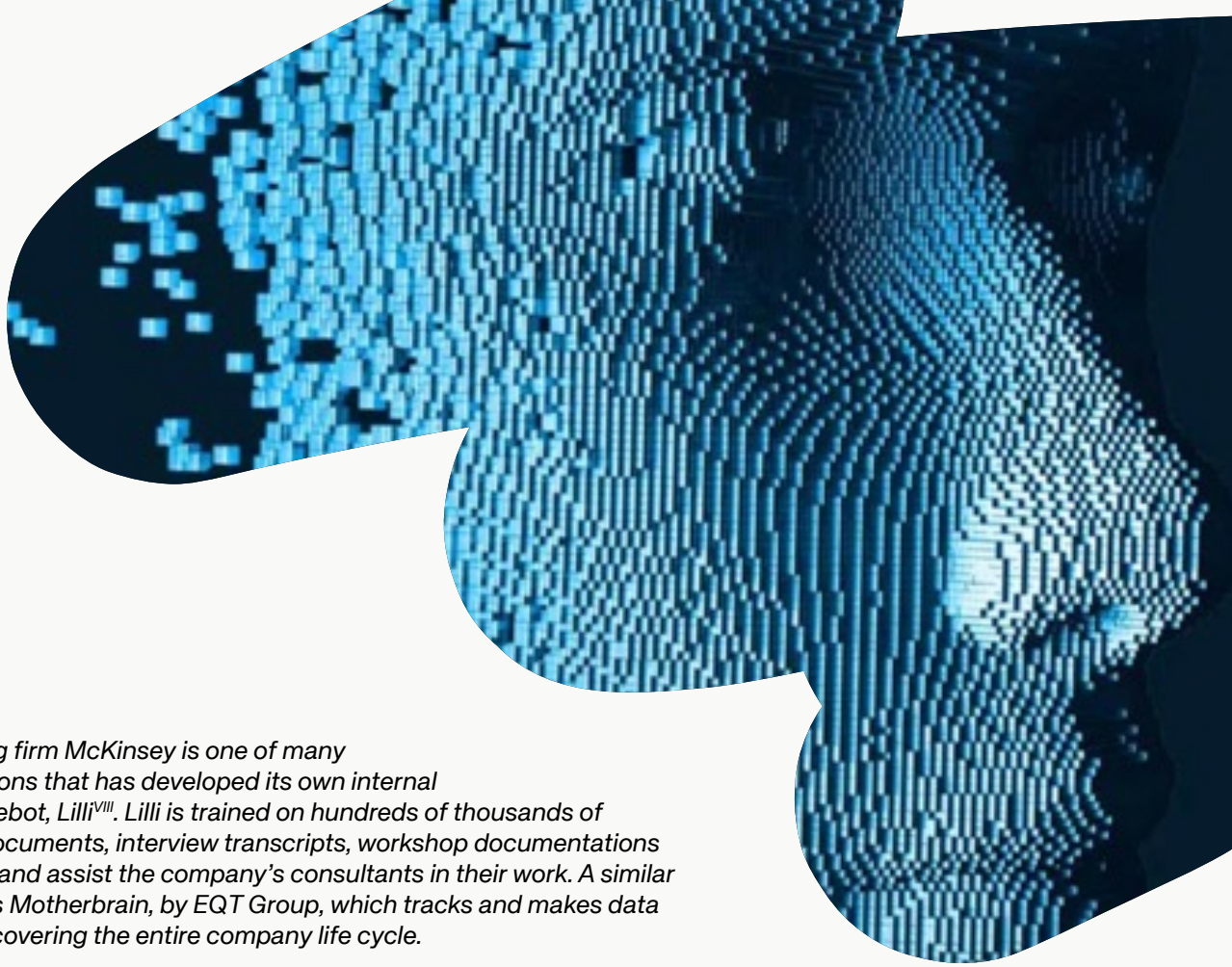
### If we knew what we know, we would be unbeatable

Since the launch of ChatGPT and its equivalents, standard solutions of generative AI have been in focus, and many companies have already started exploring how the new tools could be applied and integrated into existing processes. Being an early adopter is also clearly a winning strategy, since using generative AI seems to be strongly correlated to corporate performance.

But generative AI can be so much more than standard chatbots or image generators. By letting and AI read through internal documents, the company could suddenly have access to all previously hidden knowledge. This kind of what could be called second generation generative AI solutions are likely to be at least as important as the general applications already released.

| Top 5 technologies driving performance |
|---|
| Generative AI (like ChatGPT) |
| Tailor-made AI solution for your organization |
| Own in-house developed AI |
| Surveillance software |
| VR/AR |

*Generative AI, tailored AI-solutions and inhouse-developed AI are the three strongest performance drivers when it comes to new or emerging technologies, according to the survey among C-suit executives.*



*Consulting firm McKinsey is one of many organizations that has developed its own internal knowledgebot, Lilli[VIII]. Lilli is trained on hundreds of thousands of internal documents, interview transcripts, workshop documentations and more and assist the company's consultants in their work. A similar example is Motherbrain, by EQT Group, which tracks and makes data available covering the entire company life cycle.*

**Bossing the bot**

Already, GenAI bots are becoming skilled assistants that can be sent out on missions by knowledge workers, analyzing data, writing codes, participating in meetings and summarizing the key takeaways.

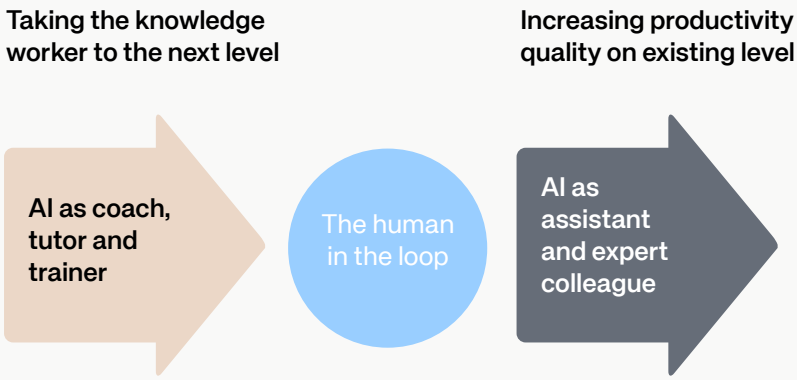
The more skilled the AI bots become, the more complex tasks they can take on, and move from intern or junior assistant to experienced project manager.

The questions business leaders must ask, is both what opportunities this presents in terms of raising quality and productivity, but also what it means short- and long term for teams, leadership and the organizing of work. And they need to ask and answer them now, tomorrow it might be too late.

**Becoming a better me**

But AI-bots or agents are not only excellent productivity boosters and sidekicks, that can do things humans cannot – such as reading through tons of documents – and sometimes also take over jobs completely.

They are and will also be excellent coaches that can help humans to perform better, by providing feedback or designing interactive training programs. One example could be individually tailored onboarding programs for new recruits, by bots trained on all relevant internal data.




*AI-bots are not just competent doers, they can also act as skilled coaches, tutors and trainers.*

**A new enlightenment, scientific revolution and accelerated innovation**

The basis of the scientific revolution was the enlightenment, when people got new tools to think and reason. With generative-AI assistants we are now given agents that can think and act for us. Everyone has the potential to be a boss over a company of research assistants, copywriters, editors and tutors, trained on the knowledge of mankind.

If the 18th century, enlightenment gave us the concepts of thinking. This new enlightenment enhances our capacities to act by manifold, and to accelerate the production of new knowledge. One example of that is the generative AI-tools that now assist scientists in the pharmaceutical industry and help them to fold proteins and develop new medicines faster than ever.

**From funny web-app to strategic asset in less a year**

It all started with ChatGPT, but it has progressed fast. By combining the capabilities of general foundation models and internal data sets, organizations can already now be equipped with "someone" who has not only read everything there is to read on psychology, business and law, but who also can apply that to a specific organizational context. As we have already discussed, companies with huge archives of reports and other data are now seeing their file cabinets come to life. Now is the time to ask the questions "how do we get there" and "what will it mean for us to know all that we know"?

**On the horizon: AGI?**

True AI, or AGI (Artificial General Intelligence), is not a well-defined concept, and people debate what constitutes a real "intelligence" for a machine. But if modern AI platforms evolve into tools that can outperform 90% or 99% of humans in 90% or 99% of all fields, that might be close enough for a "general" intelligence to count, even if the top performers in their respective fields are still more intelligent in some way than the machine. Even if such an AI is not conscious and alive in a meaningful sense, it would still have a huge impact in how we view knowledge work. What does it mean to live in a world where only the top performers outperform an AI service? If such "general" artificial intelligence is created, AI ceases to become a tool altogether and becomes not just an employee but most employees. In such a scenario, work life as we know it will look radically different – and technological unemployment might go from a specter to a real, tangible challenge.

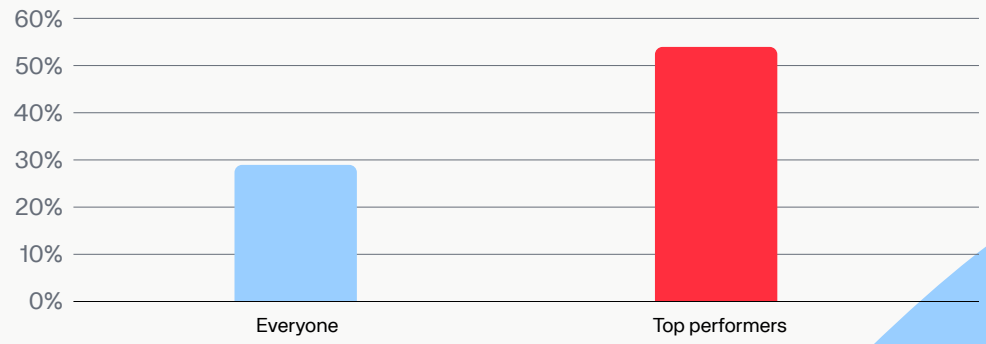
# 04. Communication goes de-siloed

***Historically, most organizations have lived in information silos. Internally, information has been siloed as well. But with the digital revolution, that doesn't work anymore. To thrive in the current interconnected and data-driven landscape, companies must adopt open and collaborative ecosystems. Information must flow freely in these ecosystems, enabling organizations to tap into the collective intelligence and resources of their partners. By fostering a culture of transparency and open communication, businesses can break down information silos and reap the benefits of a truly connected ecosystem. Free-flowing information is a clear driver of performance.***

**What fighting crime in the movies can teach about the future of work**
Who hasn't watched at least a dozen movies where different law enforcement organizations' refusal to share information and internal prestige stifled their attempts to take down a crime empire?

Well, it turns out that there is something to that trope. In the survey, top performers stand out in their ability to make information shareable. In fact, information sharing is a key performance driver. It speeds up work and makes collaboration possible.

**Easily able to share information with people outside of the organization**

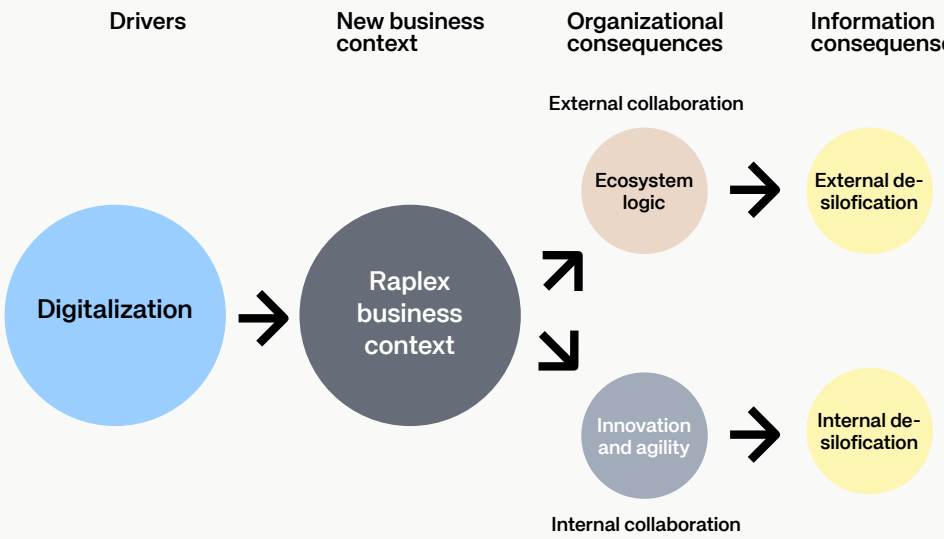



*The ability to easily share information with people outside the organization is strongly associated with organizational performance. Among top performers, over half report they can easily do so, compared to fewer than one-third in the general sample and even less among low performers.*

## The raplexity revolution calls for de-silofication

With increasing complexity and speed in the business environment, it becomes impossible for most organizations to work on their own. To thrive in such a raplex (rapidly changing and increasingly complex) landscape, you need to specialize and collaborate to secure the necessary resources. You need to work in ecosystems, ecosystems where you can share resources and where information needs to flow freely between entities in the ecosystem.

At the same time, internal silofication dampens the innovation and agility needed to thrive, as innovation becomes more crucial to success. Internal barriers musts be torn down, information needs to be both consolidated and accessible across the organization. And although each part of the organization more than ever needs to align its working model to its specific business environment, task and role, collaboration still needs to trump sub-optimization.




*Digitalization and disruptive technology create a more raplex (rapidly changing and increasingly complex) business environment, which requires companies to work in ecosystems and to internally focus on innovation and agility. To make that work, information sharing and communication is necessary.*

### De-silofication of data is key

Thus, information needs to be de-siloed. What a de-siloed information economy can accomplish became apparent during the pandemic. Consider Moderna's achievement to have a vaccine against Covid 19 ready in just 48 hours[IV] (followed, of course, by extensive testing) or how an ecosystem of 3D printers supplied spare parts and medical equipment when the global supply chains came to a halt. None of that would have been possible with a silobased structure.

## Working together requires a shared language and trust

Complexity theory teaches us that efficient collaboration requires a shared language. That is true for humans as well as for organizations and machines. And shared language could mean anything from a shared worldviews to data protocols.

At this point most organizations manage to have cross-organizational digital meetings. But seamlessly and securely sharing data is completely different thing.

First of all, sharing data across organizational boundaries requires trust. Secondly, data needs to be organized in ways that makes it possible to share. Finally, to really benefit from data sharing, it needs to be organized in ways that makes it possible to share and collaborate around on a more continuous basis, both internally and within external partnerships.

### The trade-off between openness and safety

But digital collaboration also opens new vulnerabilities that can be exploited by malicious actors. Risks range from espionage to outright attacks. Information sharing is the whole point of the Internet – and it has obviously been enormously successful in making work life easier. Returning to a pre-digital work life is likely not feasible, so the challenge is to balance openness with safety. This is a challenge dating back to the very early days of the Internet, with the famous quote about how "information wants to be free," originally from Stewart Brand.

*"Information sort of wants to be expensive because it is so valuable—the right information in the right place just changes your life. On the other hand, information almost wants to be free because the costs of getting it out is getting lower and lower all the time. So, you have these two things fighting against each other." Stewart Brand, 1984*

### On the horizon: The Internet of trash

Ecosystems require delicate balancing, and the modern-day Internet is full of fast-moving artificial entities. Some futurists and science fiction writers imagine a future in which the open Internet is simply overrun by bot traffic, rendering it essentially inoperable. Conspiracy theorists speak of the dead Internet theory, the idea that online activity already consists of more bots and faked traffic for ad revenue than genuine users. Though some suspect this is a deliberate action by some malicious government, the more likely explanation would be a natural evolution of the attention economy – if attention is worth money, then manufacturing attention becomes a logical business model. If dead Internet theory ends up being true, now or in the future, what will that mean for online business models? What will that mean for research? In an open information ecosystem overrun by bot traffic, the value of truly open information becomes essentially zero. In that case, more carefully curated ecosystems – available to trusted parties who can be depended on to provide reliable and useful information – become the only viable way of using the Internet. Perhaps we will return to curated email newsletters and group chats, and move away from an open and "social" Internet that became the norm in the previous decade.

# 05. Security goes balanced

***Security used to be about safes and guards. But in the digital age it is more about habits and mindset. And while the new world calls for security, security at any cost is no longer feasible. Opportunities must be weighed against risk, and many organizations lose out because they fail to act quickly enough. More entrepreneurial actors take risk into consideration but balance it against reward – and in the infosec landscape of the future, can any action truly be said to be risk free? There is a necessary shift toward accepting some amount of risk, especially given organizations need to open their information ecosystems to at least some trusted actors – and trusting anyone, in itself, entails taking a risk.***

### The fundamental things apply

IT security has changed in many ways, but the fundamental vulnerabilities have remained mostly the same – the problem exists between user and keyboard, as old Internet jargon has it. The most common vulnerability is users trusting someone or something they shouldn't have, such as a malicious link or a person innocently asking for a password. This is unfortunately a challenge that only grows greater and greater in a world of AI and deepfake scams, in which it's easier than ever to fake a voice, forge an email, or in other ways automatically deceive users by mimicking some legitimate source.

Another reason the challenge grows greater is that we operate in a more and more interconnected work life, relying on services from third parties, communications platforms that interlace personal life with business, and sophisticated partnerships with other organizations. We take on their vulnerabilities when we let them into our information spaces.

### Innovation is inherently unsafe

To create innovative, creative spaces, we need some amount of information freedom. Knowledge work cannot be efficiently carried out in isolation – if that were the case, we wouldn't need the Internet. Digital tools enable us to work faster, smarter, more efficiently, even with relatively "solo" tasks like organizing a spreadsheet. The ability to quickly look up information, ask an AI for assistance, paste in some efficient code or macro, are all things that enhance the productivity of a knowledge worker – and create vulnerabilities.

Taken together this means that organizations hoping to harness the power of modern tools like generative AI must accept some level of risk and lose some amount of control. The AI provider needs to access some of the businesses' internal information in order to operate. The same goes for human colleagues and partners in other organizations, other parts of the world, or other offices. Optimally, the organization finds some balance between risk and security, which is where the profits are greatest.

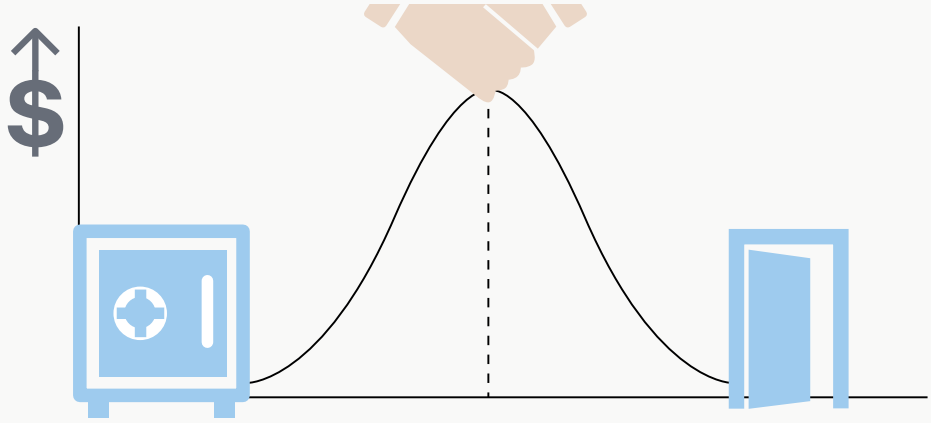


*Illustration of the balance between security and openness of information. Fully open information spaces mean valuable data can be stolen, robbing the organization of profit. But completely siloing information away behind locked doors also means loss of opportunity. Finding the balance and creating trust is the future ecosystem in which cybersecurity experts must operate.*

**The cost of cybercrime – and the cost of missing out**

According to Statista[X], the cost of cybercrime worldwide has been steadily on the rise since the mid-2010s, with the estimated cost in 2023 being over 8 trillion dollars or approximately 8% of global GDP – a figure expected to increase by over an additional 5 trillion in the coming decade.

On the other hand, the value of digital work is at least twice as high, without even including second-order effects. The World Economic Forum[XI] estimates that even a small increase in ”digital trust” – seamless collaborations with people across digital spaces – is worth increases in GDP per capita of thousands of dollars, citing a figure from the World Bank that the digital economy directly contributes more than 15% to world GDP in a positive direction, or over 14 trillion dollars. The evaluation of the cost of cybercrime includes second-order effects, but the indirect value of digitalization is difficult to calculate.

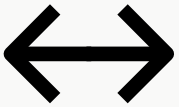
**The balancing challenge**

Being victim of cybercrime is expensive. Thus, it is not surprising that one of the key trends identified in the survey is an increasing demand on security for IT and digital devices. 72% of executives is stating this is being significantly more important in the future, making the demands on security the most significant trend and one that will dominate for the rest of the decade.
However, almost as important is the growth of remote and fully digital collaboration – which 57% believe will shape the coming five years. The crux of managing security in the modern digital environment is how to balance the accessibility and openness necessary for remote collaboration with the need for significantly more attention to cybersecurity.

**57%**

of executives believe remote and fully digital collaboration will shape the coming five years

The balancing challenge



**72%**

Of executives believe cyber-security will be significantly more important in the future

*Balancing a growing need for digital collaboration with escalating security concern is a main challenge for the future*

**A difficult complexity to manage alone**

Cyber security is a rapidly moving field with both technological and organizational aspects. This makes it a difficult area to manage alone without it swallowing huge amounts of resources. Taken together with the equally fast movements in AI and software generally, the incentive for businesses is clear: partner up with someone with expertise in fields outside of the core to free up time and resources to do what you do best. This is why the shift from owning to services is still increasingly important to understand.

**On the horizon – The quantum AI double threat (as a service)**

Quantum computers are believed to be the next big leap in computation and digital potential. And they also pose a possible threat to cyber safety. Why? Because they might just be able to break almost all standard cryptography in record speed.
Add to that the spread of deep fakes and advanced AI-scams and we are looking at a future where cybercrime might be more severe and have lower costs.

The timeline of quantum computers is uncertain – and they will be expensive – but we already see cybercrime as a service where hackers and ransomware attacks are available just a few clicks away on the dark parts of the web. This raises the question of an internet kill switch or panic room, where you with one push of the button can take your organization physically offline.

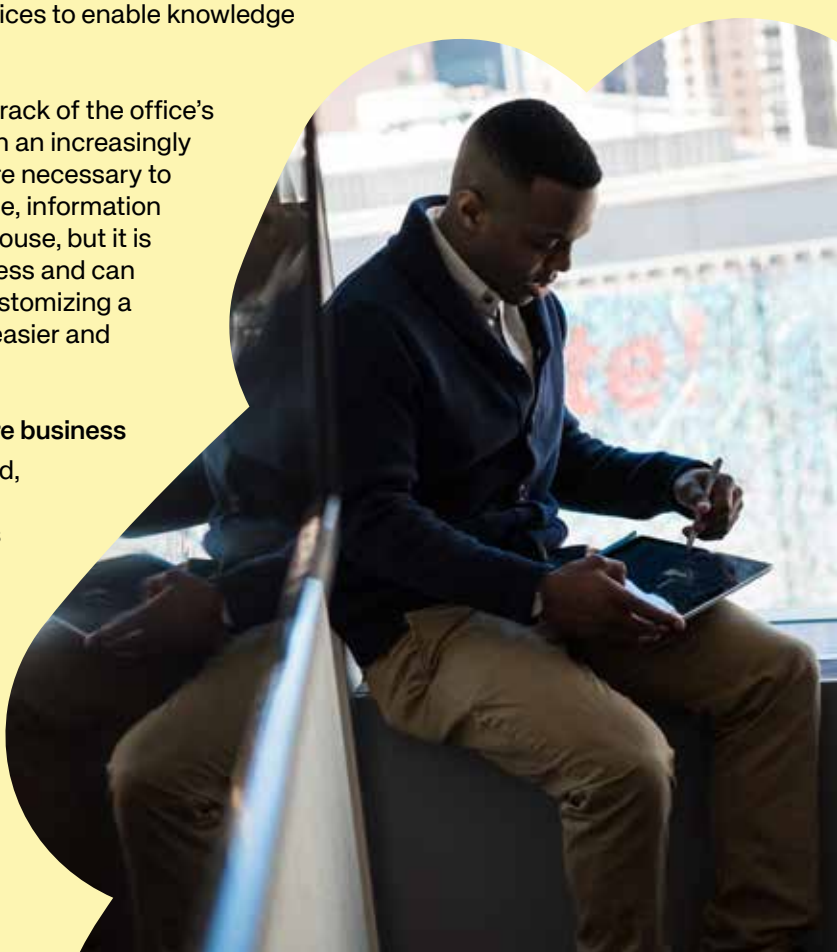
# 06. Assets go services

***For decades companies have been unloading their balance sheets, freeing up capital and improving agility – moving from owning to leasing or hiring. But in an increasingly complex and fast-moving business landscape, there are more reasons for service: competence and risk. It is nowadays impossible for almost any organization to stay on top of cybersecurity, AI, sustainability and other trends without acting in collaboration with others. The ecosystems of the future – which involve not just technology but also innovation, customer service, and relationship management – will require a greater reliance on services. Software-as-a-service is already dominating the market, but there are clear opportunities for hardware-as-a-service as well. And any service-as-a-service. A key challenge is balancing these issues against the human touch.***

### There's a service for everything

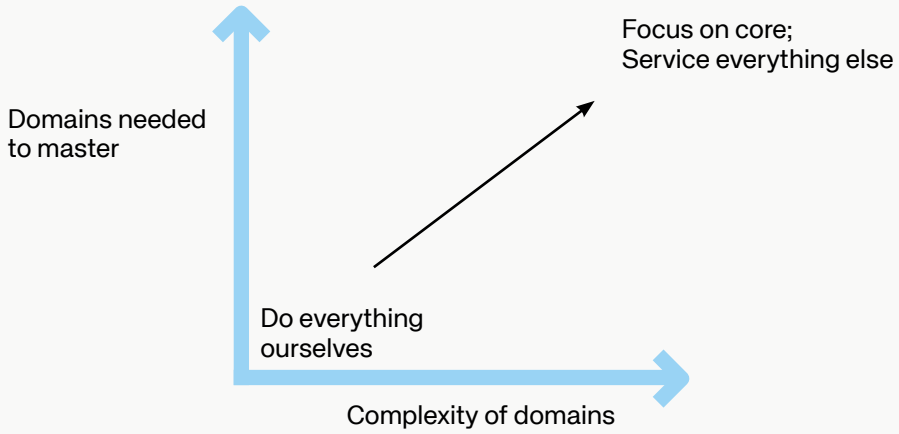
The future of knowledge work exists in an increasingly complex space where information needs to be quickly available, yet guarded against malicious actors. Where digital technology needs to be streamlined and simple, yet individualized and user-friendly – and where AI tools are increasingly capable of great work in the right constellations, but need to be managed like employees are. All this together points towards an increasing need for good services to enable knowledge workers to focus on their core business.

Gone are the days when a manager could keep track of the office's needs in a notebook or a simple spreadsheet – in an increasingly complex work life, services and collaborations are necessary to the tasks and duties of a manager. As an example, information dashboards can be created and maintained in-house, but it is an expense that takes away from the core business and can eat up quite a lot of hours. On the other hand, customizing a service provided by some other business, is far easier and faster.



### A complex world drives the need to focus on core business

To navigate efficiently in this multi-complex world, there's a growing need for service, advisory and partnering around non-core functions and areas of expertise. As an organization needs to master more and more domains, and each domain gets deeper and more complex, organizations transition from doing everything themselves to focus on the core business.




*Model of why it is becoming more difficult to do everything in-house. As organizations need to master more and more domains, from IT to legislation, and those domains become ever more complex and difficult to master for a single employee, team or organization, focusing on the core business and shedding unnecessary functions to service providers becomes necessary.*

**Sustainability service as a service**

Service-as-a-service is not just relevant for the digital domain either – in almost every field, fast moving changes and new regulations make it hard to stay on top for any company with its core business in another domain. There is a clear economy of scale in every knowledge intensive domain, more so than ever before.

Sustainability is one such example, a growing concern for practically every kind of organization in the industrialized world, but increasingly complex and multifaceted. What source of energy do we use, how much should our employees travel, and what about the physical waste generated by the organization? And not least, how should we comply with all new EU-regulation? Here, specialized service actors can provide far smarter and more elegant sustainability solutions than any company could themselves, using in-house resources.

**Hardware-as-a-service – next to come?**

Many organizations today still own or lease the hardware needed for their operations, while software solutions more often are bought on a service basis, updating agreements and licenses as needed on an annual or biannual basis.

Likely, the trend of everything-as-a-service will over time also come to incorporate more and more hardware, provided as part of a license agreement. Partly, this is for sustainability reasons, but it can also be a great cost saver to both supplier and client, creating a win-win situation.

We are not yet there, but already today almost one-third of managers say that by 2030, most organizations will own nothing but their intellectual property – all other assets will be provided as part of some sort of service or rental package. This would, in the hypothetical scenario, include everything from office chairs to computers to lamps. The trend of everything-as-a-service is probably here to stay. Indeed, almost half of respondents think that the trend of "everything as a service" will continue to strongly drive change within their industry over the coming five years.

# 31%

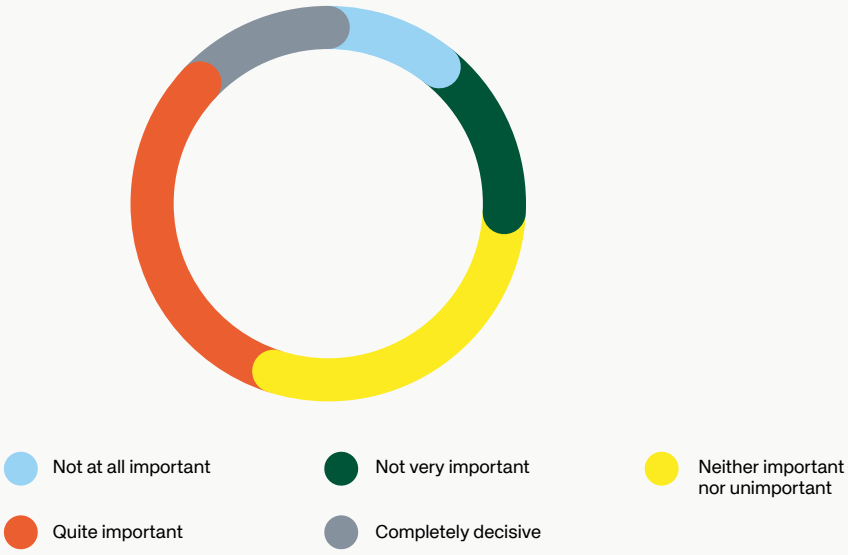
*Of executives believe that by 2030, most knowledge work organizations will own nothing except their intellectual property – everything else will be procured as a service.*

**The importance of customization**

But everything-as-a-service doesn't work without a strong customer support and the ability to customize and tailor-make the services, at least to some extent. Without a good working relationship between client and supplier, many services become ill-fitting for the user and may exacerbate technical difficulties and troubles using and implementing the technology.

To ensure the technology is implemented smoothly into the organization, it is vital that service models are not overly standardized and that it is possible to contact the supplier, at least for higher-end service models where the price tag motivates human contact. The risk of purchasing and being stuck with ill-fitting services with no way of rectifying the problem is a potential drawback of the service trend. Collaborations with other organizations are a key, and service models – even if they mean relinquishing some control – are one such method.

How important will this trend be for your organization and industry in the coming five years: ”Everything as a service”, more and more provided as a service rather than as a product.




*Almost half of the surveyed executives say the “everything-as-a-service” trend will be quite important or completely decisive; only about a quarter say it will not impact their organization to a great degree.*

**A win-win in the digital economy**

One reason why the servification trend has been and continues to be so strong is that it creates a clear win win in the digital economy. Reliable services for the user and steady income for the supplier makes it more predictable for both parties – and predictability is increasingly a commodity in an overall turbulent work life.

**On the horizon: The turnkey office**

With AI solutions, advanced IT security, and cloud computing solutions, it may soon be possible to fully automate the creation of companies through purchasing services. A turnkey company is one that is ready to run immediately upon its inception, requiring no purchases, no onboarding, nothing other than starting capital to sign service agreements.

Such things are possible with some businesses today, where the business model is already well established – such as in retailing – but it is a rarity for complex knowledge work. Nothing in theory prevents the turnkey business model for these kinds of operations, though, especially with AI assistants that can navigate the various services on offer and put together a tailor-made package for the user. Customization is likely to be key in the implementation of true turnkey offices, since one-size-fits-all solutions are unlikely to be suitable for complicated knowledge work.

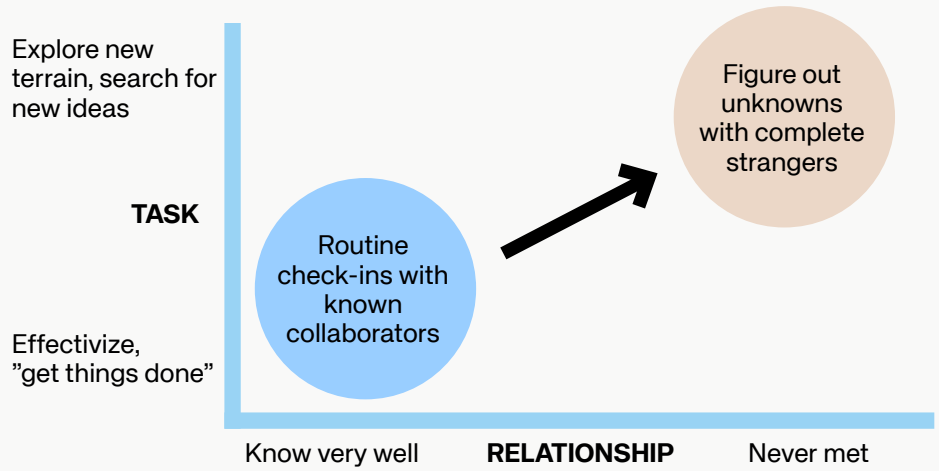
# 07. Collaboration goes crucial

***Not so long ago, most office workers worked together in the same physical place, with colleagues they knew well. Not so anymore. Today's hybrid workspaces create opportunities but also challenges. Collaboration is increasingly happening in online spaces with people who are well known to each other. Employees working remotely are impossible to monitor as closely as employees in the office, while simultaneously also having fewer spontaneous encounters of the kind that are difficult to create deliberately, but which can be of great benefit to any organization, particularly when it comes to innovation. Collaboration increasingly shifts from being about known subjects with known people, to unknown topics with relative strangers.***

### Unknown tasks with unknown allies

Collaboration has always been key to professional and financial success; otherwise, there would be no need for organizations. However, as the hybrid workspace undermines traditional collaboration, and as the tasks addressed by knowledge work become vaster and more complicated as routine tasks become automated, there is a shift from known elements to unknown, in two dimensions.

Firstly, if there is a task which can be addressed by a best practice, that task can also be automated – leaving humans far more occupied with complex problems where there is no clear best practice and issues must be addressed on a case-by-case basis, explored and investigated. Moreover, as skills become more specialized, and access to people becomes easier via remote work, collaborations become more flighty, more seldom with people we see every day and more often with relative strangers, from other organizations, other branch offices, or other parts of the world.

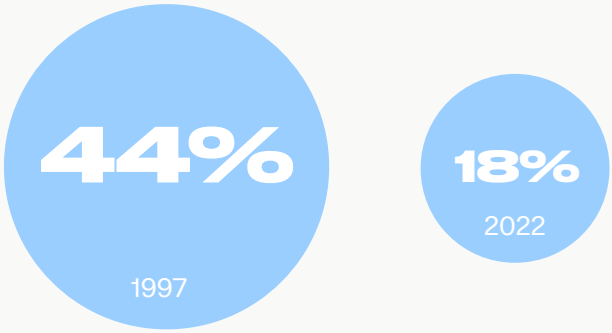



*Model of the transition from known collaborators managing clearly defined tasks, to a worklife more consisting of temporary work with relative strangers, oriented around figuring out unknown solutions to novel problems.*

### WFH – and the meaning of work

During the Covid-pandemic, most of society was forced to make a significant leap in digitalization, towards remote work both for meetings and for collaboration. But since the end of the global pandemic, remote work and the role of the office have been under renegotiation.

The competition today is stiffer for a shared physical space. During the pandemic many invested in their home offices. There is also a deeper trend underlying the move towards remote work – people invest less and less emotionally into their office and into workplace relationships. This can be seen in the valuation over time of work as significant to identity. In 1997 almost half of Swedes saw their work as giving meaning in their lives, since then the figure has almost halved[XII]. Remote work risks driving this trend even further towards instrumentalization – with work as something less important for identity and our social spheres, and something more purely instrumental.




*Changing work life attitudes. In 1997, almost half of the Swedes interviewed found that work gave meaning to their lives – in 2022, the equivalent figure was just 18%. From Kairos Future's long-time surveys of Swedish attitudes.*

Moreover, as the percentage of people who find work meaningful shifts, the emotional investment in work changes towards a more reward-oriented mindset. Those who do not find their work meaningful are, perhaps understandably, more concerned about material values like high salary and work-life balance. Those who derive meaning from work are more likely to put emphasis on shared values, corporate mission or personal development.

### The me and we tradeoff

There is no doubt that remote work has been, and continues to be, beneficial for many. It means flexibility and greater freedom, though there are drawbacks. One such trade-off is between onboarding new and junior employees and freedom for the senior staff. Transition of knowledge and experience happens when people meet, during lunch or over coffee. Being an isolated cog in a hybrid machine that delivers on time might be enough to check the task list, but it can be detrimental to longer-term career development.

One area where physical presence seems important is for collaboration and innovation. An important task for a shared location is to facilitate cross-pollination and new ideas. Enabling serendipity is the key task for each organization that wants to make knowledge work better.

# 25%

*Of executives interviewed think that by 2030, the majority of all face to face interactions a normal person will have, will happen in the workplace.*

**Not as simple as mandatory attendance**

So, why not demand a certain attendance in the office? Well, it's not that easy. A top-down order to "transfer knowledge" and "collaborate and innovate" is unlikely to work. Rather, a clear idea and shared understanding of what co-workers owe each other, is the key to the matter. What makes the shift to remote so hard to manage is that it impacts business and people so differently. Take for example the young professional with small children. For some, a return to the office can be a blessing with more calm, peace and quiet. For others in the same demographic, returning to the office suddenly means that everyday life becomes much more difficult to manage.

**On the horizon: Work life, the last bastion of social life?**

Despite the visions of the digital age to connect people, loneliness and social isolation have become an alarming trend. In 2003, 75% percent of Swedes described their life as "rich in friends", in 2023 only 45% agreed.[XIII] Twenty years ago, 12% described their life as lonely, today the number is up to 32%. And loneliness correlates strongly to a feeling of meaninglessness. Why is that?

One answer is that society has lost places and habits that provide a chance to meet and form a sense of belonging. Digital life has increased the speed and stress, while also bombarding us with comparison. A rapid environment that promotes peacocking and competition is devastating to forming deep connections and friendships. That is also why digital detoxes and a return to "dumb phones" are lifestyle phenomena that have gained traction.

# Keys to success

The manager's duty in any organization is to remove barriers to productivity. Poor planning, interpersonal conflicts, or unclear targets are all classic cases of a manager not doing their job.

Technology is increasingly one such barrier to productivity. Insufficient or incorrectly implemented technology steals huge sums from modern organizations. It may well be that the manager's chief purpose is to eliminate problems with technology in order to facilitate productivity, employee retention, and innovation – all of which are strongly tied to well-functioning technological solutions.

Considering that, this chapter presents five keys to success for the manager or executive aiming to be a thought leader in the technology-oriented space of knowledge work of the future.

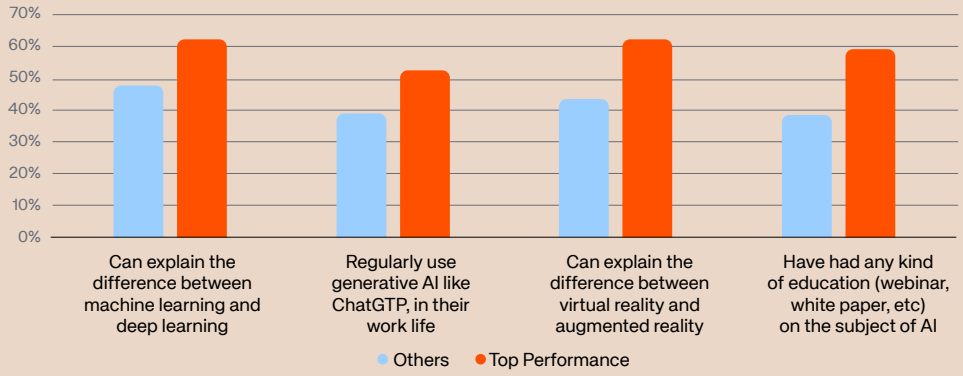
## 1. Lead by example!

The first key to becoming a technology-enabled organization is to ensure technology-enabled management. Organizations where managers adopt and actively use new technology have a clear advantage over organizations where managers don't, as reflected in survey data. Moreover, organizations where the management rely on new technological solutions also make the process of strategic alignment easier, in which plans for technological shifts or digital transformation more easily come to pass if led by active and enthusiastic managers.

The first key to success, therefore, is to make sure managers lead by example and do not implement technology they themselves do not understand or do not intend to use.

It is not necessary that they understand the ins and outs of how a given innovation works, but it is probably quite important that managers understand how it is intended to be used.

**What percentage of your organizations' top-level management do you think:**




*Top performing organizations have management with an overall higher degree of understanding. The graph shows the respondent's estimation of what percent of the organization's top management team who have an understanding of these technologies, in top performing organizations and others, from the survey.*

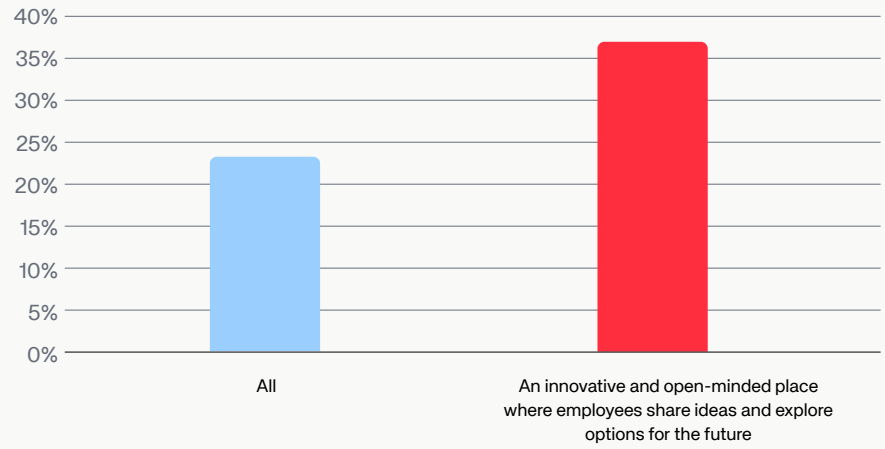
## 2. Be a learning organization!

Organizations that let employees learn in a self-directed, forward-leaning fashion fare much better than their competitors. This trend is likely to increase with more technological options on the table. Technology today is a broad smorgasbord of options that may or may not be integrated with each other, operate separately, or be integrated with the solutions employed by partners and clients. Letting employees experiment at a small scale and find the solutions suitable for their task or situations, is likely a key to success as the complexity is impossible to regulate perfectly. More so, overregulating technology use can put a damper on the capacity for innovation.

Shifting the culture of the organization towards a more proactive posture is no easy feat, but can be done by harnessing the passion and creativity of employees in a directed fashion. This is furthermore encouraged by aligning the company's values towards growth, learning, and innovation.

A clear indicator from the survey is that organizations self-described as "innovative and open-minded" and where employees "explore options for the future" perform far better across all self-reported indicators of success.

**Percent top performers**




*Being a learning organization in the sense of an innovative and open-minded workplace is a key performance driver. Among those who describe their workplace in these terms, over 35% belong to the top performing organizations; among the sample as a whole, only about 23% do.*

## 3. Eliminate hassle!

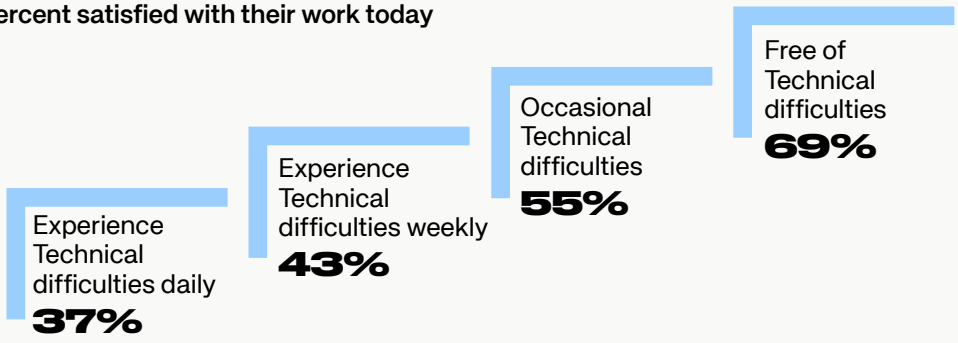
New technology inevitably brings growing pains. Since the dawn of time there has never been an innovation without initial complications, ever since the earliest modern humans burned their fingers on fire.

It is naïve to assume any innovation implemented in an organization will not introduce new problems. Successful organizations are mindful of these technological challenges and are quick to address technical difficulties and swift to report bugs or suboptimal solutions. Implementing technology that causes barriers due to e.g. computers freezing or interfaces being unclear can harm rather than help.

The third key to success is identifying technological issues as soon as they arise, rather than letting them fester over time. Malfunctioning or poorly adapted technology are a great challenge to employee retention, as clunky IT quickly drains people of their passion for work.

An earlier study by Kairos Future and Pion Group shows that those who are free of technological difficulties experience twice as much satisfaction with work and are far less prone on finding greener grass elsewhere, as those who have to deal with it regularly.

**Percent satisfied with their work today**




*From the report "Five truths about man, technology and work", Kairos Future and Pion Group, 2023.* [XIV]

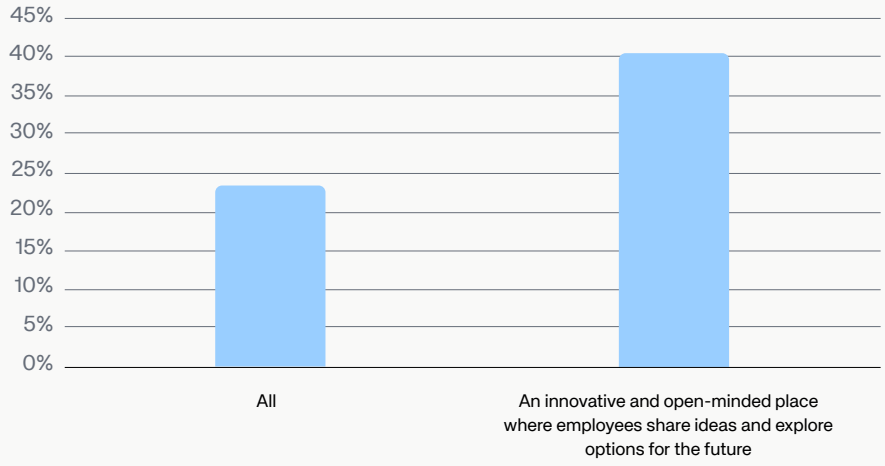
## 4. Make information available!

To use digital technology efficiently, communication must be simple, direct, and seamless. This may seem obvious – the Internet itself is a tool of communication – but easy access to information is no guarantee simply because digital tools are in place throughout an organization.

Making sure that information can flow unimpeded, and crucially, making sure that the right information is available to the person who needs it, when it is needed, can be a significant challenge even for highly digital organizations. Sorting information and making it easy to find, use, and access is no small feat – and it gets even more complicated when the need for information is balanced against the need for cybersecurity.

The fourth key to success is making sure that information is made available to decision makers, on both high and low levels, when it is necessary. Coupling this with the right security measures and balancing accessibility and ease against risk is a difficult challenge, but a necessary one to see the benefits of digitizing an operation. Especially when it comes to being able to share outside the administrative boundaries of the organization, performance is heavily impacted by easy access to information.

**Percent top performers**




*The strongest driver of top performance is the ability to share information with persons outside the organization. Among organizations with a strong ability to do so, 4 out of 10 organizations are top performers – nearly twice as many as in the general sample.*

## 5. Give employees the gift of time!

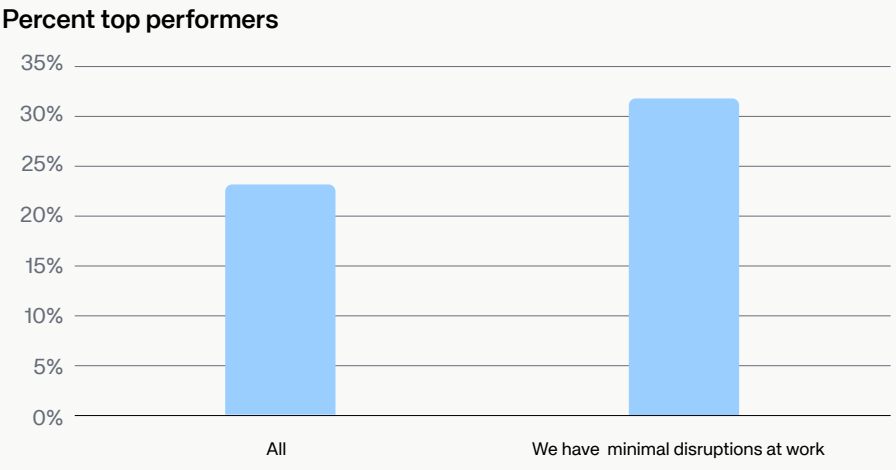
Disruption of the workflow is a clear productivity drain. Interruptions in the workplace are frequent, and many employees report working better from home simply because they avoid interruptions from coworkers, managers, and the general messiness of the office. At the same time, spontaneous meetings and interactions have a value for workplace creativity, so the office is by no means only detrimental to productivity.

The solution is creating an environment where employees are not distracted by unnecessary meetings or tedious tasks that could have been automated. Instead they can focus on creating value while making space for the meaningful interactions that spring up spontaneously in spaces created for that purpose, like break rooms, coffee tables, and the proverbial water cooler.

The fifth key to success is to give employees the gift of time to focus on important tasks, by actively creating spaces that permit it – both virtual and physical. A part of digital ergonomics is to create a digital work environment which avoids disruptions to the workflow, whether they arise from sudden calls and notifications or from technology suddenly needing an update in the middle of an important task.

Choosing the right digital platforms to create the conditions for peace of mind is as important as choosing the right office space. While the impact is not as great as other technological features in the positive direction, it is devastating for productivity if disruptions are frequent.

33 percent of organizations with minimal disruptions at work are among the top performers. Fewer than 3% of such organizations report being among the worst-performing organizations (defined as those that do not outperform their competitors in at least one dimension, such as innovation, employee retention, or profitability).




*Minimal disruptions at work contributes towards performance. Almost one-third of organizations that state they have minimal disruptions in work belong to the top performing organizations, an improvement of almost 40% over the general sample.*

# Reference list

[I] *Venkatraman, N. and V. Ramanujam (1987). "Measurement of business economic performance: An examination of method convergence."Journal of Management 13: 109-122.*

[II] https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

[III] Fem sanningar om människan, tekniken och arbetet. Pion Group 2023

[IV] https://economics.mit.edu/sites/default/files/inline-files/Noy_Zhang_1.pdf

[V] https://github.blog/2022-09-07-research-quantifying-github-copilots-impact-on-developer-productivity-and-happiness/

[VI] The study was carried out as part of a multi-client project on generative AI and knowledge work together with 12 companies, authorities, municipalities and organizations. Survey study completed in June 2023.

[VII] https://www.goldmansachs.com/intelligence/pages/generative-ai-could-raise-global-gdp-by-7-percent.html

[VIII] https://www.mckinsey.com/about-us/new-at-mckinsey-blog/meet-lilli-our-generative-ai-tool

[IX] "After the coronavirus' genetic sequence was published on January 11, it took two days for the teams to finalize the targeted genetic sequence for its vaccine, dubbed mRNA-1273." https://www.businessinsider.com/how-moderna-developed-coronavirus-vaccine-record-time-2020-11

[X] https://www.statista.com/forecasts/1280009/cost-cybercrime-worldwide

[XI] https://www.weforum.org/agenda/2022/08/digital-trust-how-to-unleash-the-trillion-dollar-opportunity-for-our-global-economy/#:~:text=The%20World%20Bank%20estimates%20that,faster%20than%20physical%20world%20GDP

[XII] Original data from Kairos Future's longitudinal study of the values and lifestyles of the Swedish people.

[XIII] Original data from Kairos Future's longitudinal study of the values and lifestyles of the Swedish people.

[XIV] Fem sanningar om människan, tekniken och arbetet. Pion Group 2023