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Management Summary

Digital transformation in the workplace of the European Chemicals Sector

A sector-specific study of the European chemical, pharmaceutical, rubber and plastics industry

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Management Summary

This is the executive of the study on the **"Digital transformation in the workplace of the European Chemicals Sector – A sector-specific study on the European chemical, pharmaceutical, rubber and plastics industry"** on behalf of the *European Chemical Employers Group (ECEG)* and *industriAll European Trade Union*. The study was tasked to provide answers to the following questions:

- Which are the **sector-specific transformations** through digitalisation and Industry 4.0?
- What are potential **impacts** of the digital transformation on **skills, qualifications, working patterns** and **health and safety**?
- How **digitally mature** is the European chemical, pharmaceutical and rubber & plastics industry?

The study builds upon a **strong empirical basis**, including a comprehensive online-survey with 500 respondents from across the European Member States, more than 20 expert interviews, two conferences and additional steering group discussions, desk research and trend analysis. The research was performed from March 2018 to December 2018.

Based on the extensive research, **six overall conclusions on the digital transformation in the workplace of the European chemicals sector** have been drawn and are explained in more detail below:

Overall conclusions	
	**1.** The **1st wave of the digital transformation** (i.e. digitising analogue data and integrating cloud solutions) is successfully accomplished in the European chemicals sector. However, the implementation rate increases with the company size: especially the implementation rate of digital solutions in micro and small enterprises (<50 employees) is lagging.
	**2.** The **2nd wave of the digital transformation** will be driven by the Industrial Internet of Things, Big Data, Artificial Intelligence, automation and augmented reality – and it will come into effect in the near future (within the next 5 years). The transformation around **AI** might cause more drastic implementation gaps between very large enterprises and SMEs.
	**3.** A **shift in skills in the European chemicals sector is clearly visible** – basic digital skills are broadly existing in the sector. However, more advanced digital skills & transversal skills require attention by all stakeholders in the industry. Especially SMEs currently lack dedicated training programmes for digital upskilling and rate their digital skills less positive than larger firms.
	**4.** The **working environment** in the chemicals sector is predominantly changed through mobile working with greater employee autonomy but also an increased level of multi-tasking. Close attention needs to be paid to the level of psychological stress, which is expected to increase significantly due to digitalisation, especially in larger firms.

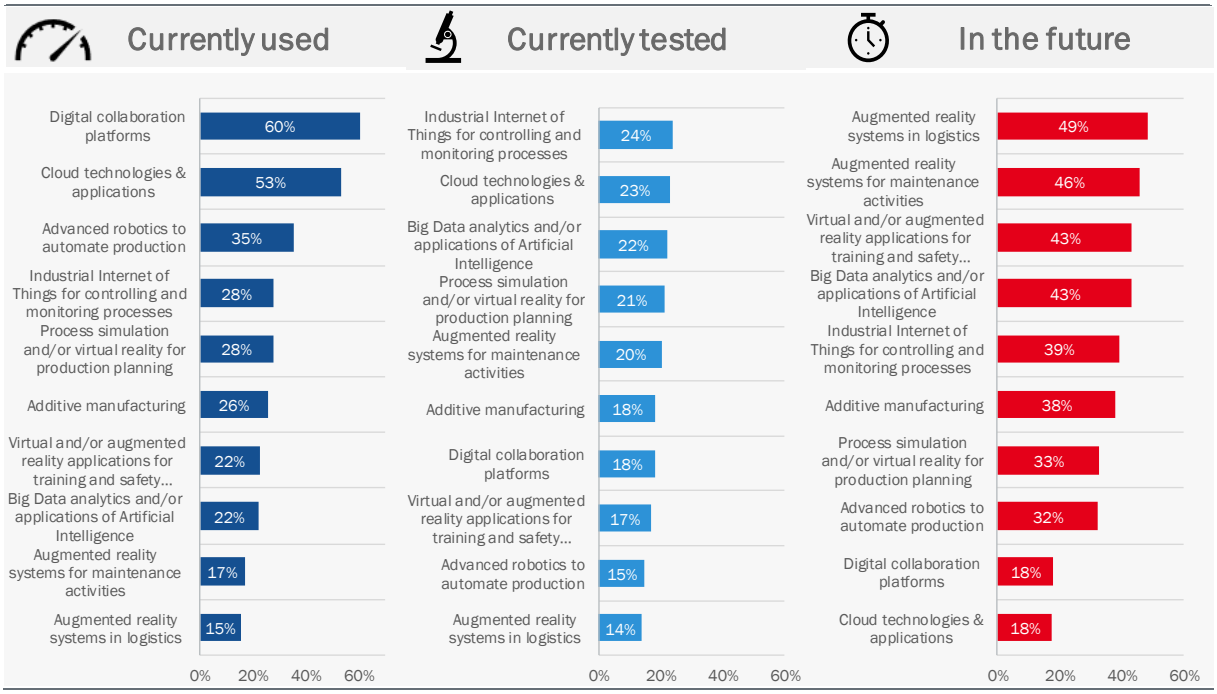
	**5.** **Collective agreements** need to pay greater attention to the issue of mobile working & working-time arrangements and qualification. Other sensitive issues linked to the digital transformation (data protection, performance monitoring) also need to be addressed with collective agreements or accompanied by other initiatives (e.g. open dialogue processes).
	**6.** **Change management** and the **involvement & support of employees** is currently the biggest challenge in the digital transformation process of the European chemicals sector. It is decisive to address this to allow for a successful transformation. The digital maturity assessment shows little variance across Member States and sectors. Southern and Eastern Europe are more likely to have greater challenges. In these regions the issue of employee participation seems to be addressed less by collective agreements at national, regional or sectoral levels.

Technological transformation through digitalisation in the European chemicals sector

The research shows that the **1st wave of digital transformation** has been **successfully accomplished**, driven by cloud technologies and digital collaboration platforms which improve and facilitate interdisciplinary collaboration. More than 75% of the chemical companies are currently using or testing cloud technologies and applications. Moreover, the use of digital collaboration platforms for internal communication and/or cooperation is widely spread. Currently, around 80% of respondents are using or implementing such technologies. Overall, the analysis did not find any significant differences across the sub-sectors. However, the **implementation rate increases with the company size:** especially the implementation rate of micro and small enterprises (<50 employees) is lagging.

The 2nd wave of digital transformation in the chemical industry will be driven by Big Data analytics, applications of Artificial Intelligence (AI), the Industrial Internet of Things (IIoT) as well as applications of augmented and virtual reality – and it **will come into effect in the near future** (most likely in the next 5 years). From all sectors considered, the pharmaceutical industry appears to be the frontrunner, especially in the use of IIoT, Big Data or AI applications. The survey results also indicate that especially the **transformation surrounding Big Data analytics and Artificial Intelligence might cause drastic implementation gaps** between very large enterprises (>1000 employees) and SMEs. While 63% of very large companies are already using or are testing these kinds of applications, less than 30% of SMEs are.

Figure 1: Current use, testing or future application of digital technologies in the chemical industry



Source: Prognos AG (2019), based on European wide chemical industry stakeholder survey (2018), n=290-376.

Digital transformation of work: skills, working patterns, health & safety

The research results indicate that the technological transformation in the chemicals, pharmaceuticals and the rubber & plastics sector is accompanied by an important **skills shift**. The move towards more automated and intelligent production processes and smart digital tools supporting decision making is profoundly impacting the chemical job profiles of the future. Workers will require less manual and basic cognitive skills and more advanced digital and complex transversal digital skills[1] that necessitate at least some basic technical and digital knowledge.

The research shows that **basic digital skills are already widely established** across the chemical workforce. 70% of respondents assess the skills of using basic IT-tools (e.g. software to process and store information) as good or very good. However, more **advanced digital skills**, like programming (e.g. development and application of digital assistance systems or machine learning), or **IT-skills for the complex analysis** of large data sets **require more attention**. 56% of respondents give a poor to very poor assessment to programming and 47% to Big Data analysis, indicating a current lack of skills within the industry. However, these advanced digital skills will become more important for companies in the coming five years, when the 2nd wave of digital transformation will come into effect.

[1] Transversal digital skills are skills that are typically considered as not specifically related to a particular job, task, academic discipline or area of knowledge and that can be used in a wide variety of situations and work settings (e.g. critical and innovative thinking).

The **social skills assessment** of the European chemical industry is overall **positive**. For all the listed skills, incl. managing interpersonal relations, self-organisation or initiative-taking, at least 85% of the respondents gave an acceptable or good assessment. In particular, **self-learning and multi-disciplinary work** will **gain in importance** in the coming 5 years – over 70% of the surveyed chemical industry stakeholders are expecting an increase. These findings correspond with the results in relation to the changing work environment and training needs (see below). Thus, in addition to the basic and advanced digital competencies, the industry also needs to pay attention to the development of social competencies in the course of the digital transformation of work.

The skills assessment indicates that **requirements are also increasingly focused on transversal digital skills**, which are becoming more important in the age of digitalisation. Digital communication is widely established in the chemical industry, with approximately 45% of the survey participants assessing current competencies as being good or very good (87% even as acceptable or better). Within a mobile working environment, where spatial and temporal ties between team members are changing, these skills will become progressively more important (~80% see an increase in importance in the next five years). In addition, **skills to implement digital solutions** are equally important, though 30% estimate them to be poor to very poor, which could lead to a **shortage of these skills in the future**. This applies also to more creative skills categories, like design skills or non-technical competencies (e.g. system thinking or process understanding).

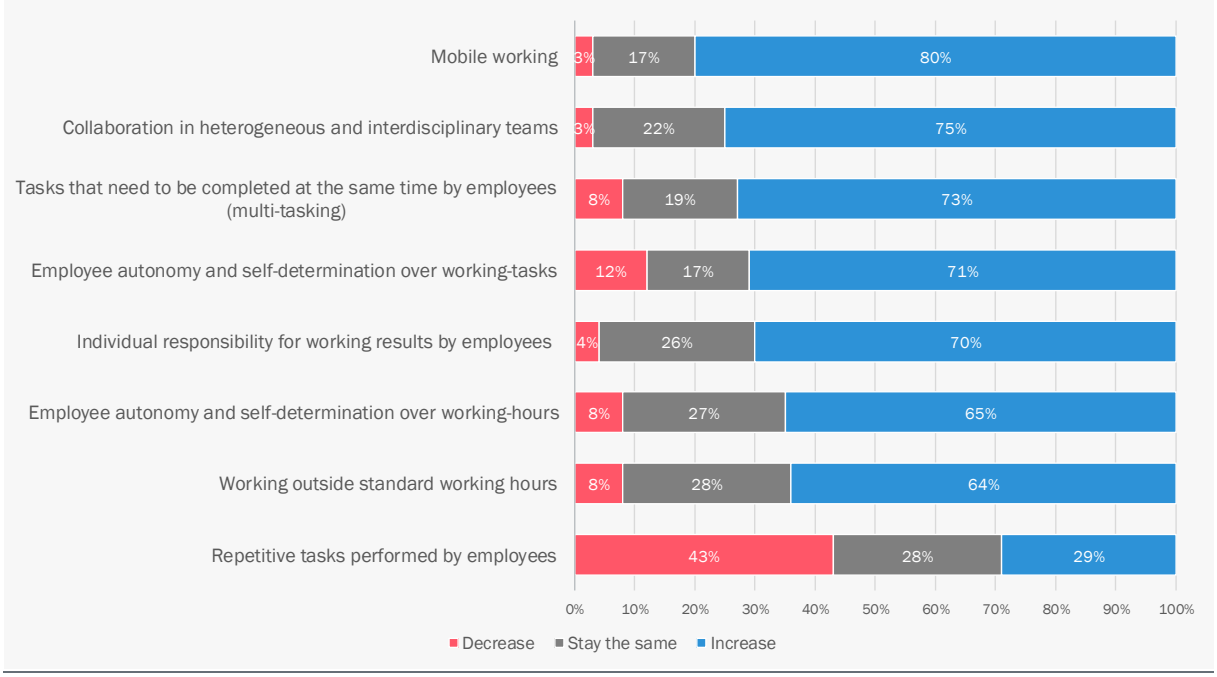
The analysis of skills across company size shows that there exists a **digital skills gap between SMEs and large enterprises**. Respondents from SMEs consistently assessed their technical and transversal digital competencies worse than large (>249 employees) or very large enterprises (>999 employees). It may explain the identified implementation gap regarding the 2nd wave technologies (AI, IIoT, AR, etc.) as well.

In the context of missing skills and necessary upskilling of the workforce, training measures play an important role. The results show that many employees currently participate in **training measures for digital up-skilling**, but there are distinct variations in company sizes, and **improvements regarding both the quality and quantity of training measures** are necessary. Overall, only a quarter of all respondents receive training in relation to digital up-skilling more than twice a year. One third of respondents working in a large or very large company reveal that the offer of training measures is insufficient and can lack in quality. For respondents working in SMEs, up to 43% indicate that the training offer is not appropriate to their needs or does not exist at all. If this trend is to continue, the digital skills gap between SMEs and large enterprises might deepen.

Furthermore, the survey results show that the chemical industry stakeholders see up-skilling and training as a **private and public matter**. The analysis shows that both managers and employees recognise their responsibility to invest time and/or financial means for digital up-skilling. Around 50% of the participating **managers strongly agree that companies should invest in training programmes** to keep their employees' digital skills up to date and around 60% of **employees agree that they need to invest in digital training themselves** too. Furthermore, managers as well as employees find that the government and other public administrations can play an important role in securing digital skills – for instance, by providing incentives (~75% agree) or investments for training programmes (75-80% agree). Both respondent groups recognize the important role of **social partner cooperation** within this process. Over three-quarters of the surveyed employees and two-thirds of managers agree that social partners should negotiate new and/or revise existing training schemes.

The previously mentioned technological transformations and the resulting changes of the necessary skillset of workers are interlinked with the evolution of their **working environment** and the way how activities are performed by both employers and employees. With differing intensity across company departments, **one of the predominant changes is related to mobile working** (see Figure 2). Overall, 80% of respondents expect an increase in remote working opportunities. This evolution is closely related to the accomplishment of the 1st wave of digital transformation. Furthermore, employees as well as employers have confirmed the trend towards more mobile working in the European chemicals sector in interviews. This trend will have an important impact on the organisation of work since spatial and temporal ties between workers will change. Yet, the possibility of working outside the company requires fundamental trust between employers and employees and comes with an increasing responsibility and autonomy for employees regarding their working tasks, working hours and results.

Figure 2: Assessment of the impact of digitalisation on the working environment



Source: Prognos AG (2019), based on European wide chemical industry stakeholder survey (2018), n=440-451.

In addition, 43% of respondents expect that their **share of day-to-day simple and repetitive tasks will further decline**, as they will increasingly be carried out by digital solutions. At the same time, new technologies enable workers to carry out a greater number of more diversified activities. 73% of respondents see an increase (and 34% a strong one) in multi-tasking and, potentially, their works' complexity. **The increase of collaborations in heterogeneous and interdisciplinary teams**, which has been affirmed by three-quarters of the respondents, is further evidence for greater work environment complexity in all chemical sectors. For example, whereas chemical process engineers previously optimised the production processes on their own, they now cooperate with computer scientists and data analysts that embody the necessary competencies.

The changes in the working environment also have an impact on health issues. In this regard, employees, managers and other industry representatives are expecting a **significant increase in psychological stress at work** (see Figure 3). This is especially true for large to very large companies (>250 employees). Digitalisation, however, through developments in automation and new technical assistance systems, will help to decrease the number of hazardous tasks, thereby **reducing the risk of physical injuries and working accidents** in the sector (around half of the respondents agree). This is particularly apparent in the specialty and rubber & plastics sectors. Overall, there is a balanced and rather positive assessment of the impact on the **general health of the workforce**. Around 34% of respondents expect an increase in the workforces' general health, compared to 24% that expect an overall decrease. Most respondents (42%), however, see no major overall changes.

Figure 3: Expected effect of digitalisation on the health of the workforce in the European chemicals sector

- **~50%** see slight to strong **decrease** of **hazardous tasks**
  - …**stronger decrease** expected in **specialty** and **rubber & plastics industry**

- **~70%** see a risk of **increasing** levels of **psychological stress**
  - …and **1/3** expect an even **stronger** increase
  - …in **large firms,** the **risk** for increased levels of psychological risks is expected to be **higher**

- **~42%** see **no major** overall **changes** in the **general health** of the workforce
  - …**34%** see an **improvement**
  - …and **24%** an overall **decrease**

Source: Prognos AG (2019), based on European wide chemical industry stakeholder survey (2018), n=443-449.

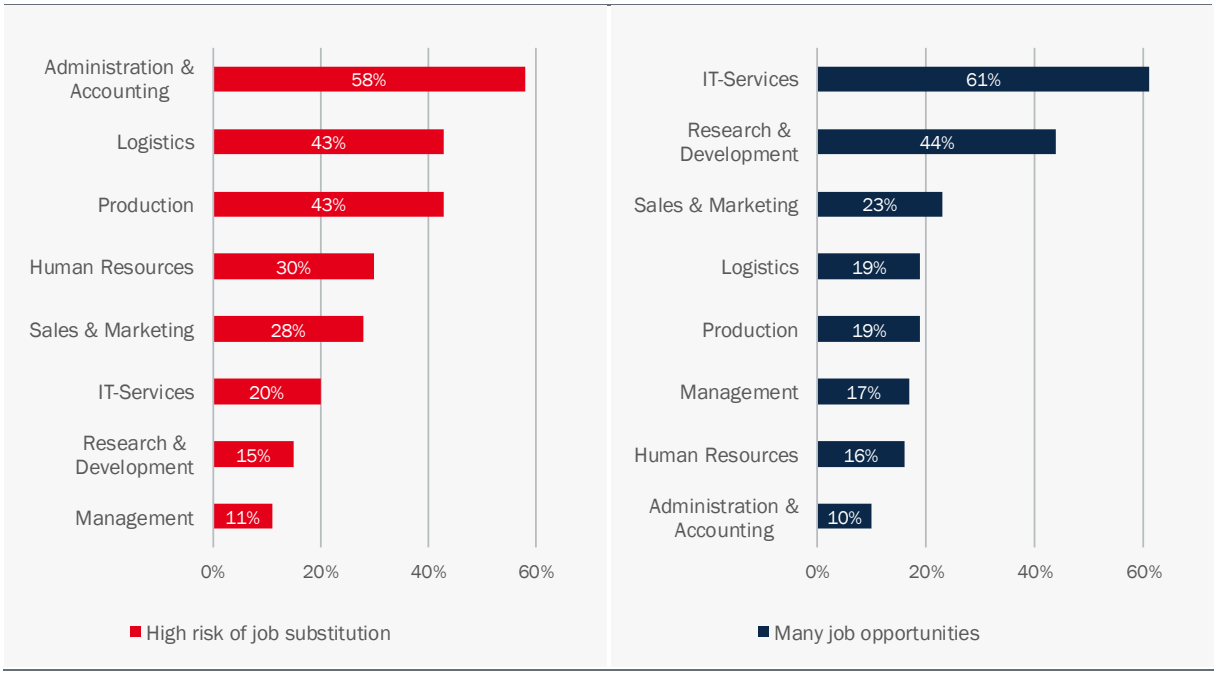
The introduction of digital technologies and the resulting changes in the working environment and needed skillsets also have an impact on the current and future composition of the workforce. Regarding the **risk of workforce reduction**, the research results show that **digitalisation bears (high) risks for some job profiles, but also brings many new opportunities** in the chemical, pharmaceutical and rubber & plastics industry, as most job profiles will not become fully obsolete or redundant. They will rather change with the new technologies as they become available and it will require new skills-sets as discussed above.

According to the survey respondents, the **risk of a total workforce reduction is highest** in production, logistics and, **first and foremost, administration & accounting** (see Figure 4). For the latter, 58% think that there is a high risk for redundancies. In total, 90% of respondents consider employment in administration & accounting at (low to high) risk. In production and logistics, nearly 90% see an overall risk for workforce reduction by 2023 too, though a smaller share of respondents assumes higher risks (43%). This corresponds with the previous results that indicate an expected reduction of repetitive and more easily automatable tasks. Such tasks are at the same time more prevalent in the above mentioned company departments.

At the same time, **opportunities are expected** to be created in sales & marketing, research & development (R&D) and, **especially, in IT related activities** (86% of the chemical industry stakeholders agree). For the R&D department, close to 80% of survey respondents see new opportunities. Importantly, the results show that also around one fifth of the survey participants expect many opportunities in the "threatened" departments of **production and logistics**. This can be a strong indication of a **structural transformation of profiles** in these departments.

The study also finds that **managers see more opportunities with digitalisation, whereas employees emphasize risks**. This shows the importance of sound communication strategies between management and employees on the profound changes that arise with the digital transformation: a clear communication about risks, clarifying how a company and its workforce can embrace the transformation and reduce existing uncertainties.

Figure 4: Risks of a reduction in the workforce and new job opportunities by company division in the next 5 years (by 2023)



Source: Prognos AG (2019), based on European wide chemical industry stakeholder survey (2018), n=391-452.

Employer-employee relationship and collective agreements in the digital age

Discussions between social partners across Europe and resulting collective agreements play an important role in the digital transformation. The research reveals that **several important aspects** in relation to the digital transformation **are so far moderately addressed by the current collective agreements**. Especially the topic of working hours seems to be covered well by the collective agreements in place. 80% of respondents agree that this issue, with respect to the digital transformation, is moderately or sufficiently addressed. Furthermore, respondents have the opinion that collective agreements cover (at least moderately) important issues like working time flexibility (60% agreement), occupational training (50% agreement), work-life balance (46%

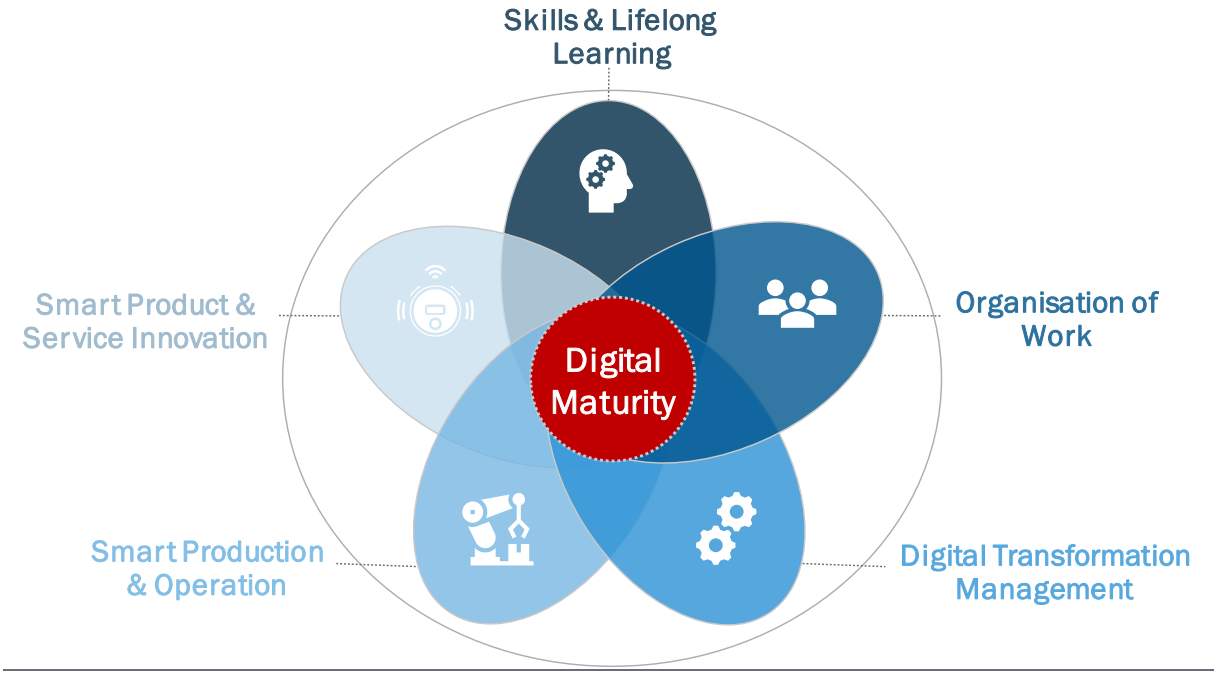
agreement) or mobile working (45% agreement). However, concerning these last three topics, i.e. occupational training, work-life balance and mobile working, it needs to be stressed that there are also between 10-17% of the stakeholders who indicate that these issues are currently not addressed at all by collective agreements, indicating a substantial gap.

At the same time, the following four aspects will gain especially in significance **in the next 5 years**: **mobile work** (60% indicate a strong increase in importance), **working-time flexibility** (58% indicate a strong increase), **work-life balance** (54% indicate a strong increase) and **occupational training** (53% indicate a strong increase). Nevertheless, the study also highlights other sensitive issues (e.g. data protection or performance monitoring) and that collective agreements that should be accompanied by other initiatives (e.g. open dialogue processes) for dealing with the challenges that arise with the digital transformation in the workplace.

Digital maturity of the European chemicals sector

To analyse the digital maturity of the chemical industry and its sub-sectors and obtain a final and comprehensive assessment of the digital transformation in the sector, a new concept including five dimensions and 20 related indicators was established for this study (see Figure 5). For each of these indicators, statements were formulated (indicating the highest possible digitalisation level), for which survey participants were asked to indicate their agreement (from not at all to fully agree). Finally, the answers were translated into an ordinal scaling system from 0 to 5, with five being the highest degree of digitalisation.

Figure 5: Digital maturity model for the European chemicals sector



Source: Prognos AG (2019), based on own research. Icons: Copyright Flaticon.

The maturity analysis shows that, overall, there are **no large differences in the maturity levels across the different dimensions**. Neither **does it reveal large differences in the overall maturity level across the different sectors**, even though the basic chemical industry shows a somewhat higher digital maturity.

The most striking differences can be found across the 20 different maturity indicators. Some of the **best scores** exist in the **use of digital platforms** for interdisciplinary cooperation and exchange of information or the availability of **infrastructure for flexible working arrangements**. This is directly related to the previously mentioned accomplishment of the 1st wave of digitalisation in the chemical industry. Indicators related to **change management** and the **involvement and support of employees** (e.g. concerning skills, lifelong learning or consideration of experience) received some of the lowest scores, which shows that this is currently **one of the biggest challenges** in the digital transformation process.

Survey respondents strongly agree that the outcomes of discussions between management and employees in the chemical industry help to improve the competitiveness. Thus, **dialogue** ought to be seen as **one of the industry's strengths**. **Change management and constructive dialogue will be key to a successful digital transformation** in the chemical industry and are vital for the industries' competitiveness in a fast-changing and volatile globalised world.

Outlook: key challenges and conclusions

The research findings show that the European chemical industry has made visible progress in the digital transformation, both in terms of technology and the "new world of work". But transformation processes, especially those with far-reaching implications such as digitalisation, are always accompanied by uncertainty. Besides the issue of **missing advanced digital skills** in the industry, which has been discussed above, three **key challenges** require attention in the future:

- **Lack of understanding about the advantages of digitalisation:** across the board, managers, employees and industry organisations as well as union representatives report a lack of understanding or knowledge about the specific benefits of digitalisation for companies in the different chemical sectors. This indicates that a more differentiated discussion about digital transformation in the sector is needed which prioritises thinking about the customer needs, business model and employee competencies and, in a second step, asks in how far digital solutions can be supportive.
- **Uncertain returns from digital investments:** aligned with the above, especially managers in the chemicals sector are not fully confident in the returns of digital investments. Almost 50% of the survey respondents confirm this uncertainty. Besides technological complexities and ongoing R&D for many digital solutions, this finding underlines the need for a clear perspective on the purpose of digitalisation in any company's business model.
- **Unclarity about methods and processes for the digital transformation:** for 40% of the 200 company representatives in the online survey, the "how" of digital transformation in terms of methods and processes is unclear. This finding clearly shows that transformation management competencies, alongside a clear understanding of the desired digital transformation path (strategy), is absolutely crucial and will become even more crucial in the next few years given the enormous technological progress in digital solutions.

The findings of this study underline that **digital transformation** in the European chemicals sector needs to be addressed by a **holistic approach** as presented in the "Digital Maturity Model" of this project. It needs to be driven by a clear understanding of the customer needs (do digitalisation

plans meet customer needs better?), the companies business model (is digitalisation improving the business model?) and the internal experiences and competencies of people. Knowledge is becoming increasingly easier to access (online) and cheaper while digital tools are becoming increasingly powerful. Qualifications and creativity of the workforce remain both the key differentiator and competitive advantage of the sector. Investments in employees become ever more important. Further, it must be made sure that working conditions, co-determination and health & safety are equally addressed in a social dialogue that characterizes and strengthens the European social market economy.

All in all, we need to remind ourselves that this digital transformation is not a technological but also a cultural and social transformation and that it is not happening in a vacuum but in the context of global competition. Hence, adjustments to the future of work in the chemical industry need to be made with care and speed at the same time.

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Imprint

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