



## **SEAD**

Sustainable Employment in the Age of Digitalisation:  
challenges, obstacles and opportunities

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**Case reports for specific occupations: the case of R&D managers**

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## Introduction

The scope of the WP3 is to **study changing occupations** (in connection with the introduction of digital tools) in established organisations. The changes are related to job content, skills, and quality of work. Those occupations were found according to two sources of recruitment: 1. individual workers from the selected occupations within the organization of the WP2 (made of 21 case studies); 2. individual workers from the selected occupations outside the organization of the WP2. **The objective** of this work package is to realize in-depth qualitative case-studies of technology-related change in specific occupations (*no matter what the organisational context they are embedded in*). The case study reports are structured according to the conceptual model that is used in this work package. This is discussed in the SEAD Chapter 1 Induction paper.

75 interviews of the five occupations depicted below were held, completed by 3 interviews of middle-managers and recruiters' representatives.

**The five considered occupations are:**

Occupations	Assembly line workers	Customer advisors	Middle Managers	R&D Managers	Recruiters
<b>Interviews number</b>	N=11	N=12	N=21	N=12	N=17
<b>Definition</b>	Workstations wherein a product is assembled progressively by different workers or machines, each of them executing a subset of the needed assembly operation (Moreira et al., 2015)	Workers who interact with customers after the purchase of goods/services. Their main aim is usually to provide service and support to clients in order to increase customers' satisfaction (Jasmand, Blazevic, & De Ruyter, 2012)	Managers who typically head a function, team or office and supervise day-today operations (Chen, Berman, & Wang, 2017).	Managers responsible for the research, planning and implementation of new programs and protocols. They also supervise the development of new products from the initial planning phase to implementation or production (Study, 2020).	Workers in charge of recruitment (the act of building a pool of potential candidates for a vacancy) and selection (assessing the capabilities and fitting of those candidates for the said vacancy) (Stone et al., 2015)

## 1. Preliminary information

Before delving into a deeper analysis of how various technologies shape the work of R&D managers in Belgium, it is crucial to acknowledge that the impact of technology is anything but straightforward. Our discussions with these R&D managers have consistently unveiled a broader narrative where changes primarily stem from shifts in organizational dynamics and market forces, rather than direct technological interventions. **While technology is indeed a part of their daily work, its impact on their role as 'R&D managers' is often relatively limited.**

For instance, some managers highlight changes in the interpretation of their role, but they attribute these shifts not to the technologies they use daily but to phenomena at the organizational or macro level. Take, for example, the growing emphasis on commercial tasks and budgeting. Some R&D managers now find themselves paying more attention to budgeting and commercial relations due to the cost of innovative research. This shift is not primarily driven by technology but by the evolving landscape of their organizations and markets.

Moreover, the trend of internationalization, which many R&D managers are part of, is not solely a consequence of technological innovations like collaboration tools. It has been an ongoing trend that shapes their roles as R&D managers, with technology merely altering their work processes rather than fundamentally redefining their roles.

In this study, we intentionally zoomed in on the micro-level to explore how daily technology use impacts various aspects of R&D managers' work. However, it's essential to recognize that their work environment's complexity extends far beyond technology. Our findings suggest that while technology plays a role in shaping specific aspects of their work, broader societal trends, market dynamics, and organizational decisions are the dominant forces shaping R&D managers' roles and experiences.

Therefore, as you delve into the detailed analysis presented in this report, always keep in mind the broader context of the ever-evolving landscape of R&D management. **Changes in work content and conditions are multifaceted, and our research indicates that other factors may exert more significant influence in certain areas.** This report offers a nuanced exploration of technology's role in R&D management, acknowledging that technological changes exist within a larger ecosystem of workplace shifts.

### The overall profile & contextual information of respondents

We encountered several challenges in finding the right profiles for this study. Despite the guaranteed anonymity, potential interviewees and their organisations were rather hesitant to participate and share their experiences. The reasons for not engaging in this study seemed to be two-fold: (1) a concern to disclose (potential) innovative ideas

to third parties, and (2) the number of requests one receives to participate in research leading to a certain 'research tiredness'.

Another challenge had to do with the term 'R&D manager'. For this study, we defined an R&D manager as someone responsible for *"research, planning, and implementing new programs and protocols into their company or organization and overseeing the development of new products [...] from the initial planning phase to implementation or production"* (Study, 2020). However, during the recruitment phase, it became evident that this is not a ubiquitous job title. In smaller companies, employees often take on R&D responsibilities alongside other tasks without explicitly holding the title of 'R&D Manager'. Other organisations use other titles for managers who – according to our definition – could be labelled as an 'R&D manager'. As a result, our sample consists of 11 managers in various organisations and sectors in Belgium, and one specific case (Case 12). All interviewees engage in a supervising position and are in one way or another involved in the research and planning of new products, services, and/or protocols. However, in some cases, we notice a difference in work context. Some managers are more customer-centric and are involved in the product strategy to bring a product to the market successfully (e.g. Manager 10). Others have a more innovation-centric focus, leading projects that do not always result in immediate commercialisation (e.g. Manager 4). And – as we mentioned previously – there is also a group of managers who portray their job function as a mix of the two, where fundamental and innovative research is being linked to increasing attention towards commercialisation and customer needs.

These different work contexts not only lead to small differences in work responsibilities but also seem to shape their outlook on what makes their work sustainable (see point 5). Moreover, depending on the work context (customer-centric vs. innovation-centric) other types of technology are prioritized, or the same type of technologies are used for different purposes (see point 2). What makes this difference in work context has an important impact on the interpretation of their role, the technology used, and therefore also their work experiences.

Our final sample consists of 11 managers from various organisations in Belgium and 1 case. First contact was established at the end of 2021, and the beginning of 2022. The interviews were primarily conducted via Microsoft Office Teams throughout 2022. Below we provide a summary of the interviewed managers and their organisational context.

- **Manager 1** is a male Manager in Product Development at the R&D department of a large company in the HR sector. He is responsible for a team of HR experts and IT developers that create new digital products. His main tasks include people management and defining the long-term product strategy. He has a background in IT.
- **Manager 2** is a 40-year-old male. He leads a team of 3 researchers in the construction sector. They primarily focus on physical safety tests and digital

simulations for product safety and product development. He has been working for this organisation for 9 years and has also academic experience.

- **Manager 3** is a 47-year-old male with over 16 years of management experience in R&D departments, with a focus on applied research in the construction sector. He also works for the same employer as Manager 2, a large (multinational) company in the construction sector. He oversees a group of 40 to 50 employees (experts and laboratory technicians) who mainly instigate and test new processes and ideas before they are developed for the market.
- **Manager 4** is a 55-year-old male. For over 7 years, he has been heading of the R&D Department of a large research organisation, overseeing 900 scientists and engineers who investigate innovative and sustainable solutions for the economy. He has over 25 years of experience in research, as well as academic experience.
- **Manager 5** is a 46-year-old male working for a small company in the agricultural sector. He developed an eco-friendly waste management system. Now he mainly oversees the technical development and the optimization of this system. He has also academic experience. He does not lead a team but has a few co-workers.
- **Manager 6** is a 50-year-old male with over 20 years of experience in the chemical sector. For 3 years, he has been one of the heads of the R&D department in a large company for building materials and chemicals, simultaneously he is also in charge of the sustainability strategy of the company. As the head of R&D, he leads a team of 20 employees. He describes that job as mainly being people management, as well as selecting and prioritizing the “right” projects.
- **Manager 7** is a 51-year-old woman who operates in a large agricultural company. She has a biochemical background. She has been working for this company for over 25 years in different roles. She started as a researcher when it was still a medium-sized company, eventually assisting the CEO in sales, operations, and quality control. After a restructuring – one year ago – she became head of the R&D department. Her focus is to validate products or processes for their customers.
- **Manager 8** is a 40-year-old male who founded a small company in IT solutions. The company functions according to a consultancy model and is specialized in AI - solutions for customers. Each manager is responsible for the client and their project teams. As a founding member of the company, he is also involved with HR management.
- **Manager 9** is a female R&D manager (age unknown) for a research organisation in the textile industry. For 7 years, she has been leading a team of 10 researchers that take on innovation-oriented research projects for companies within the sector. She has an academic background in chemistry.
- **Manager 10** is a 47-year-old female Product Manager working for a large company in the financial sector. She has been working for this company for over 12 years. Her job entails conducting competitive analyses of products, evaluating

the company's attractiveness to customers, and managing aspects related to contracts.

She also provides support for IT development to improve products and/or IT systems. She has over 20 years of experience in the banking and insurance sector.

- **Manager 11** is the CEO of a small research institution (University spin-off) in the medical sector that executes contract-based research for the private market. The manager interviewed has over 10 years of seniority within the company. The technology used involves aspects of digitalization and image processing.
- An exception in this list is **Case 12**, which is a large sheltered workshop. The focus group consisted of a 57-year-old Supply Chain Manager (Male), a 48-year-old COO (Male), and a 32-year-old Organisational Development Manager (Female). They respectively had 3, 9, and 2.5 years of seniority within this organisation. The company's social mission is to create jobs for employees with disabilities. They therefore do not want to simply automate away all simple work steps. They are committed to the digitalization of their machinery, HR, supply chain tracking, etc. They work together with external partners and research institutions.

## 2. Type of technology(ies) used

For this study, we drew attention towards four distinct categories or types of technology: collaboration technology, tracking technology, automation technology, and interaction technology.

- **Collaboration technology** facilitates the sharing of ideas and discussion with anyone, anytime and anywhere. It facilitates working together. This could include tools like video conferencing, cloud-based document sharing, etc. (Brown, Venkatesh & Zhang, 2011).
- **Tracking technology** refers to technologies used to monitor and collect data on persons, processes, objects, or systems, often with the aim to control and/or optimize. We consider this category quite broad. It can include monitoring or surveillance technology, GPS, health monitoring, smart data technologies, smart logistics, etc. (Rosini, 2018; Bates & Holton, 1995; Chung et al., 2017).
- **Automation technology** involves technologies that perform tasks or processes automatically, without human intervention. It automates or digitises manual tasks (Canals, 2020). For example, robotic process automation (RPA) or automated email responses (Lévy, 2018).
- **Interaction technology** usually involves the interaction between humans and machines (Human-Computer interaction) or solely between machines (Internet of Things) (Abdel-Basset, Manogaran & Mohamed, 2018, p. 615). The difference between automation technology is that this technology does not only share a

workspace with workers but also co-operate with workers (Hentout et al., 2019). Examples can be voice assistants or chatbots, but also collaborative robots or augmented reality (AR).

Not all types of technology are evenly covered within our sample. For example, collaboration technology is present in every case and was immediately touched upon by the managers during the interviews. While other types of technology, such as automation or interaction technology, were less present. During the interviews, it was noticeable that not all organizations and their respective R&D departments are open to technological innovation. For example, Manager 6 states that his organisation and colleagues are rather indifferent to innovative technology. In addition to the financial costs and potential data challenges, it is not easy to get everyone on board. In this case, even introducing cloud systems is experienced by the manager as a huge challenge. We will discuss this further under point 4.

Another important element to consider why some types of technology were missing or not extensively discussed, is that R&D managers are mostly responsible for managing their research teams and supervising projects. They don't consider themselves "experts" and are generally not involved with carrying out the development of new products or services. It is therefore not surprising that they mainly work with collaboration technologies. These kinds of technology help and support them to carry out their coordinating role.

One last element that we would like to draw attention to is that we noticed that (potential) interviewees had trouble understanding what was meant by 'new' or 'innovative' technology. Despite the use of examples, such as chatbots, AI, or business analytics, most of the managers only referred to collaboration technologies. This might not be that surprising, given the fact that the recent pandemic forced many organisations to introduce such collaboration tools on a wide scale. However, somehow this leaves the question open how widespread certain technology is in the daily work practices of R&D managers.

Below, we will discuss the types of technologies that were discussed and their respective uses:

- **Collaboration Technology**

A prominent and widely used example of this technology type is Microsoft Office Teams, which has proven essential for remote work and continues to be frequently utilized by the individuals in our sample. The ongoing growth of telecommuting ensures that such technology plays a significant role in the daily operations of these individuals. However, not all the interviewed R&D managers employ this technology to the same extent. While the chat and meeting features of Microsoft Office Teams appear to be widely adopted, its cloud services and collaborative features are not.



For instance, Manager 6 uses Teams primarily for video calls, but their organization has not fully embraced digital transformation. Consequently, much of their work remains fragmented, involving separate servers and sharing Excel files via email. Nevertheless, several respondents in our sample frequently utilize cloud services. In the interview with Manager 2, we explored a tool that enables real-time collaboration with external partners and stakeholders on construction projects. However, other interviewees simply mention using the cloud option of Teams or collaboration systems like SharePoint, which facilitates seamless collaboration with internal colleagues.

- **Tracking technology**

Another technology category prominently used by the R&D managers in our sample is tracking technology. Notably, data collection is highly regarded among most R&D managers as a means of optimizing and streamlining work processes. Interestingly, this type of technology was primarily utilized in contexts where a strong focus on customer-centricity prevailed, as we previously described. For example, in Case 1 this type of technology was recently adopted with the dual purpose of digitalizing machinery and ‘objectifying’ HR processes, all aimed at enhancing efficiency.

A similar approach is evident with Manager 8, who reports the implementation of a new management tool that translates customer needs into specific tasks assigned to specialized employees. This tool plays a crucial role in project tracking and cost calculation, rectifying previous chaotic monitoring that resulted in high stress levels and employee turnover. While these tools may not be classified as tracking technology per se, they do incorporate certain tracking elements.

Additional examples of what can be categorized as tracking technology can be found with Manager 9 and Manager 10. They describe software systems used for market performance analysis, customer needs assessment, and profit margin evaluation. These systems assist them in facilitating product improvements and adjustments, providing insights into what is effective in the market.

A final example comes from Manager 5, who discusses tools used to track temperature and humidity. These tools are integrated into a larger system that could also be categorized as automation or even interaction technology. For instance, the system regulates specific parameters within the factory and alerts the manager remotely.

- **Automation and interaction technology**

Automation technology, the third category explored in our interviews, holds various forms of significance. Managers 2 and 3 highlight their use of digital modelling for conducting fire tests. In the past, such tests were exclusively conducted in laboratories, but the approach has evolved towards digital testing. Moreover, both managers express aspirations to integrate AI technology into these processes. This integration holds the

promise of accelerating the comprehension and development of new systems, signifying a shift from exclusively relying on physics-based approaches to emphasizing data analysis.

As mentioned earlier, Manager 5 provided a compelling example of a fully automated factory, minimizing the need for hands-on operationalization. In this context, when anomalies occur, such as temperature fluctuations, Manager 5 receives immediate alerts on their phone. Furthermore, they can remotely control significant aspects of factory operations. This example exemplifies the profound transformation that automation technology can bring about, streamlining oversight and decision-making processes.

### 3. Changes/modifications of work

#### 3.1 Changes in work content

##### 3.1.1. Types of Work Tasks

Our conversations with R&D managers within our research sample highlighted the complex impact technology has on the role of an R&D manager. **What emerges from their insights is a nuanced narrative where changes in their roles are primarily influenced by shifts in organizational dynamics and market forces, rather than direct technological interventions.** As we discussed earlier, it is essential to recognize that the complexity of their work environment goes beyond the realm of technology alone.

This observation also applies to the transformations in the types of work tasks undertaken by managers in our sample. Many of the R&D managers perceive **the direct influence of new technology as relatively limited.** Instead, they frequently attribute changes to broader organizational or macro-level factors, such as evolving market trends, corporate restructuring initiatives, or the overarching process of global digitalization. This does not make it easy to determine how exactly technology changes their work tasks. Nevertheless, some emerging themes indicate that they attribute changes in the nature of their work specifically to the technology they use.

In the past, some of these managers often found themselves physically present in laboratories or factories, conducting experiments manually. Good examples are Managers 2 and 5. However, the introduction of **automation and interaction technology has made it possible for them to be less on-site.** They describe a certain shift where **their work focuses more on modelling and data analysis instead of physical experiments,** changing their way of working. Another change that was explored is due to collaboration technology. As the technology mentioned above, **collaboration tools also enable remote work. It completely transforms the way these managers communicate, collaborate, and manage their projects.**

However, nearly all managers assert that **the core aspects of their jobs remain fundamentally unchanged, regardless of the technology they employ**. It's only with automation technology that noticeable changes in work tasks become evident. The transition from physical experimentation to digital modelling is a prime example. Moreover, these managers emphasize that automating operational tasks frees up more time for research-related work.

### *3.1.2. Impact on workload and complexity*

The managers in our sample perceive their roles as R&D managers as inherently complex. They are often engaged in a wide range of activities, from managing a research team to making decisions on research practices. They must stay updated with the latest innovations in their research field and/or market developments. Additionally, they manage budgeting, and in some cases, maintain commercial relationships. We identified some recurring themes in how collaboration and tracking technology, as well as automation technology, can influence the complexity of their work and impact their workload.

When discussing collaboration and tracking technologies, most of the interviewees share a similar idea. Collaboration and tracking technology make it **easier for them to coordinate their teams and follow up on research projects**. This is particularly true because they feel that the introduction of cloud services and tools such as Microsoft Office Teams has initiated **a certain standardization or streamlining in their 'way of working'**.

*"Of course, now I think that's really great. This has only happened recently, that everything falls within one system. I used to have someone in France, for example. He would use Excel, or it was a Word document, and for Germany it was different again. But now everything is in English. The same workflow [...]" (Manager 3).*

Especially in the context of managing geographically distributed teams, this leads to a reduced workload and greater clarity. As Manager 7 puts it, **they experience increased oversight and more control over their tasks**. Additionally, the structure these tools provide makes finding information easier. A good example is Manager 10. She recalls that, in the past, most information was shared through e-mail. She found it challenging to retrieve specific information because documents or meeting minutes often got lost. According to her, this is no longer the case in the current cloud set-up.

However, while most of the interviewees see the positive impact of these types of technologies in terms of efficiency and coordination, some of them also address certain downsides. Manager 5, for example, tells us that he and his co-workers are often **accustomed to their own work methods**. They stick to how they believe is right, **leading to confusion in shared workspaces**. He especially refers to the "messy" folder structure, which **nullifies the advantage of finding documents easily**. In the end, for him, this leads to more work.

Another example of how the standardization qualities of collaboration or tracking technology can have adverse effects can be found in the story of Manager 7. She describes how she and her colleagues are increasingly confronted with reporting duties, which has a significant impact on her workload. While not she does not directly link this experience to the use of collaboration or tracking technology, the issue she raises reflects the unintended consequences that often accompany the implementation of such technologies. **We notice that the introduction to shared workspaces or tracking technology often comes with extra reporting duties or new protocols, aiming to help employees navigate these tools in a “proper” way.** While the goal is to enhance efficiency (and often increase performance), these technologies **bear the risk of overwhelming employees and adding to their workload**, obtaining the opposite effect. This is especially noteworthy because most managers in our sample mention that their organisation rely on self-tracking.

In contrast to collaboration technology, automation technology does not seem to burden managers with increased complexity or a higher workload. While the available evidence is limited, it suggests that **R&D managers using automation technology experience a reduction in their workload.** This, in turn, grants them **additional time and resources** that can be redirected towards new tasks. As mentioned earlier, this type of technology primarily leads to task-shifting.

*"It's not because there's more automation that it's more complicated, it's simply that it frees up time for other tasks. But the overall level of work remains more or less the same. That's what I think. (Manager 5).*

### *3.1.3. Impact on work pace*

The introduction of **collaboration technologies**, such as video conferencing and chat platforms has significantly influenced how work is conducted. It has become easier to collaborate with colleagues from any location. However, it is important to note that these technologies **not only bring new dynamics to the workplace but also have the potential to exacerbate existing ones.** For example, Manager 10, a Product Manager in the financial sector, has traditionally been involved in numerous meetings and collaborative efforts. However, since her organization implemented collaboration technology during the recent COVID pandemic, the frequency of meetings has increased to the point where she now needs to allocate specific time blocks to complete her other work tasks.

*"There are a lot of meetings, so the mental workload is even greater when there are meetings and a lot of emails and we don't have the time to process them or the time to carry out these analyses". (Manager 10).*

This trend is consistently observed within our sample. Several managers seem to experience that collaboration technologies have **amplified the existing 'meeting culture'** that was already prevalent within organizations. Furthermore, some R&D managers have noted that these **meetings often occur at a rapid pace.** In the past, there

were intervals between meetings to catch a breath, grab a coffee, and clear one's mind. However, in the current context, these **moments of respite are often absent**.

In addition to the challenges posed by the amplification of the 'meeting culture,' collaboration technologies have brought about another significant shift in workplace dynamics, as observed by R&D managers. They describe a heightened expectation from colleagues and clients for **increased responsiveness**. This change is closely tied to the emergence of **new ad-hoc work patterns**, as Manager 3, an R&D manager puts it:

*"For my people ask in the new digital world, is the perception that you are almost constantly available. Sending questions, problems or decision requests to three people at the same time is a new culture and we have to deal with that. If someone has a question or is stuck with something, they ask that question to three people. In the long run, it creates a kind of stress for me because I have to be the first to answer. Otherwise, I lose control of the decision. The person who asks the question sends it to three people at the same time." (Manager 3).*

Manager 3's observation sheds light on a broader trend that extends beyond their specific role. Another R&D manager, Manager 7, working in the agricultural sector, provides an additional perspective. Her employer now expects her to respond quickly to various queries, primarily driven by the goal of enhancing customer satisfaction. According to her, this expectation represents a significant departure from the past when the focus was on thoughtful and comprehensive responses, often discussed during client meetings or handled using pre-prepared questions.

The phenomenon of 'increased responsiveness' that they describe is not solely attributed to collaboration technology. During the interviews, they emphasised that **digitalization and the internet, in general, have made access to information much more straightforward**. They can **quickly monitor new scientific publications or actions planned by competitors**. While they perceive this as a significant advantage, they also acknowledge that it has **led to a sense of obsolescence**. They describe a feeling of acceleration, where their profession demands much more reactivity.

Moreover, they note that the internet provides **an endless stream of information and impressions, affecting their ability to maintain focus**. This challenge is not unique to the internet but is also experienced in the context of collaboration technology, where immediate responses can be expected based on needs.

#### *3.1.4. Changing competencies*

This section offers a brief overview of how new technologies influence the required competencies of the R&D managers in our sample. The discussions primarily centred on two competencies that gained more importance. The first relates to people management. While the role of an R&D manager has always required a certain degree of interpersonal skills, the managers interviewed emphasize that **collaboration technology and the ability to work remotely have increased the need for effective leadership skills**. For example, during online meetings, subtle signals like body language

can be lost, hindering communication and information interpretation. Manager 10, for example, effectively illustrates the emotional and communicative complexities of virtual interactions.

*"So obviously, we all turn off our cameras because otherwise it bugs faster and so it's much more... How shall I put it, difficult, because we feel alone, and so we talk and talk and we can't see faces, we can't see people and that's much more complicated, we say to ourselves, are people still interested in us, we can't see if people understand, or don't understand." (Manager 10).*

Most managers argue that such video conferencing tools are not suitable for all work tasks. For example, Manager 4 indicates that creative sessions or brainstorming are still better conducted in a physical setting. Manager 3, on the other hand, states that performance reviews and sensitive conversations do not always work well in a digital format. He believes that these situations require a certain sensitivity and 'soft skills' that do not always translate well effectively in digital interactions. However, during COVID, he had no other choice. He experiences that time as being a sort of "school teacher". Additionally, he notes that it is not easy to conduct 'hybrid' meetings, for the very same reason. As a moderator, it is challenging to bridge the gap between colleagues who participate remotely and those in the office. He argues the technology is not yet optimal, and even then, it requires a certain level of sensitivity to identify subtle behaviours. According to his experience, remote or hybrid meetings demand much more mental energy than in-person meetings.

In this context, it's crucial not only to recognize **the significance of 'soft skills' but also to understand how to convey them in a digital format.** Additionally, it's important to know when it's more appropriate to engage digitally and when a physical presence is more effective.

Another topic that was raised concerns automation technology. The managers involved with this type of technology (Manager 2, Manager 3, Manager 4, and Manager 5) all mention that, **while computers and algorithms can perform certain tasks, human expertise remains crucial.** As Manager 2 puts it:

*"So what it means for us substantively is that we are no longer dealing with that physics, but we need it for interpretation. So still that gooey background through those models we still have the necessary insights and experiences that we still need. Because the computer doesn't tell you that anymore, so you need those insights to make sure you don't misinterpret, so that's still important." (Manager 2)*

This statement underscores the enduring importance of human expertise in grasping complex situations and making sense of results, even as automation takes on a more prominent role in task execution. This viewpoint aligns with the perspectives of other interviewed managers who are actively involved with automation technology. **The ability to seamlessly blend deep insights and experience with the outputs of automation is swiftly becoming a critical skill.** Therefore, it is crucial to exercise careful judgment in determining when technology is suitable and when it is not. As

Manager 3 puts it: *"The biggest pitfall is that everyone sees AI from, that's going to solve it. But usually that creates even more problems. So we have to think first. What do we want to achieve?"*

### *3.1.5. Learning opportunities*

When we discuss the learning opportunities in their roles, the managers in the sample emphasize that **their jobs, by nature, require curiosity and a constant thirst for learning**. In particular, managers working in product- or innovation-oriented work contexts highlight the challenge of often dealing with new elements or subjects they are not entirely familiar with. So, for them, their job inherently provides numerous learning opportunities. They do **not seem to experience an increase or decrease in the extent of learning opportunities, but rather in their ways of learning**.

What stands out is that "learning" is not so much formally organized by their employer. Instead, they take the initiative to pursue courses independently. During the discussions, they emphasize that **a significant portion of their learning occurs through interactions within their team**. Usually, each team member appears to have some specific expertise. Therefore, knowledge sharing seems to be an undeniable part of their work dynamics. **Collaboration technology facilitates this**. Individual learning opportunities are often found through the internet. It becomes apparent that **the internet has significantly expanded access to valuable knowledge**. For instance, Manager 5 explains how he can now learn from podcasts or gain new insights through YouTube tutorials or online discussion panels, instead of going to the library. Manager 4 proudly presents how he received an additional degree from a highly regarded American university by following courses online.

In this sense, the digital revolution has greatly eased the process of acquiring knowledge and learning on a larger scale. Particularly because they proactively seek out new knowledge, they recognize the pivotal role of digital technology in this process. It not only simplifies the gathering of knowledge but also accelerates it.

### *3.1.6. Impact on work autonomy*

From the conversations, it quickly becomes evident that a significant portion of the R&D managers in the sample place great importance on their work autonomy. Particularly, **the R&D managers engaged in more product- or innovation-oriented working contexts emphasize the significance of autonomy, freedom, and flexibility in generating new innovative ideas**. These elements are crucial to them and contribute to **what they believe makes their jobs sustainable**.

*"Yes, but as I said, there are conditions, yes, which could mean that if I have someone on my back all the time, if my timetable is decided by someone else, if every time I do something I have to report if everything I do has to be profitable in the immediate future too. That's not the case with a scientific approach where you have to leave*

*yourself time to think, to imagine new things. You have to spend time surfing the web, reading articles that may be useless" (Manager 5).*

Most of the managers also state that they enjoy a high degree of freedom and flexibility in their work. They often determine the order of their tasks, possess methodological freedom, and can sometimes choose their work hours freely. In this sense, the introduction of collaboration technology has further strengthened that flexibility. We will discuss this further in point 3.2 and point 5.

Ironically, as mentioned earlier, **some technologies have the potential to impede autonomy**. We previously discussed how collaboration technologies influence their work rhythm and impact their workload. In this regard, several managers explain that they have developed strategies to manage the influx of new stimuli. For example, Manager 7 mentions that she has taken courses to find ways to handle the constant flow of information. Manager 3 even describes in detail how he devised a system to cope with the continuous stream of digital interactions. He has a system where he reviews all his emails every evening and determines if any action is required. If so, he puts the email in a "to-do" folder. If an email is purely informational, he marks it as read. He ensures that all emails are processed every evening before shutting down his computer. He describes failure as mental and workflow chaos.

The same applies to work methods. While technology can help streamline certain processes, it can also lead to additional work in terms of reporting and adhering to protocols. **The impact of technology on the work autonomy of R&D managers is a double-edged sword**. On one hand, it has **enhanced their flexibility and freedom**, allowing them to explore new innovative ideas and work on their own terms. On the other hand, **the constant influx of digital interactions and the need for rigorous reporting can sometimes threaten this autonomy**.

### **3.2 Changes in employment conditions**

While discussing the impact of new technology on employment conditions, we observed limited or absent responses from the interviewees. Some respondents shared insights into their contractual arrangements, but it appeared that no significant modifications had been introduced. This observation extends to career opportunities, which the interviewed managers did not perceive as having undergone any substantial changes.

Regarding performance reviews, most of the R&D managers in our sample reported engaging in annual one-on-one conversations with the upper management to discuss set targets. Again, no change was observed due to the introduced technologies. However, **when it came to evaluating their teams, certain noteworthy themes emerged**. While the earlier-mentioned project management tools include certain tracking features, the managers making use of them reveal that they are not intended to be used for performance reviews. According to Manager 8, it is not to monitor or "spy" on



employees, but rather « empowering everyone ». He believes the tool will help employees to reflect on their work and create a so-called « culture of support ». This is something he finds valuable because he experiences less interaction between employees due to the company's enlargement. Manager 1 also mentions that the self-tracking technology they use is merely to calculate the customer price. He ensures the data is never analysed on the individual level, only on the team level with the aim of improving work processes.

In contrast, some **managers in a product- or innovation-oriented work context are rather hesitant to monitor their team by using technology**. All of them point, in one way or another, to the so-called scientific process, which requires space to be creative and achieve innovative results. Manager 4, for example, indicates that as a manager he will never look over someone's shoulder. He believes that **trust is a very important element in a manager-employee relationship. Creativity and innovation cannot be measured with a « stopwatch »**. Manager 3 shares the same perspective. As an R&D manager, he is more of a generalist, instead of an expert. He is the one who keeps the overview. For him, that requires a certain distance and trust.

We do not have insights into how these specific employees experience these tracking technologies, because this study focuses on the experiences of the R&D manager. However, we think it is important to indicate that **several scholars take a rather nuanced attitude towards the use of technology for such purposes**. Especially because some managers emphasize that they want to use technology to objectify certain processes (e.g. Case 12). Employees can perceive it as **impersonal and passive** and can create **an artificial distance between employees and organisations** (Stone et al., 2015). Electronic performance monitoring can also **provoke stress responses** in employees (Amick & Smith, 1992). Some authors, such as Vrontis et al (2021), highlight the benefits of using technology for HR (related) processes in terms of reduced workload, but also warn of the potential 'danger'. HRM, especially in the case of intelligence automation. They suggest that managers refrain from letting technology dominate. According to them, it should merely use as a supporting tool. They emphasize **the need for a balanced approach that harnesses technology's potential benefits while preserving the essential human aspects of 'people management'**.

Moreover, it's worth noting that the flexibility of work schedules for these R&D managers has evolved, influenced by technological advancements. While we did not delve into the specifics of their daily schedules, testimonies from several managers indicate that their roles as **R&D managers are not confined to the traditional 9-to-5 work regime**. Instead, they often describe rather long working days. Technology, particularly **collaboration tools**, has **transformed the locations from which they can engage in work**, whether it be from their cars, homes, or other remote settings. This newfound flexibility grants them a heightened sense of control over their work-life balance, a topic we will delve into more deeply in point 5, 'Quality of Work Life.'"

### 3.3 Changes in employment relations

By employment relations, we understand (1) the worker's involvement and participation, (2) the collective representation (involvement of trade unions), and (3) the social support and workplace interactions.

**In terms of worker involvement and participation, it's notable that most R&D managers indicate the existence of opportunities to propose ideas and suggestions regarding new technology.** However, it's important to emphasize that **the ultimate decision-making authority typically resides with the upper management.** This is especially evident when the scope extends to organization-wide technological changes. An illustrative example is the case of Manager 6, where the R&D department, and consequently the entire company, adheres to traditional practices, predominantly relying on Excel Spreadsheets. Despite the R&D Manager's desire to transition towards a more data-driven approach, both upper management and colleagues exhibit a preference for conventional methods. This tendency is viewed by the interviewed manager as 'silos formation', signifying a reluctance to embrace change, such as transitioning to cloud-based systems.

Nevertheless, there are instances where **alternative approaches** have been deliberated upon. In both Case 12 and Manager 8 scenarios, **a participatory approach** has been adopted, actively involving employees in the selection and implementation of technology. Case 1 also offers an interesting perspective, with various task groups being formed. This facilitated a phased introduction of technology, with recommendations from the task groups being instrumental in this approach. According to the management involved, this approach **allowed for better acceptance and support from staff.** Similarly, in Manager 8's case, technology integration was guided by the needs of both the company and its employees. Feedback sessions and surveys were leveraged to gauge the reception of new technology.

The involvement of employees in the technology introduction process appears to hold potential benefits. Nevertheless, it's crucial to recognize that challenges associated with integrating a diverse workforce, especially in terms of age and digital literacy, should not be underestimated. We will delve deeper into this subject in the subsequent discussion.

Interviewees provided **limited or even no insights into changes concerning employee representation, such as the role of trade unions.** This may imply that the role of trade unions within the context of technological change remains ill-defined within the organisation, or it could suggest that interviewees lack a comprehensive understanding of these dynamics.

### 3.4 Changes in the work organisation

Changes in the work organization primarily encompass the mechanisms of division, distribution, and coordination of work within teams. While some aspects of this topic have been extensively covered in this report, such as task coordination (discussed in point 3.1), we can provide a concise overview of changes in task distribution.

In most cases, R&D managers perceive themselves as someone responsible for maintaining an overview. Their teams typically consist of experts with well-defined roles based on their respective areas of expertise. However, in situations where clear role definitions are lacking, as exemplified by Manager 10, it is important to note that the determination of Manager 10's **task package is often influenced more by decisions from higher-ups in response to digitalization than by the technology itself.**

Nevertheless, two managers offered insights into the evolving organization of their teams regarding task allocation. Manager 6, for instance, described a process where new projects undergo initial analysis and are subsequently divided into work packages. Task assignments are made based on individual expertise. On the other hand, Manager 8 characterized their organization as having a hybrid structure, devoid of a strict hierarchical arrangement. Here, the focus is on ensuring seamless project execution and goal attainment, with the manager's role being akin to that of a coach or facilitation to optimize team performance – an approach also discussed by Managers 3 and 4.

It's essential to note that this was explored independently of their link to technology. Therefore, **it remains unclear what specific impact technology has had, if any, on these aspects of work organization.** It is only in the case of Manager 8 that we can definitively state that project management technology has been introduced to support this new organizational structure. In other instances, the views on leadership or alterations in team structures were not explicitly tied to the introduction of new technology.

## 4. Digital tools perceptions

In this report, our primary focus has been on understanding the perceptions of R&D managers regarding the technology they use. We have previously discussed various aspects, such as the potential increase in workload and changes in work rhythm, as well as the broader impact on their roles as R&D managers. In this section, we won't reiterate all those perceptions. Instead, we will highlight three overarching themes that emerged from our interviews. These themes encapsulate the general concerns and reservations that R&D managers expressed about technology and innovation.

- The introduction of new technologies

In our exploration of R&D managers' perspectives, one recurring theme that emerged prominently was the introduction of technology into their organizations. Notably, a critical aspect that garnered special attention was the diverse composition of these organizations, encompassing **different generations with varying levels of digital literacy**. This consideration frequently came to the forefront during discussions of the managers' own experiences. For instance, Manager 10, who herself identifies as belonging to the older generation, provided valuable insights into the challenges of transitioning to a paperless work environment. As someone who had grown accustomed to traditional paper-based methods, she candidly shared how it took considerable time and effort for her to adapt to digitalization and shift from conducting her work on paper to embracing shared digital workspaces. Her experience serves as a **poignant reminder of the significant adjustments required, even for seasoned professionals, when adopting new technologies in the workplace**. Similarly, Manager 5 recounted experiences dealing with older colleagues who preferred traditional forms of communication and collaboration. This theme, though previously touched upon from the angle of technology increasing workloads due to employees adhering to familiar work methods in digital shared workspaces, also illuminated the managers' perspective on the intricacies of introducing technology in a workforce marked by generational diversity.

A prevailing belief among the managers was that the younger generation exhibited greater adaptability to new technologies, primarily owing to their upbringing in the digital age. Conversely, they perceived that **older employees required more effort to acclimate to technological changes**. Managers such as Manager 3 and Manager 6, therefore, approached the introduction of new technology with caution. **Their foremost concern was the potential emergence of a two-speed organization**, where technological proficiency varied widely. As Manager 6 aptly put it, *"But you have to have the people along and if half your team says 'foert' then you can say you are the boss and they have to obey, but cooperation and a positive atmosphere are essential."*

While the introduction of organization-wide technology often stemmed from higher-level decisions, **the managers believed in the importance of a well-supported introduction**. This support extended beyond mere information dissemination to active involvement of staff in the process. Additionally, it meant not adopting technology indiscriminately but conducting thorough assessments of motivations and how technology could align with the organization's mission and benefit the staff. A compelling example is Case 12, where initial technology implementation did not align with the organization's identity and mission. They opted for a different approach, forming working groups to support technology adoption. This phased introduction strategy allowed staff to gradually adapt, garnering widespread support within the organization. Similarly, Manager 8 emphasized post-implementation follow-up, seeking opinions during evaluation interviews, and conducting surveys to gauge technology's effectiveness.

- Technology as the “ultimate” solution

This theme has also been discussed earlier in this report. Notably, it is striking that many of the managers have a **strong belief in technology to optimize and objectify processes**. As mentioned previously, interviewees like Manager 8 and the insights from Case 12 emphasize the role of technology in providing structure and reducing certain subjectivity, particularly in HR processes.

However, this report has also underscored that technology does not always offer the ultimate solution. According to several managers, the human element remains equally important. In the case of more advanced technologies like AI, some **R&D managers observed that technology is not infallible**. While it aids in working faster and uncovering new perspectives, it does not always yield accurate results. They emphasize that interpreting results plays a vital role. As Manager 2 articulates:

*"With that, you still have engineers, still slightly less ITs, but still need engineers... Who still understand physics and how things are put together to assess that. "*  
(Manager 2).

Furthermore, it has become evident **that technology does not operate in isolation**; the way organizations, managers, and employees engage with technology can lead to varying outcomes. Certain technologies hold the potential to enhance efficiency, but as noted earlier, they can also result in increased workloads and a faster work pace, making efficiency gains uncertain. Once again, the impact of technology on work experiences proves to be a multifaceted and intricate matter.

The discussions with R&D managers have illuminated the pivotal role that technology plays in addressing organizational challenges. It is obvious that technology has the potential to optimize processes, reduce subjectivity, and drive efficiency. However, **it is equally important to acknowledge that technology is not a panacea that can miraculously resolve all issues. Instead, it operates within the intricate framework of organizational structures, established customs, and unique corporate cultures**. Its impact is shaped not only by its capabilities but also by the way organizations, managers, and employees embrace and adapt to it. The complex interplay between technology and these contextual factors underscores the need for a nuanced and strategic approach to its integration.

- The importance of collaboration

As highlighted at the outset of this report, not every manager operates in an environment characterized by the widespread use of advanced technology. During the recruitment phase for this study, it became evident that **not all companies make significant investments in cutting-edge technology**. Nonetheless, there exists a growing demand for the implementation of innovative technology, as articulated by Manager 11. He explains that this demand emanates from several factors, including customer expectations, the competitive market landscape necessitating innovation for

competitiveness, and international collaborations, which underscore the importance of digitalization in research.

However, not all organizations readily embark on the journey of embracing innovative technologies. The process of introducing such technologies entails not only engaging employees but also presents economic challenges. As several managers have pointed out, **there is no guarantee of an immediate return on investment, and numerous factors must be considered.** Manager 6, for instance, emphasizes the need to preserve existing data and ensure its usability in the future. Simultaneously, substantial costs, especially in terms of cybersecurity, are incurred, as highlighted by Manager 11:

*"There's a whole series of rules that we have to comply with that require us to do additional administrative work on top of our jobs, on top of quality assurance, on top of this. So I think that each time we have to deal with additional workloads and costs that are generated by this modelling, but at some point we also find it difficult to pass on all this to our customers, and this is often to the detriment of margins. So there's an underlying economic problem. (Manager 11)*

Manager 7 previously revealed that their organization had closed its lab due to economic considerations, opting for outsourcing instead. To maintain profitability, they would have had to sell lab capacity, which was not aligned with their core business focus. This exemplifies the complex economic decisions that organizations must grapple with.

One recurring theme that emerged throughout our discussions was the significance of **collaboration as a catalyst for innovation.** Many R&D managers emphasized the value of partnerships with academic institutions and industry peers. Manager 2 highlights the advantages of such collaborations, wherein academic partners bring expertise and access to diverse knowledge, creating a symbiotic relationship. This principle extends to managers like Managers 9 and 4, who lead research institutions engaging in sectoral collaborations, effectively spreading risk.

## 5. Quality of working life

As mentioned in the introduction of this report, collaboration technology is prevalent among the cases in our sample. This prevalence isn't surprising, especially considering that many of the interviews took place in the aftermath of the global coronavirus crisis, a period that greatly accelerated the adoption of remote working solutions. **The ability to work remotely, from the comfort of one's home, was a recurring theme in our discussions, and it's a facet of work that significantly impacts the lives of the managers interviewed.** This impact is particularly pronounced given their frequent engagement in international contexts, necessitating regular interactions with foreign counterparts. For Manager 4, this technology, exemplified by tools like Microsoft Office Teams, **has introduced a sense of tranquillity to his work:**

*"Voilà, hops I quietly had a coffee - I have a nice court - I went outside to clean in my court. I didn't have to rush. Do you know that's different... 3 years ago, [then I] had to go to [Name of municipality where interviewer lives]. Right to the point man. Then I stood for an hour before I could contrast this with you." (Manager 4).*

Manager 10 echoes this sentiment, highlighting how technology has transformed her work-life balance. Remote meetings allow her to attend to personal matters, like caring for an ill child, without missing crucial discussions. However, she also notes that **'hybrid working' has its drawbacks, making office visits both physically and mentally taxing:**

*"So physically, I noticed that going to the office was much more tiring. [...]. Interactions with colleagues, face-to-face meetings..." (Manager 10).*

Yet not all managers share this perception of technology's impact on work-life balance. Manager 3, for instance, elucidates how **the blurring of boundaries** has become an issue. Operating in an international context, where time differences and easy accessibility through collaboration technology facilitate constant work, he laments the disappearance of the concept of a 'lunch break.' To mitigate the constant demands, he tries to limit digital distractions, though he acknowledges the unique mental toll of round-the-clock availability:

*"I try to coach my people that you also have to see the humour in it, you have to enjoy doing your job and if you enjoy doing your job and can laugh at the fact that someone is fussing about a problem at two o'clock in the morning... Then it's not that they're doing it to bully you, but that's then... They have a problem. There it is then 2 PM. That one doesn't realise that it's night time for you." (Manager 3).*

Manager 3's perspective sheds light on the deep commitment that R&D managers often feel toward their work, viewing it as more than just a job or a means of earning a living. This **passionate dedication is a common theme among managers involved in product- or innovation-oriented research**, exemplified by Manager 4, who affectionately refers to his job as 'a hobby.' As discussed earlier, these managers **highly value work autonomy**, often referred to as 'the scientific process.' Manager 2 captures this sentiment, shared by many, succinctly:

*"That's obviously the advantage of being in R&D, you get that space and time actually to do those things. If I were at an engineering firm, for example, I wouldn't have the time for that, I'd just have to deliver a project every day, so to speak. We're just in that field where it's sustainable for me as well because you actually do get that time to explore that actually, let's say." (Manager 2).*

Manager 2's comparison to an engineering firm underscores the difference in expectations between roles, with project-based work often allowing less room for exploration and experimentation, vital for driving innovation. Manager 7 raises a critical point, expressing concern about a shift away from 'genuine' research in her organization,

characterized by less time and resources allocated to research in favour of a stronger focus on cost-efficiency and commercial considerations.

In conclusion, our exploration into the perspectives of R&D managers offers a multifaceted view of the evolving landscape of work-life balance and sustainability in the context of technological advancements. Collaboration technology, especially in the wake of global events like the COVID-19 pandemic, has reshaped the way these managers approach their roles. While remote work solutions have introduced newfound flexibility, enabling them to attend to personal commitments and collaborate across borders, they have also brought about challenges related to the blurring of professional and personal boundaries.

The testimonies of these managers reveal a deep-seated passion for their work, often referring to it as more than just a job but as a fulfilling pursuit. They cherish the autonomy afforded by their roles, emphasizing the importance of 'the scientific process'—an iterative journey of exploration and discovery. This enthusiasm transcends the daily grind, aligning their dedication with their sense of purpose.

However, the sustainability of their roles is not uniform across the board. The shift toward cost-efficiency and commercialization in some organizations has raised concerns about the diminishing emphasis on 'genuine' research, potentially compromising the time and resources allocated to innovation. It calls for a delicate equilibrium between harnessing technology for productivity gains while preserving the essence of meaningful, purpose-driven work.

## 6. Conclusions

The role of R&D managers is inherently complex, involving various responsibilities such as team management, decision-making, budgeting, and staying updated on industry trends. While technology plays a part in this complexity, broader organizational dynamics and market forces often have a more significant impact on their roles.

Technology, particularly automation and collaboration tools, has led to changes in their working methods. Some R&D managers have shifted from physical experimentation to digital modelling, and collaboration technology has transformed their communication and collaboration processes. These technologies have streamlined coordination and project management, reducing workloads and increasing clarity. Automation technology, specifically, has automated operational tasks, reducing the burden on R&D managers. Additionally, collaboration technology has given them more flexibility, enabling remote work and better work-life balance.

Although the extent of learning opportunities may not have changed significantly, the methods of learning have evolved. R&D managers now rely on the internet for accessing knowledge and often pursue independent online courses. Collaboration tools facilitate knowledge sharing within teams.



However, the impact of technology is not straightforward. Collaboration technologies, while enhancing teamwork, have also accelerated the pace of work, leading to a constant feeling of being available and increased stress. The expectation for increased responsiveness has also become more pronounced in the digital age, influencing their work pace. Standardized workflows can lead to increased complexity and impede autonomy. The impact of technology is shaped not only by its capabilities but also by the way organizations, managers, and employees embrace and adapt to it. For example, an already existing meeting culture has only become stronger in digital form.

Interviewees also emphasize the importance of "soft skills" in digital interactions. Effective leadership and communication skills are critical in virtual meetings and interactions. While technology was seen as a means to optimize and streamline processes, it was not considered a universal solution. Human expertise remained indispensable, particularly in interpreting results and ensuring technology aligns with the organization's mission.

The impact of new technology on employment conditions, employment relations, and work organization is rather limited. Contractual arrangements and career opportunities have often remained relatively unchanged. Performance reviews continue to rely on traditional one-on-one conversations, with limited integration of technology for this purpose. It appears that non-management roles might be more impacted by this, in terms of evaluation and performance, than these R&D managers.

Employment relations, particularly worker involvement and participation, demonstrated opportunities for proposing ideas related to technology. However, decision-making authority typically rests with upper management, leading to a complex interplay of ideas and implementation strategies. The role of trade unions in this context appeared to be either ill-defined or not well-understood.

In conclusion, our exploration into the world of R&D managers navigating the digital age has revealed a complex tapestry of experiences. As organizations continue to evolve in response to technological advancements, a nuanced and strategic approach to technology integration is necessary, preserving meaningful, purpose-driven work while harnessing the potential benefits of innovation.

Amidst this transformation, the dedication and passion of R&D managers for their roles shine through. Their commitment to the scientific process, embrace of autonomy, and pursuit of innovation underscore the enduring human element in the ever-evolving realm of technology-driven work.

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