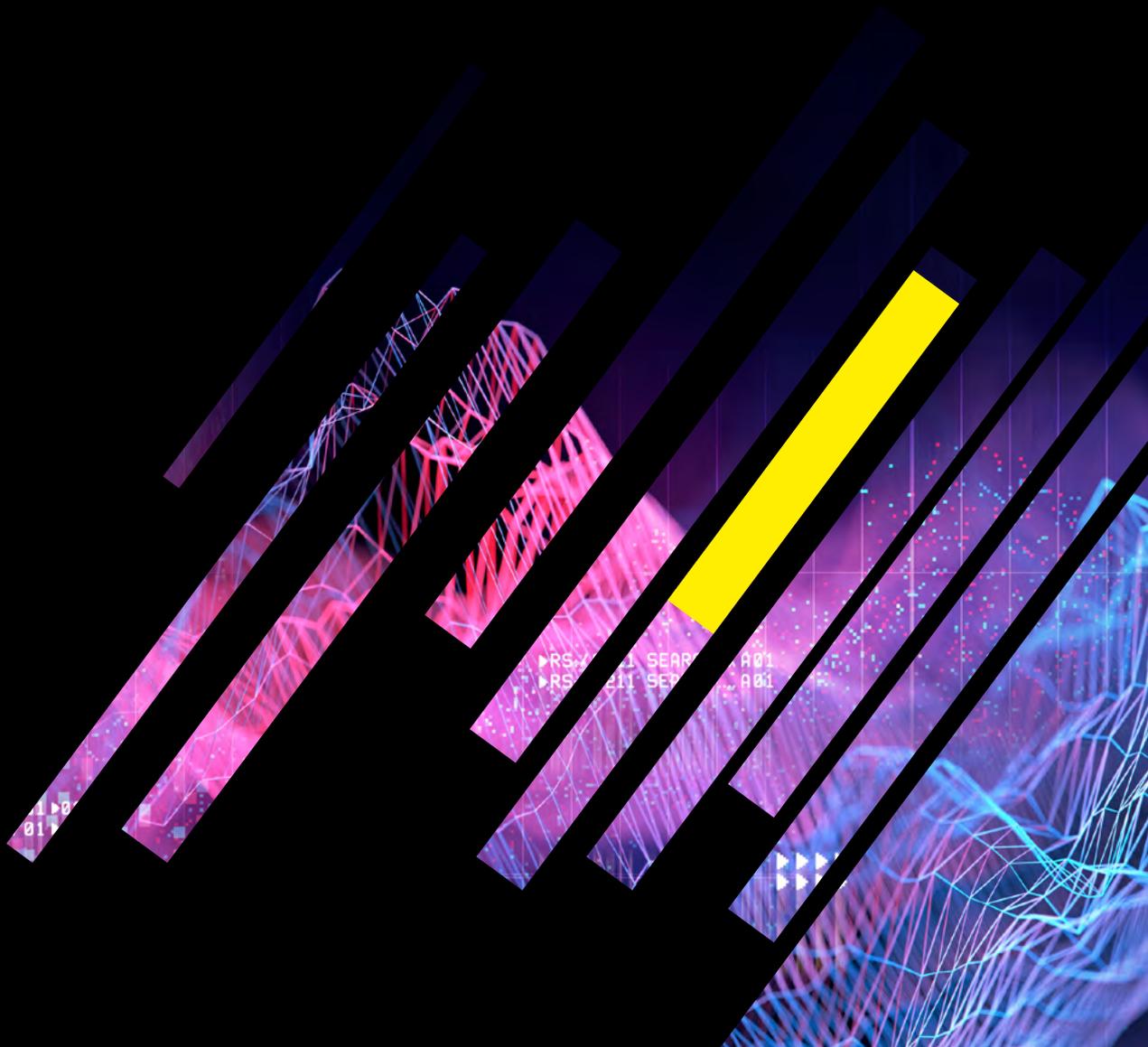# DREES & SOMMER

INNOVATION SCOUTING
REPORT 2024

This edition of the Drees & Sommer Innovation Scouting Report marks the fourth year in succession that the publication has summarized the most important technology trends in the construction and real estate industry. This year's report focuses on artificial intelligence (AI). Extensive interviews were conducted with AI startups, and the individual phases of the real estate lifecycle were examined to identify potential applications for AI technology and look at its level of development and acceptance. The resulting Drees & Sommer AI Hype Cycle allows pioneering trends and technology-oriented solutions to be identified and classified.

The ability to identify and understand trends is critical in today's dynamic world. They shape our culture and economy, and are the driving force for innovation and for social and digital transformation. The large number of ideas and innovations makes it essential to distinguish between short-lived hype and long-term change. The relevance of specific technologies has to be examined in order to arrive at a sound assessment of current trends. The Trend Radar methodology is particularly well-suited for this purpose, as it classifies trends relevant to a system in a clear and compact visualization.

International construction and real estate data (both qualitative and quantitative, see Fig. 1) from 2023 and 2024 was analyzed for this year's **Trend Radar**, and various data sources – such as reports and databases – were evaluated. In addition, the data is based on an international, industry-wide survey on current and future use of technologies in the construction and real estate industry. The glossary at the end of the report provides explanations of the various technologies.
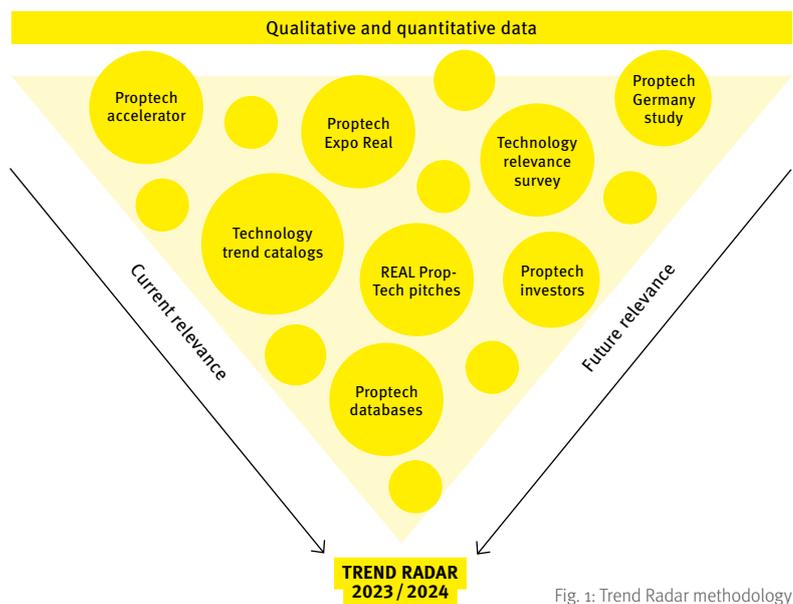

Fig. 1: Trend Radar methodology

THE RESULTS:
THE TOP 4 OF 2023 ALSO MADE IT ONTO THE PODIUM IN 2024

Artificial intelligence (AI) maintains its leading position in the Trend Radar this year with a significant increase in relevance of 7.6% (see Fig. 2). **Big data analytics** remains in second place.

The synergistic relationship between AI and Big Data is a significant one and always needs to be borne in mind. AI is used in big data analytics to enhance data analysis. AI, on the other hand, relies on large volumes of data – and on high-quality data in particular – to learn and be able to optimize decision-making processes. Data quality drives innovation, but flawed data leads to poor results and wrong conclusions, even with the application of future technologies.[1]

The use of **cloud computing** (4th place) also offers numerous advantages, including reduction of costs and carbon emissions. But most importantly, cloud computing enables access to a wide range of other technologies such as AI and the **Internet of Things** (IoT), the latter once again ranking third in this year's report.[2]

[1] Cf. Ayers R. (2022)
[2] Cf. Streim A. (2023)

2022
■ Artificial intelligence (16%)
■ Big data analytics (15.1%)
■ Internet of Things (12.8%)

TECHNOLOGY TREND AND ASSESSMENT OF RELEVANCE

2023/2024
■ Artificial intelligence (23.4%)
■ Big data analytics (15.3%)
■ Internet of Things (11.9%)

■ Cloud computing (11.2%)
■ Digital twin (7.4%)
■ AR / VR (9.5%)
■ Sensorics (5.0%)
■ Robotics (4.3%)
■ Blockchain (3.7%)
■ 5 G (2.3%)
■ 3D printing (4.4%)
■ Quantum computing (1.6%)

2022

2023/2024

23.4%
15.3%
11.9%
11.2%
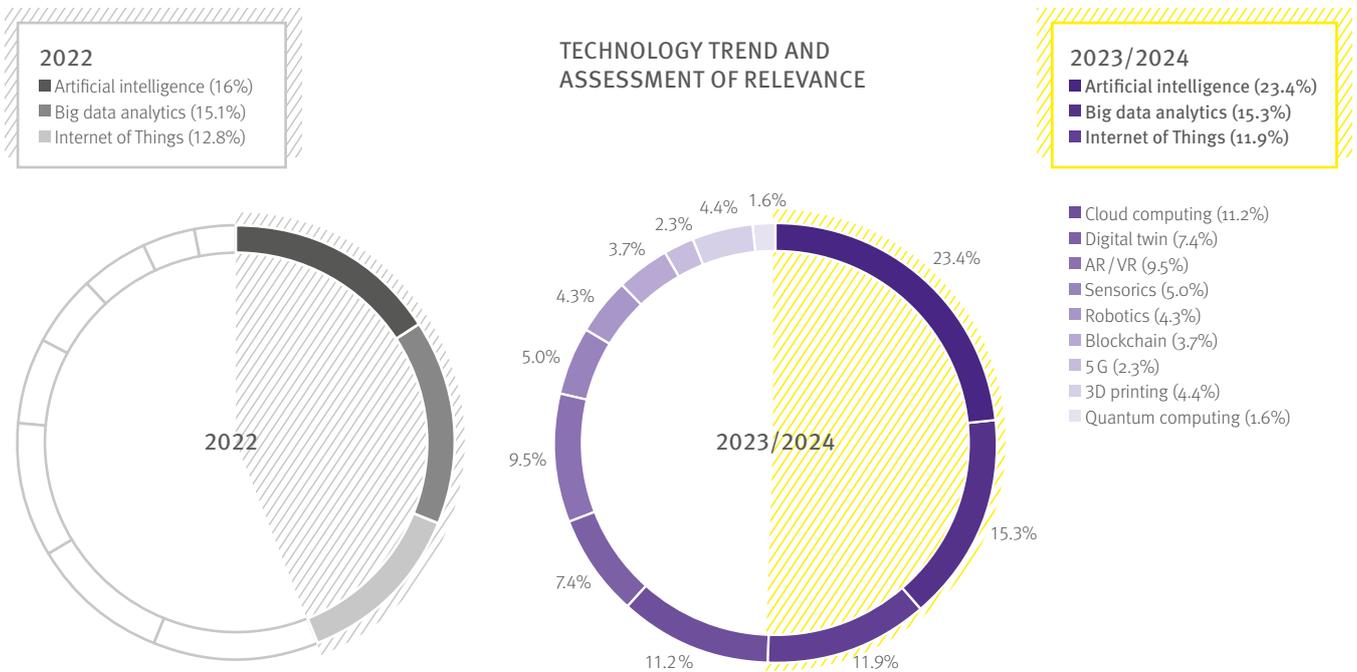7.4%
9.5%
5.0%
4.3%
3.7%
2.3%
4.4%
1.6%

Fig. 2: Trend Radar results

In contrast to artificial intelligence and big data analytics, a number of technologies have lost relevance in the past year.

THE REASON: Developments in generative AI over the past year have led to a previously impossible level of interaction between the various technologies. Technologies such as the **digital twin** are losing importance when viewed in isolation, but are gaining importance in synergy with AI, and now can be mapped in the 'real world'.

EXAMPLE:

Digital twin technology continues to have a strong global market value of USD 9.9 billion and is projected to reach an average growth rate of 33% in the period 2024 to 2032. In addition to its conventional application as a generator of digital images of buildings and machines, the digital twin is also used in the production sector in combination with Omniverse, a real-time graphics collaboration platform developed by Nvidia. Growth is being driven by greater use in supply chain management and the increasing adoption of big data analytics, IoT and cloud platforms. The combination of the two technologies allows the creation of accurate, reliable and optimized digital twins that offer even greater business benefits. Nvidia Omniverse shows the great promise for the future that the combination of the two technologies holds. For example, Nvidia has constructed a digital twin of the world to enhance prediction of natural disasters and enable timely initiation of appropriate measures. It is expected that the already significant importance of the digital twin will be overshadowed by its integration with AI.[3]

A NEW TREND IN THE INNOVATION SCOUTING REPORT:

The Trend Radar also shows that **quantum computing** is an emerging field of research that is currently attracting increased interest. Even though the technology is not yet considered to be of high relevance and it is not yet widely used, quantum computing is seen as having significant potential.[4] (2022 market value = USD 1.9 trillion, expected to rise to USD 42.1 trillion by 2032)[5] Quantum computing is more efficient than conventional computers at recognizing and analyzing complex patterns and relationships in large data sets. According to the Future Today Institute, quantum computing will have a significant impact within five years, particularly in the areas of cryptography, security, optimization and simulation, machine learning, and artificial intelligence.[6]

DIGITAL MATURITY: AN IMPORTANT INDICATOR

A company needs to have reached a certain level of digital maturity in order to best integrate and use new technologies in everyday operations. According to the German digitization study 'Transform to Succeed' undertaken by Drees & Sommer and Aschaffenburg University of Applied Sciences (02/2024), the construction and real estate industry in Germany currently has a digital maturity rating of 3.37 on a scale of 1 to 5. Companies will require a balanced mix of strong leadership and operational excellence to raise their level of maturity and optimally position themselves to meet future competitive challenges. This means firstly overcoming the prevailing generational conflict, promoting and incentivizing the workforce's willingness to change, while also taking a holistic approach to topics such as process optimization, data management and the application of technology.[7] In this context, open dialog with experts across all hierarchical levels is particularly important.

INCREASINGLY, IT IS LESS ABOUT THE DEVELOPMENT OF INDIVIDUAL TECHNOLOGIES AND MORE ABOUT THE BIG PICTURE AND THE SYNERGY BETWEEN THE VARIOUS TECHNOLOGIES.

[3] Cf. Global Market Insights (2024)
[4] Cf. Future Today Institute (2024)
[5] Cf. Acumen Research & Consulting (2024)
[6] Cf. Fraunhofer Institute (2019)
[7] Cf. Transform to Succeed digitization study (2024)

THE BOTTOM LINE: The strong growth in the importance of artificial intelligence for the construction and real estate industry must be emphasized. It is essential that all industries and sectors make targeted use of the potential of artificial intelligence to adapt to new developments and actively shape the future.

The Trend Radar 2024 findings are also reflected in this year's analysis by the Future Today Institute.[8] Its 'Impact of Trends' analysis shows when a specific trend will become relevant for a certain sector. And the results clearly show that generative AI is already having a strong impact and is therefore of high relevance for the construction and real estate industry.

For this reason, this Innovation Scouting Report takes a detailed look at artificial intelligence – from its development to its potential applications.

AI **DEEP DIVE**

Within a very short time, artificial intelligence has developed from a vision into a reality. This field of research has developed rapidly since the Dartmouth Conference back in the summer of 1956, at which the term artificial intelligence (AI) was coined. Artificial Intelligence has experienced a strong surge in recent years, especially due to generative AI (GenAI). Across the broad spectrum of AI applications, machine learning and deep learning focus on understanding complex concepts, recognizing patterns, and evaluating nuances of natural language. GenAI differs in that it creates new written, visual, and auditory content based on trained knowledge and user prompts.

It forms the basis for language models such as ChatGPT, Microsoft Copilot, Google Gemini and DALL-E, and has thus become a central element in numerous industries. Its ability to recognize patterns, optimize processes and automate complex tasks is having a transformative impact on the way companies and their employees operate and on our everyday professional and private lives as well.[9]

THE MARKET FOR GENERATIVE AI IN THE REAL ESTATE INDUSTRY IS SET TO GROW SIGNIFICANTLY. ACCORDING TO FORECASTS, THE GLOBAL MARKET SIZE IS EXPECTED TO INCREASE TO SOME USD 102.78 BILLION BY 2032, GROWING AT A COMPOUND ANNUAL RATE OF 11.2%.[10]

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[8] Cf. Future Today Institute (2024)
[9] Cf. Heinrich J. (2023)
[10] Cf. MarketResearch.biz (2024)

THE FOCUS IS ON PEOPLE

OpenAI estimates that AI will affect about 80% of jobs in the near future, but argues that this should not be seen as a negative impact. As has happened over the last 80 years, new technologies will continue to create numerous new specializations to make best use of their economic and social potential – in this case also in connection with AI. [11]

Microsoft CEO Satya Nadella emphasizes a human-centered approach in which AI does not replace humans, but assists them to drive productivity growth. [12] The more data-driven AI is used, the more important and crucial human expertise in assessing the results becomes. So personal judgment remains of great importance. [13]

AI MUST BE REGARDED AS A TOOL. WE NEED TO HAVE CLEARLY DEFINED GOALS BEFORE USING IT.

AI'S IMPACT ON THE STARTUP SCENEE

GERMAN GDP IS EXPECTED TO GROW BY MORE THAN 11% BY 2030 AS A RESULT OF AI-BASED INNOVATIONS. [14]

Changes in the startup scene are also an important indicator of a range of developing trends. Startups employ new technologies, develop innovative business models and thus drive digitization. This is demonstrated by the current boom in the AI startup scene.

According to the annual analysis by the appliedAI Institute for Europe, there were about 6,300 AI startups in Europe in 2023, of which about 10.6% are classified as generative AI startups. These are scattered across the EU, but the majority of AI startups are based in Germany. [15] Globally, about one quarter of all AI startups are in the USA. [16]

GENERATIVE AI IS EXPECTED TO BECOME A $1.3 TRILLION GLOBAL MARKET BY 2032. [17]

According to the findings of the survey conducted as part of this Innovation Scouting report, artificial intelligence, big data and augmented reality/virtual reality (AR/VR) are the technologies expected to have the greatest impact on the construction and real estate industry in the future. In industry and factory planning, for example, Nvidia is already making the Omniverse a reality. According to a 2023 study, over 80% of real estate investors and developers want to increase their investment in AI over the next three years to enhance their market position. [18]

[11] Cf. Goldman Sachs (2023)
[12] Cf. MSNBC (2023)
[13] Cf. Prof. Dr.-Ing. Zeitner R. et al. (2024)
[14] Cf. Pöhler D. & Watts R. (2023)
[15] Cf. Dr. Hutchinson P. et al. (2024)
[16] Cf. Duarte F. (2024)
[17] Cf. Bloomberg Intelligence (2023)
[18] Cf. Heinrich J. (2023)

POSSIBLE APPLICATIONS IN THE CONSTRUCTION AND REAL ESTATE INDUSTRY

AI has a wide range of potential applications in the construction and real estate industry, with numerous opportunities that can significantly influence and advance the sector. Targeted application of AI technologies plays a key role in meeting new demands. The two biggest challenges here getting people to adapt and the way in which companies deal with the changes that lie ahead. Ultimately, AI is not just a technological issue, but a human one too.

One example of this is AI-assisted planning and optimization, where AI technologies contribute to intelligent space design, energy efficiency and optimization of usage. AI technologies can also be used for tasks such as site analysis, tender management, and the analysis and predictive modeling of building services equipment. Another important application is the use of generative design in BIM models. AI enables the development of reliable and cost-efficient designs by exploring thousands of potential design variants for buildings.[19] According to this year's PMRE Monitor – a market study of AI – increasing efficiency and quality by reducing process costs is one of the biggest application opportunities for AI, closely followed by increasing data quality through automated data creation and AI-assisted data collection, and by the optimization of business processes through AI-based automation, vulnerability analysis and early warning systems.[20]

If one compares the various services provided by the construction and real estate industry, the PMRE Monitor currently sees the greatest AI potential in data and document management, and reporting. Accounting and building administration, valuation and finance, as well as strategic real estate management, are also considered to be areas of great potential. Given the current high demand for monitoring of regulations, AI also offers a range of potential applications in ESG monitoring.

19 Cf. Heinrich J. (2023)
20   Cf. Prof. Dr.-Ing. Zeitner, R. et al. (2024)

DREES & SOMMER
AI HYPE CYCLE

Applications from the various phases of the real estate lifecycle are examined in the following to illustrate technological developments and trends. Representatives from seven AI startups were interviewed and asked to categorize the technological progress in the individual phases of the real estate life cycle.

MINERALMINDS

Mineral Minds offers Material Flow as a Service, an in-house software solution for all aspects of your material flows – from the initial analysis and operational project execution through to final evaluation.
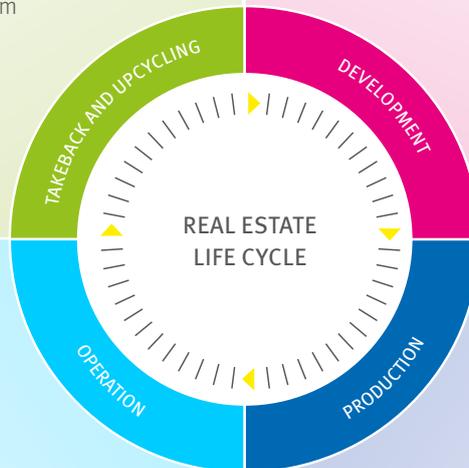Further information: Mineral Minds

OPTOCYCLE

Optocycle is developing an AI-based system for the visual classification of building rubble and mixed construction waste.
Further information: Optocycle

einwert.

Einwert is the leading platform for real estate value management. It provides seamlessly integrated centralized access to expert reports, current market data and your own real estate data.
Further information: einwert

Octoscreen

Octoscreen offers a B2B solution for complex, time-consuming site monitoring.
Further information: Octoscreen

syte

Syte is the leading AI platform for building stock, specializing in the analysis of construction and energy potential.
Further information: syte

oculai

Oculai is a technology for automated process and progress recording on construction sites using a combination of crane cameras and artificial intelligence.
Further information: oculai

Building Radar

Building Radar is a revenue engineering platform that combines AI data insights, process excellence, and talent development, integrating seamlessly with our clients' CRMs.
Further information: Building Radar

REAL ESTATE LIFE CYCLE

TAKEBACK AND UPCYCLING

DEVELOPMENT

OPERATION

PRODUCTION

Fig. 3: Real estate lifecycle

The individual phases of the real estate lifecycle (see Fig. 3) were classified in the Drees & Sommer AI Hype Cycle based on the expert assessments. Modeled on Gartner's Hype Cycle (explained below), the AI Hype Cycle attempts to predict the development and acceptance of AI in the individual phases of the lifecycle.[21] It is important to bear in mind that each technology will go through every phase of the hype cycle. So there is no grading within the phases, but only a statement about how far the phase of the real estate lifecycle has progressed with regard to development and acceptance.

To create the Drees & Sommer AI Hype Cycle, the individual phases of the real estate lifecycle were incorporated into the AI Hype Cycle based on the interviews conducted and on thorough research.

FUNCTION AND DIMENSIONS OF THE AI HYPE CYCLE

The AI Hype Cycle is a model for evaluating and visualizing the lifecycles of technologies, concepts, and trends. This model helps companies to differentiate between hype and the real drivers of a technology's commercial promise, and to identify and evaluate possible opportunities and risks at an early stage. This allows informed decisions to be made about the integration of technologies and reduces the risk associated with investing in technologies.

The axes of the AI Hype Cycle express two important dimensions:

The **X-axis** represents time and illustrates the progress of a technology's application from when it first arrives on the scene to when it becomes mainstream. It tracks the development period and shows the maturity of various use cases.

The Y-axis, on the other hand, shows the level of expectation and the general expectation for specific use cases. The curve is divided into five different phases. It begins with the **technology trigger**, the point at which the idea first arises and expectations are raised. Expectations then rise towards the **peak of inflated expectations**, where the hype and positive expectations reach their maximum. The curve then drops steeply into the **trough of disillusionment**, as reality and challenges often fails to meet original expectations. But as soon as organizations and users understand the use better and recognize additional realistic applications and benefits, the curve rises on the **Slope of enlightenment**. Finally, the use case reaches the **Plateau of productivity**, enters the mainstream and is widely accepted. It is important that companies don't allow themselves to be overly influenced by what is generally exaggerated hype, particularly in the peak of inflated expectations phase. It is advisable to take a case-by-case approach and to examine the actual impact of specific applications.[22]

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21 Cf. Gartner (2022)
22 Cf. Gartner (2022)

When **Development** – phase one of the real estate lifecycle – is integrated into the hype cycle, it is clear that it spans the first three phases of the hype cycle. This emphasizes the high level of complexity of these use cases, which results from the combination of different technologies. Phases two and three, **Production** and **Operation**, also show different degrees of development and acceptance.
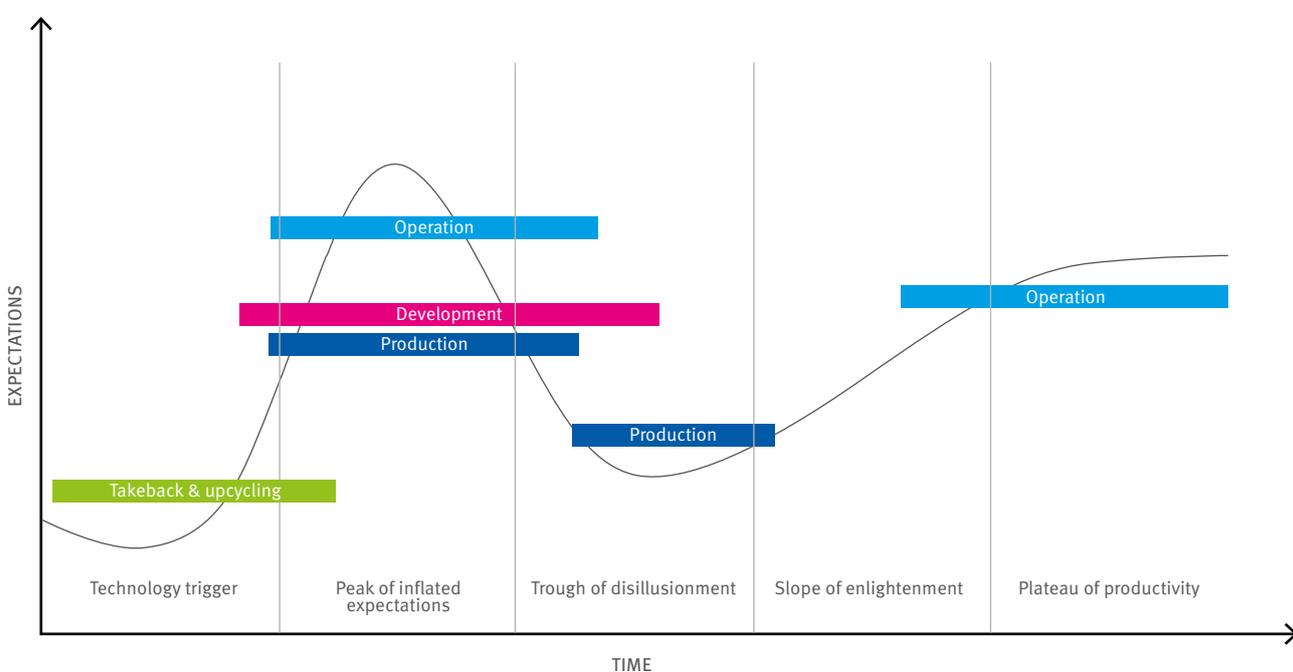

Fig. 4: The Drees & Sommer AI Hype Cycle

While some of the applications in the operational phase are already fairly firmly established on the market, there are also use cases that have currently raised initial expectations and have already reached (or will soon) reach their peak. This is due to the high availability of data during building operation, which simplifies the integration of AI. The **takeback and upcycling** phase are not yet very advanced, so it is shown close to the technology trigger. This results from the neo-ecology megatrend, which is characterized by growing public environmental awareness and sense of responsibility, and is based on the three pillars economy, ecology and ethics.[23]

To sum up, the graph shows that the majority of the phases of the real estate lifecycle are still in the first half of the AI hype cycle. The use of AI on the construction site, in particular, still faces a number of challenges, two crucial ones being a lack of employee acceptance and of specific use cases. As a result, it will be some time before construction site use reaches the plateau of productivity and gains wide acceptance in the industry. Smart Building technologies, on the other hand, have already positioned themselves on the plateau of productivity, as solutions such as AI-based optimization of energy management were successfully tested some time ago and have established themselves on the market.

The ongoing development of AI and the emergence of new AI tools will lead to increased integration of AI in the construction and real estate industry in the future. This trend will be supported by the emergence of new use cases that highlight the enormous potential of AI to further transform the sector and provide innovative solutions to future challenges.

23 Cf. Zukunftsinstitut (2023)

THE TOP 3
TAKEAWAYS

The various Innovation Scouting Report methodologies and evaluations make it clear that

1. Technologies can no longer be considered in isolation as that they merge and work in synergy. This is one of the reasons why technological progress continues to accelerate.

2. Personal judgment remains of great importance. AI is the copilot and does not replace the human.

3. When it comes to AI, all phases of the real estate lifecycle are still in relatively early stages of development. High-quality data i s still lacking.

The situation is exciting – the experts at the Drees & Sommer Innovation Center will be keeping a keen eye on how the trends and technologies develop over the course of the year.

INTERVIEW WITH ROLAND STAIGER AND MARIUS KOLLECK, AI EXPERTS AT DREES & SOMMER

Now that we have an overview of current technology trends, we would like to take an even deeper dive into AI and bridge the gap between theory and practice.

In an interview with Drees & Sommer AI experts Roland Staiger and Marius Kolleck we discuss the practical use of artificial intelligence in everyday life. You will learn what AI can already do today, how best to use the technology, and the first steps that the experts recommend.

1

HOW CAN SYNERGIES BETWEEN AI AND OTHER TECHNOLOGIES BE BEST EXPLOITED?

AI acts as a catalyst for many technologies, accelerating their development and opening up new areas of application.

Here are a few examples of how synergies are used:

AI uses the virtual image of a digital twin as the basis for applications such as process mining, predictive analytics and predictive maintenance. Artificial intelligence can also simulate construction, renovation and refurbishment measures to ensure that building work is time-, cost- and resource-efficient. We are already achieving substantial efficiency gains and cost reductions thanks to simple integrations.

2

WHAT IS THE CURRENT STATUS OF ARTIFICIAL INTELLIGENCE AND WHICH FUNCTIONS ALREADY WORK RELIABLY?

Many of us are finding out what AI is already capable of by using it in a private capacity. The major providers are vying for our favor and many companies are trying turn their chat assistant into the personal assistant in our pocket. Things that don't work now may be old hat in just a few months – because the tools and platforms are evolving at breakneck speed. GPT-4 (OpenAI), for example, has become increasingly proficient at processing videos, images and large texts – functionality that can form the basis for numerous applications. In my opinion, there is already so much potential in these models that they create immediate opportunities for every company. The real difficulty lies in deploying these solutions in a scalable form in production environments.

3

WHERE DOES THE GREATEST POTENTIAL LIE?

If you look at current studies on AI applications, you will find that the greatest potential is in completely generic and industry-independent areas such as document analysis, data analysis, language, forecasting and automation. So there is absolutely no excuse not to start exploiting this potential today.

4

HOW CAN NEW IDEAS FOR AI SOLUTIONS BE DEVELOPED?

Continuously expanding our toolbox with AI tools and API calls to language models – as well as cooperation with startups and their products – will give us a better understanding of internal company needs and allow us to provide solutions. This process of solution finding must be carefully designed. Innovation formats such as ideathons, hackathons and accelerators promote the development of ideas within the company. The information and ideas generated in this way must be managed, processed and expedited in a clearly defined process.

Our AI Lab provides the infrastructure for a secure sandbox environment with few bureaucratic hurdles that allows ideas to be tested for their applicability..

5

WHAT ARE YOUR RECOMMENDATIONS FOR THE INITIAL IMPLEMENTATION OF AI AND WHAT FACTORS NEED TO BE TAKEN INTO ACCOUNT?

Organizations must be agile and open to change, establish a digital culture and align their mindset to being active agents of the digital transformation. They have to ask themselves "Where are we on the AI Readiness Scale. And what steps do we still have to take?"

If we look at implementation, we believe that the focus should currently be on simple, verifiable solutions with a clear rationale. Always with the caveat that, as employees, we have to use our expertise to evaluate – and, if necessary, correct – the output. We are currently in an age of assistant systems – and are just at the beginning of this development. At this point in time, it is important that we take employees' concerns and skepticism seriously, and that we educate and empower them with simple solutions. The desire for more will then come naturally with an increasing sense of achievement. For me, the key to empowering employees is to ensure that the added value is clear to everyone and that the benefits outweigh any drawbacks, even if one or other of the solutions is only 60 to 80 percent efficient.

THE DREES & SOMMER INNOVATION CENTER:
INNOVATION FOR SUSTAINABLE CHANGE.

Innovation is part of Drees & Sommer's DNA. The Innovation Center has set itself the task of driving the digital transformation of the real estate industry – and as this transformation takes place, customer's needs and interests are changing faster than ever. So Drees & Sommer aims to accelerate its pace of innovation. Existing business areas are being digitized and new business models are being developed and brought to market in an efficient and targeted manner.

Drees & Sommer is a partner-managed, global consulting company providing a single source of consultation and implementation services for the real estate, industrial, energy and infrastructure sectors. The company delivers sustainable, innovative, and economically viable solutions that meet each client's unique needs. Founded in 1970 and long recognized as a pioneer in driving sustainability and digitization in the real estate industry, today Drees & Sommer employs more than 6,000 people at 63 offices. The company's interdisciplinary teams are involved in around 6,500 projects worldwide, working to create a livable future and unite concepts which can at face value appear to be opposites: tradition and future, analog and digital, efficiency and well-being. As 'intrapreneurs', the Drees & Sommer Partners are personally responsible for managing the company.

DREES & SOMMER

GLOSSARY OF
TECHNOLOGIES

3D printing: 3D printing, also known as additive manufacturing, is a manufacturing process in which three-dimensional objects are built up layer by layer. Based on digital 3D models, materials such as plastics, metals, concrete or ceramics are applied layer by layer.

5G: 5G is the fifth generation of mobile phone technology. It offers higher data transmission rates, lower latency, improved network capacity, and greater reliability.

Augmented reality (AR) und virtual reality (VR): AR adds digital information and elements to the real world, while VR creates an immersive, computer-generated environment that can be experienced by the user.

Big data analytics: Big data analytics is the process of examining, analyzing and interpreting large and complex data sets to gain valuable insights, identify patterns, predict trends, and make informed decisions.

Blockchain: Blockchain is a distributed, decentralized database that stores transactions in the form of blocks and connects them using cryptographic techniques. It enables the creation of secure, transparent and immutable records that can be used for various applications.

Cloud computing: Cloud computing refers to the provision of IT resources such as computing power, storage space, and applications over the Internet. Instead of working locally on a physical computer or server, users access cloud services remotely.

Digital twin: A digital twin is a virtual representation of a physical object, process, or system. By integrating real-time data, the digital twin can simulate and predict behavior, analyze performance, and suggest optimizations.

Internet of Things (IoT): IoT refers to a network of interconnected devices, sensors and other devices that can communicate with each other over the Internet and exchange data to perform automated actions or provide information.

Artificial intelligence (AI): AI is an interdisciplinary field of research that deals with the development of computer systems that mimic human cognitive abilities and can recognize, understand, and act on information from input data. It encompasses technologies such as machine learning, neural networks, language processing, and computer vision. Generative AI (GenAI) is a special form of AI that aims to generate new written, visual and auditory content b based on previously trained models and user prompts, and that continuously adapts to new data and experiences.

Quantum computing: Quantum computing is an advanced type of computing based on the principles of quantum mechanics. Unlike traditional computers, which work with bits (binary digits) that can be either a 0 or a 1, quantum computers use so-called qubits (quantum bits), which can be 0 or 1 or a superposition of both states simultaneously. This special property allows quantum computers to solve certain problems exponentially faster than conventional computers.

Robotics: Robotics refers to the design, development, and application of robots to replace, automate or support tasks undertaken by humans.

Sensorics: Sensorics is the technology that makes it possible to detect, measure and analyze the physical or chemical properties of objects or environments.

SOURCES

1. *Big Data and Artificial Intelligence: How they work together* 29.03.2022
   Author: Ryan Ayers
   Page: InData Lab
   Big Data and AI – A Quick Overview (indatalabs.com)

2. *Press release: Cloud-Nutzung wird rasant zunehmen,* Berlin, 16.05.2023
   Author: Andreas Streim
   Page: Bitkom e.V.
   Cloud-Nutzung wird rasant zunehmen | Presseinformation | Bitkom e.V.

3. *Digital Twin Market Size – By Application (Product Design & Develop-ment, Machine & Equipment Health Monitoring, Process Support & Service), By End Use (Manufacturing, Healthcare, Automotive, Aerospace & Defense, Energy) & Forecast,* 2024 – 2032
   Date: 03.2024
   Author / Page: Global Market Insight
   Digital Twin Market Size & Share, Growth Analysis 2032 (gminsights.com)

4. *2024 Tech Trends Report: Executive Summary,* 17th Edition
   Author: Future Today Institute
   Page: 4
   TR2024_Executive_Summary_FINAL_LINKED.pdf (futuretodayinstitute.com)

5. *Quantum Computing Market Size – Global Industry, Share, Analysis, Trends and Forecast 2023 – 2032*
   Date: 02.2024
   Author: Acumen Research & Consulting
   Quantum Computing Market Size Report Forecast 2032 (acumenresearchandconsulting.com)

6. *Quanten Computing*
   Date: 2019
   Author: Fraunhofer Institute
   Quantencomputing (fraunhofer.de)

7. *Study: Transform to Succeed*
   Author: Drees & Sommer & TH Aschaffenburg
   Date: 02/2024
   Page: 39

8. *Künstliche Intelligenz im Bauwesen: Ausblick 2023*
   Date: 08.05.2023
   Author: Johannes Heinrich
   Page: PlanRadar
   Künstliche Intelligenz im Bauwesen: Ausblick 2023 – PlanRadar

9. *Generative AI could raise global GDP by 7 %*
   Date: 05.04 2023
   Author: Goldman Sachs
   Generative AI Could Raise Global GDP by 7 % (goldmansachs.com)

10. *Microsoft CEO says we're moving to the 'co-pilot era' of AI*
    Author: MSNBC
    Date: 16.05.2023
    Page: Youtube
    Microsoft CEO says we're moving to the 'co-pilot era' of AI (youtube.com)

11. *PMRE MONITOR 2024*
    Process Management Real Estate Monitor
    Date: 2024
    Authors:
    Prof. Dr.-Ing. Regina Zeitner,
    Prof. Dr. Marion Peyinghaus,
    Ann-Kathrin Kempter
    PMRE-Monitor-2024.pdf (ccpmre.de)

12. *Generative AI in the European Startup Landscape 2024*
    Date: 2024
    Authors: Dr. Philip Hutchinson, Dr. Frauke Goll, Christoph Mügge
    Applied AI Institute for Europe
    Study_Generative_AI_in_the_European_Startup_Landscape.pdf (hubspotusercontent-eu1.net)
    Page: 11

13. *How Many AI Companies Are There?*
    Author: Fabio Duarte
    Date: 19.01.2024
    Page: Exploding Topics
    How Many AI Companies Are There? (2024) (explodingtopics.com)

14. *Investieren mit Gewinn: Künstliche Intelligenz als Co-Pilot*
    Date: 12.07.2023
    Author: Haufe Online-Redaktion
    Künstliche Intelligenz (KI): Evolution des Immobilienmarkts | Immobilien | Haufe

15. *Generative AI In Real Estate*
    Author: MarketResearch.biz
    Date: 04.2024
    Generative AI In Real Estate Market Size, Share | CAGR of 11.2 % (marketresearch.biz)

16. *Gartner Hype Cycle*
    Wie man Technologie-Hype interpretiert
    Author: Gartner
    Date: 2022
    Hype Cycle Forschungsmethodik | Gartner

17. *Megatrend Neo-Ökologie*
    Date: 10.12.2023
    Author: zukunftsInstitut
    Der Megatrend Neo-Ökologie (zukunftsinstitut.de)

18. *Generative AI to Become a $1.3 Trillion Market by 2032, Research Finds*
    Date: 01.06.2023
    Author: Bloomberg Intelligence
    Generative AI to Become a $1.3 Trillion Market by 2032, Research Finds | Press | Bloomberg LP

19. *36 Statistiken und Trends zum Thema Künstliche Intelligenz (KI)*
    Date: 11.12.2023
    Author: Pöhler Daniel & Watts Rob
    Page: Forbes Advisor DE
    KI (AI) Trends. Statistiken und Fakten, die Du kennen solltest – Forbes Advisor Deutschland