



Digitalisation of the Construction and Real Estate Industry

8TH DIGITAL REAL ESTATE SURVEY 2023



LEGAL NOTICE

8th Digital Real Estate Survey 2023

Publisher	pom+Consulting Ltd, Zurich
Authors	Dr Joachim Baldegger, Isabel Gehrer, Devin Horak, Gabriel Otth
Editing	Senarclens Leu+Partner AG, Zurich
Design	Picnic Terminal Visual Communication, Zurich
Publication	March 2023

The study was compiled with the friendly assistance of
Blum&Grob Rechtsanwälte AG.

Blum & Grob
RECHTSANWÄLTE

© 2023 pom+Consulting Ltd

All rights are reserved, including those of reprinting in extracts, photomechanical reproduction (including microcopying) and evaluation through databases or similar means.



CONTENTS

	LEGAL NOTICE	2
	FOREWORD.....	4
1	INTRODUCTION	5
2	SUMMARY OF THE MOST IMPORTANT ASPECTS.....	6
3	DIGITALISATION LEVEL	9
	Investments in innovation and digitalisation come at a cost!.....	9
	Digital Real Estate Index 2023	11
	Digitalisation level in terms of different roles	13
4	DIGITAL TECHNOLOGIES	17
	Degree of technological maturity.....	17
	Use and benefit of technologies.....	18
	Which technology fits which role?.....	20
5	DATA ANALYTICS.....	22
	High expectations of data analytics	22
	Where do construction and real estate industry companies stand?	23
	Learning from experience.....	25
	What real benefits are derived from data analytics?.....	26
	Beware of these obstacles	27
	Expert interview from a legal perspective	28
	Expert interview from a user perspective.....	30
6	THE MOST IMPORTANT CONCLUSIONS.....	33
7	ABOUT THIS STUDY	36
	Survey and methodology	36
	Digital technologies in the construction and real estate industry.....	37

FOREWORD

There is still a certain curiosity attached to successful digitalisation projects in the construction and real estate industry, or that is at least the conclusion of last year's Digital Real Estate Study. And what is the situation one year later? Are we exploiting digital potential with greater effect? The answers are to be found in this survey.

It is green for go in this area, and that in the truest sense of the expression. External pressure to achieve greater sustainability is forcing the real estate industry to take action. Quite simply, climate compatibility cannot be achieved in the case of real estate without digital support. Given this, the increase in efforts to achieve this goal should be welcomed. However, the majority of market participants remain defensive and react hesitantly to demands that are made on the building sector from outside. As a systematically relevant sector, a greater degree of ambition from the construction and real estate industry should be expected.

If we maximise our impact and actively contribute to shaping and, indeed, influencing the connected world of the future, a change is necessary to obtain an integral appreciation of buildings. In the first place, digital solutions are needed that cover the entire data chain (life cycle data management) in the life cycle of a property. Secondly, the sector must develop the expertise needed to collect, evaluate and interpret this data. Only in this manner can a better understanding of business and real estate processes for specific roles be developed and the service portfolio aligned to address requirements in a digital world.

P. Staub

Peter Staub
President of the Board, pom+Group



The prototype of a new chatbot from an AI company took only five days to reach one million users. Reports of the diverse application options of this chatbot that flooded social media platforms at the turn of the year demonstrate the opportunities and threats associated with this technology. The enormous potential, and the consideration of whether the right course is being pursued in an organisation to participate in these technologies, have caused more than one executive in the real estate industry some discomfort.

This year's core topic examines the extent to which data science in general and data analytics in particular are already anchored in the real estate sector and the experience gained in different roles thus far. The findings should help to improve estimation of the level of maturity that data as a topic has achieved in one's own organisation and to launch possible initiatives. Only those who structure and understand data relating to their own business processes can, at a later stage, also establish data-related technologies such as artificial intelligence and machine learning and their applications (e.g. a chatbot) in their own organisation.



S. Schneider

Stefan Schneider
Partner, Head of Business Unit Future Lab, pom+Consulting Ltd

1 INTRODUCTION

The digital transformation is currently changing the world, and its impact is also felt in the construction and real estate industry. But what exactly is the situation in the industry, and how can its digital maturity be evaluated? This question has preoccupied pom+ for some considerable time. Since 2016, this survey has provided answers every year concerning the level of digital transformation in the construction and real estate industry in Switzerland. The study was expanded in 2019 to include the German market. The digitalisation level has been measured since then on the basis of the Digital Real Estate Index (DRE-i).

Digitalisation Level

The Digital Real Estate Index (DRE-i) is based on the assessment of more than 180 executives and specialists in the construction and real estate industry regarding 25 indicators of digital maturity and the use of digital technologies. It represents the degree of digital maturity in the industry. A comparison with the DRE-i of previous years and changes to the indicators enable conclusions to be drawn regarding development last year.

Digital Technologies

In the case of twelve digital technologies relevant to the construction and real estate industry, investigations have been conducted for eight years to determine how their maturity level is estimated by the sector. The information collected relates to the current level of use and anticipated potential benefit associated with the technology. Relevant changes can be identified and investigated in this manner. As not every technology has the same potential for different stakeholders, the evaluation is also realised on the basis of the respective role played by those surveyed.

Data Analytics

The core topic of data analytics highlights technologies whose potential is still underexploited by the sector. The issue is not new, and certain challenges such as data quality have preoccupied companies for a long time. For this reason, the obstacles are analysed more precisely in this survey and potential approaches are outlined. In addition, various possibilities that this technology could open up are illustrated, and this means today, not in future.

This study clearly illustrates the current situation regarding digitalisation in the construction and real estate market. Only in this manner can the digital transformation and its impact on the sector be better understood and evaluated. pom+ hopes to contribute to the future-oriented development of the industry in this way.

We would like to express our appreciation to all participants in the survey, and we look forward to any feedback concerning the results. We hope you enjoy your read!

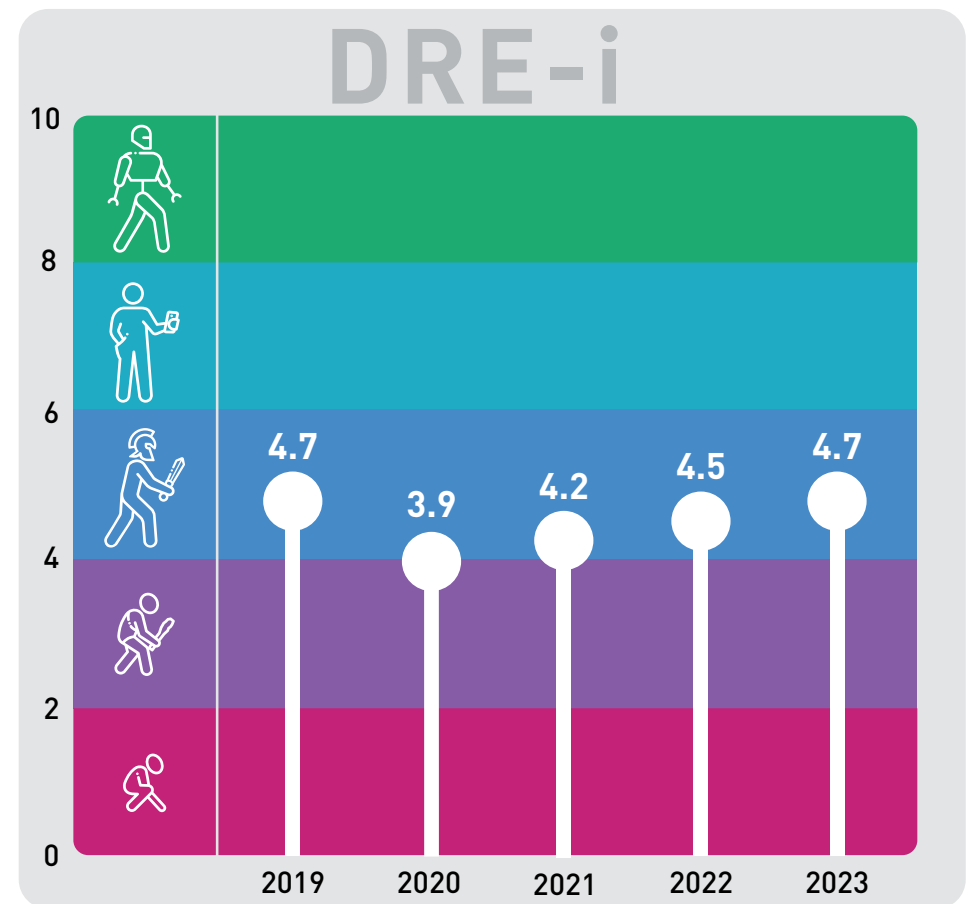
2 SUMMARY OF THE MOST IMPORTANT ASPECTS

Same thing every day – a dictum that outlines the development of the digitalisation level in the construction and real estate industry. The Digital Real Estate Index (DRE-i) represents digital maturity on a scale from 1 to 10 and, at the beginning of 2023, scores 4.7 points for Switzerland and Germany. This indicates an increase of 0.2 points on last year. The markets in Switzerland (DRE-i 4.6) and Germany (DRE-i 4.8) have aligned, with the development of digital maturity in different roles being extremely homogeneous in the sector. FM service providers still have a higher DRE-i than property owners and investors, managers, planners and developers. Evaluation according to size indicates that larger companies have a higher level of digital maturity than SMEs.

Investment in the digital transformation is required to develop the industry. Two-thirds of companies invest more than 1% of annual turnover in innovation and digitalisation. A comparison with the previous year indicates a drop in investment in large companies, while medium-sized enterprises invested a similar amount of money and small enterprises even more than in 2022. There is a conspicuous decline in investment among FM service providers. Increasing price levels are apparently placing them under pressure, so investments have had to be reduced.

An investigation of digital technologies relevant to the sector indicates that the evaluation of their maturity has been unchanged for four years. This stagnation is an impressive illustration of how much the construction and real estate industry still struggles with the introduction and exploitation of these technologies. Although all these technologies are used more frequently than four years ago, the increase is relatively moderate in most cases. Expectations with regard to the benefit of the technology have lowered practically everywhere. One exception is decentralised energy technologies that, due to the threat of energy shortages, have received a considerable boost.

Figure 1: Development of the Digital Real Estate Index (DRE-i)



The core topic of data analytics this year indicates that the industry believes this technology is highly significant and harbours enormous potential. The greatest influence in this respect is anticipated in the optimising of business processes and the cost structure. Large companies are still in the lead when it comes to using data analytics. Interestingly enough, development is not inhibited by a lack of applications or clarity regarding the benefits. What is decisive here are factors such as the absence of a strategy, no resources or an expertise deficit. However, the greatest obstacle continues to be the quality of the database.

What is exciting are the findings regarding the correctness of a positive assessment: the greater the development of data analytics in the company, the more positive the evaluation of experience with the technology. The anticipated benefits, however, cannot be realised to the fullest extent in every case. For example, the acceleration of internal processes and optimising of the provision of services is frequently not achieved to the degree hoped for during planning and development of the technology. On the other hand, the benefits achieved in areas such as the reduction of risk, the expansion of the value chain or the improvement of customer satisfaction are greater than originally anticipated.

3

DIGITALISATION LEVEL



3 DIGITALISATION LEVEL

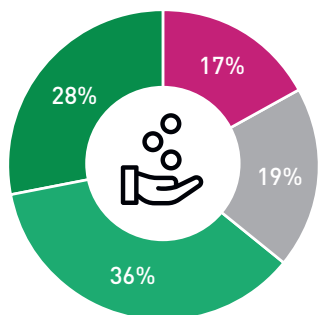
Investments in innovation and digitalisation come at a cost!

Innovation and digitalisation cost money, but not every company is able or willing to invest to the same degree. Annual investments in innovation and digitalisation are surveyed to evaluate the construction and real estate industry more effectively and identify current developments. Clear differences are apparent in this regard:

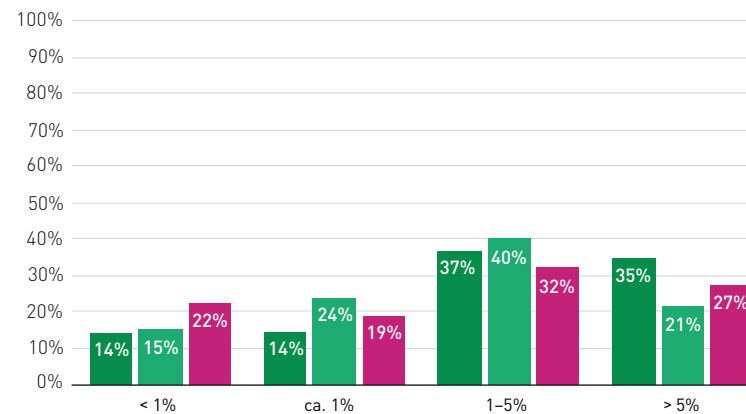
- Two-thirds of companies invest more than 1 % of annual turnover in innovation and digitalisation. More than a quarter of companies invest even more than 5 %.
- 17 % of companies surveyed dedicate less than 1 % of annual turnover to innovation and digitalisation.
- Proportionally, small enterprises invest more than medium-sized and large enterprises. While 28 % of companies with up to 49 employees dedicated 1 % or less of annual turnover to innovation and digitalisation, the proportion among medium-sized and large enterprises is considerably higher at 39 % and 41 %, respectively.

Figure 2: Investments in innovation and digitalisation as percentage of annual turnover

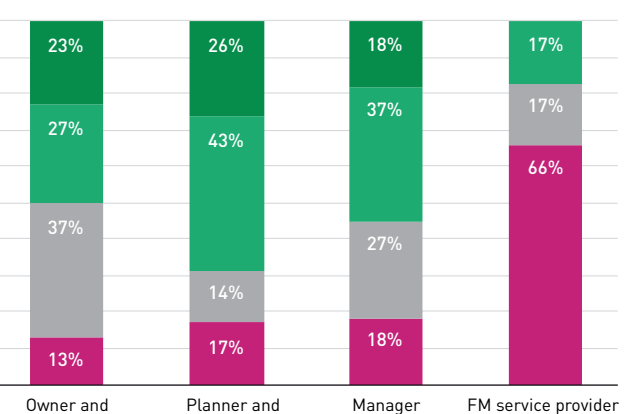
Investments across all companies



Investments according to company size



Investments according to role



■ < 1%
 ■ ca. 1%
 ■ 1-5%
 ■ > 5%
 ■ Small (up to 49 employees)
 ■ Medium (50 – 249 employees)
 ■ Large (more than 250 employees)
 ■ < 1%
 ■ ca. 1%
 ■ 1-5%
 ■ > 5%

- Investments in large companies were reduced when compared to the previous year. Whereas 37 % of large companies stated that they invested more than 5 % a year ago, the proportion this year has fallen to 27 %. Medium-sized enterprises invested at a similar level to the previous year, and small enterprises spent more money. In the case of the latter companies, the proportion of enterprises that invest more than 5 % of annual turnover rose from 25 % to 35 %.
- Planners and developers invest to a greater degree than other role players in innovation and digitalisation. This can probably be traced back to BIM, a technology that is increasingly employed, especially in planning.
- The trend discerned in the previous year, where investments from owners and investors have risen while the level among residual stakeholders has fallen, has been confirmed. A relevant difference to other roles in the industry can no longer be identified.
- A clear difference when compared to the previous year is obvious in the case of FM service providers. Investments in innovation and digitalisation have practically collapsed here. More than every fifth respondent in the previous

year said that their company invested more than 5 % of their annual turnover in innovation and digitalisation. This cannot be said to be the case for any of the FM service providers interviewed in this year's survey. Within the year, the number who invested less than 1 % of annual turnover tripled from 22 % to 66 %. Companies involved in a business where price pressure is great and margins are correspondingly narrow find themselves under even greater pressure as a consequence of the increase in prices. Price increases can only be passed on in part and depend on the service provision contracts drafted. Consequently, the room to manoeuvre with regard to investments has reduced for many FM service providers. It can only be hoped that this trend can be rapidly alleviated, as it is undoubtedly detrimental for the entire industry if FM service providers cannot invest in the optimisation of their services.

Public administration organisations are not taken into consideration in this configuration as the key turnover-based figure is less meaningful for these.

Digital Real Estate Index 2023

As a measurement variable, the Digital Real Estate Index (DRE-i) is an indication of the level of digital maturity in the industry. The situation is presented as follows on a scale of 1 (very low digitalisation) to 10 (very high digitalisation):

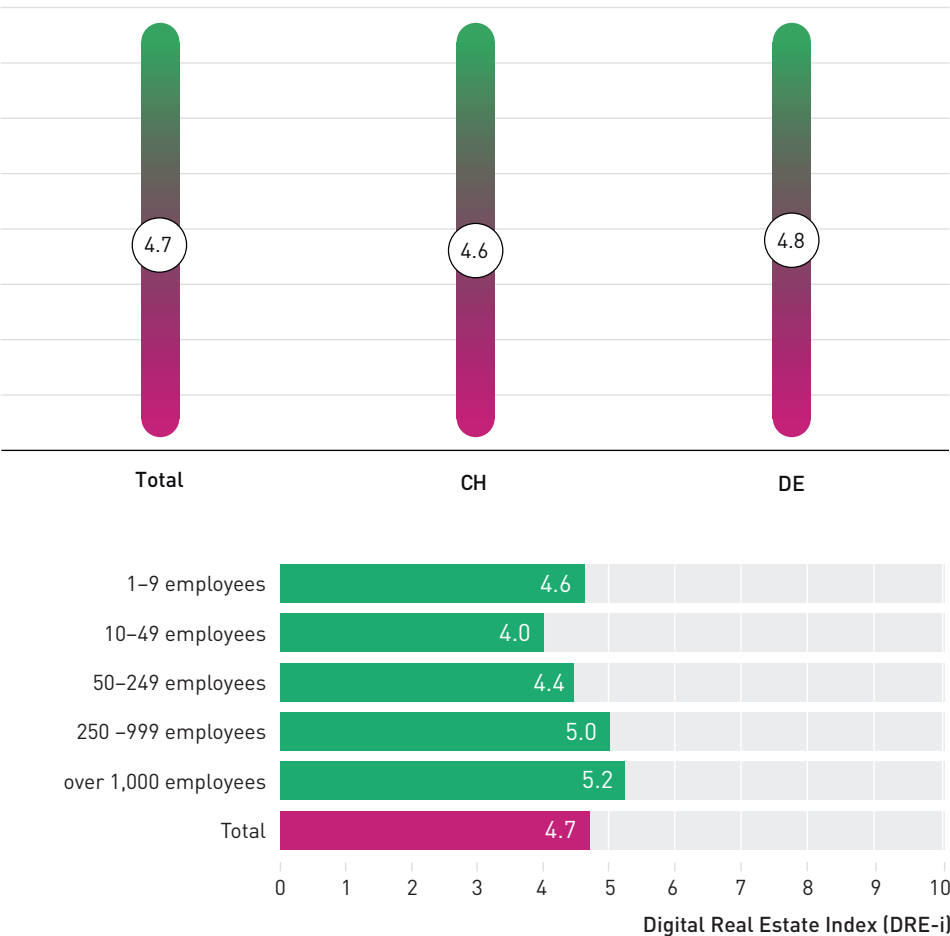
- DRE-i of all respondents: 4.7
- DRE-i Switzerland: 4.6
- DRE-i Germany: 4.8

The index value for the entire industry has increased by 0.2 points in the past year and now measures 4.7 points. It is also apparent that current efforts in the sector are increasing digital maturity. This increase is, however, relatively modest. Whereas the index value has dropped by 0.1 in Germany, the value for the Swiss market has increased by 0.2 points. Differences in the degree of maturity of both markets have therefore decreased.

Large companies have a higher level of maturity

An overall view indicates that the level of digital maturity is higher in large companies than small and medium-sized enterprises (SMEs). Small enterprises with 10 to 49 employees have an average index value of 4.0, while large companies with over 1,000 employees have an average DRE-i of 5.2. Only micro-businesses with up to 9 employees are at odds with this pattern because, with 4.6, they have a higher index value than other SMEs.

Figure 3: DRE-i 2023 of the construction and real estate industry



Broad improvements in strategic indicators

The DRE-i was calculated on the basis of 25 indicators in clusters that cover strategy, organisation & processes, customers, products & IT infrastructure, and the use of technology. Practically all indicators showed improvements last year at a strategic level, with companies working more intensively on their digitalisation strategies, supporting management with regard to the digital transformation and undertaking digitalisation projects. But clear improvements are also discernible in trend and technology scouting. Currently, digital ecosystems are an important topic: an increasing number of respondents are developing or have already established a system to expand and cultivate partner networks and develop business models based on new technologies. Both factors form an important foundation for such ecosystems.

The following interesting developments have been identified at an organisational level:

- Responsibilities with regard to the digital transformation were strengthened further last year. In comparison with the previous year, more respondents state that responsibilities in the company were clearly defined.
- On the other hand, the industry appears to have difficulties when it comes to company-wide innovation processes. While this indicator rose steeply for the first time in the last study, it is currently dropping again to the lowest level of previous years. It appears that innovation primarily occurs in the context of individual projects.
- Digital transformation requires suitable skills and expertise and appropriate know-how in the company. This is primarily developed through the recruitment of new employees. While the respective indicator has increased considerably, the indicator for the promotion of digital expertise among existing employees has diminished somewhat. Companies therefore rely more on recruitment than internal development of personnel. Against the background of a major shortage of skilled professionals, it remains to be seen whether the industry is sufficiently appealing to attract an adequate number of digital talents.

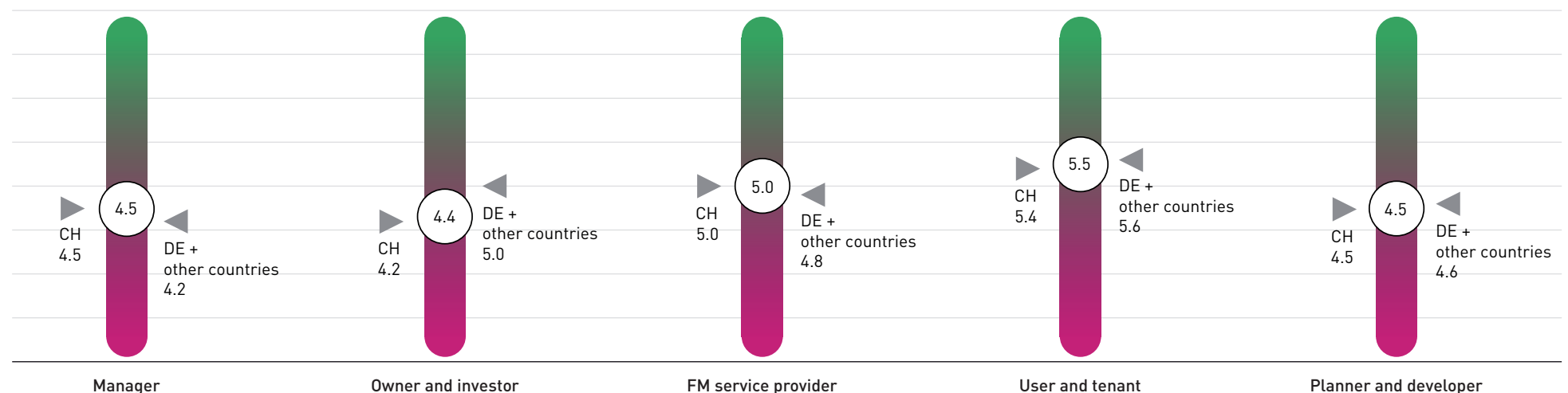
Digitalisation level in terms of different roles

The declining differences between different roles in the industry identified last year have been confirmed in this year's survey. Managers, planners and developers have an index value of 4.5. This is only slightly higher than the index value for owner and investor roles of 4.4. FM service providers, on the other hand, estimate their degree of maturity to be higher at 5.0. Users and tenants achieve the highest score with 5.5 index points.

The balanced increase in the index value indicates that the development of digital maturity last year was evenly distributed across the entire construction and real estate industry. Development occurred at the same pace, with no single role standing out as positive or negative.

A greater balance can also be determined in a comparison of the Swiss market with other markets. Although major differences occurred in the past with regard to roles, a more balanced picture can be identified this year. Considerable improvements are evident on the German market in the roles of owner / investor and user / tenant. The former saw an index value increase from 3.9 to 5.0 points, while the value for the user / tenant role increased from 4.6 to 5.6.

Figure 4: DRE-i 2023 according to company role

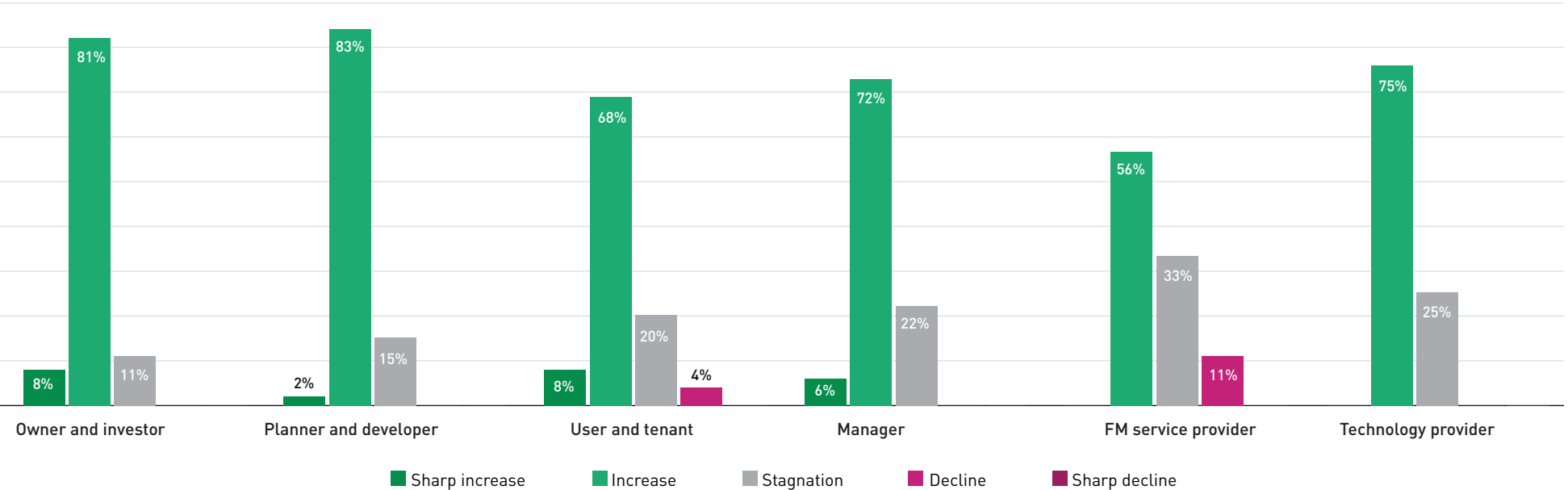


The market recognises an increase in the maturity level – FM service providers view this critically

Is the development measured with the DRE-i reflected in the subjective perception of market players? A clear majority of respondents believe that the level of digital maturity in the construction and real estate industry has grown (77%). Nevertheless, at least every fifth respondent (17%) is of the opinion that digital majority stagnated last year. Only a few respondents state that either strong growth (5%) or, conversely, a decline in digital maturity (1%) has occurred.

FM service providers are considerably more critical than other roles in their assessment of the development of digital maturity last year. Almost half of those surveyed declared that, from their point of view, the degree of maturity had stagnated or was even declining. The proportion of respondents with such a critical view is considerably lower in other roles. This viewpoint of FM service providers is not (yet) reflected in the current DRE-i. The index value of this role increased further last year and, at 5.0, is considerably higher than that of other market players.

Figure 5: Subjective evaluation of the development of the degree of digital maturity in the industry last year

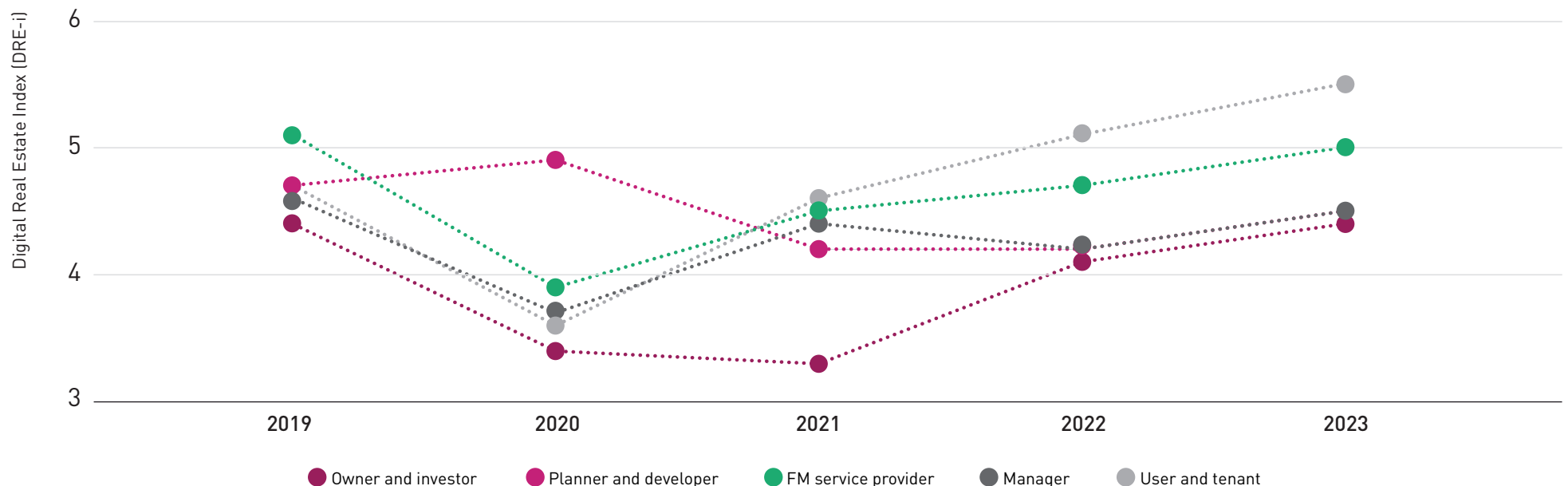


Roles are developing at the same pace

The DRE-i has been conducted annually since 2019. Following a significant reduction in 2020, the overall index has grown continually by 0.2 to 0.3 points per annum and is now once again at the level recorded in 2019. If this development is examined for each role, a few exciting points are evident:

- While the overall index and all other roles experienced a clear decline in 2020, the index value for planners and developers grew somewhat in that year. Disillusionment came only in 2021. 2022 saw the index values stagnating at the 2021 level, only increasing again this year.
- The role of owners and investors consistently limped somewhat behind the digital maturity of stakeholders. This was very evident in 2021, but this gap has now almost been closed.
- The lead of FM service providers and users / tenants manifested itself most clearly in the last two years. It will be fascinating to see whether this development continues next year. This should also be seen against the background of FM service providers being considerably more pessimistic than the other roles in their assessment of development this year.

Figure 6: Development of DRE-i during the last 5 years according to company role



4

DIGITAL TECHNOLOGIES



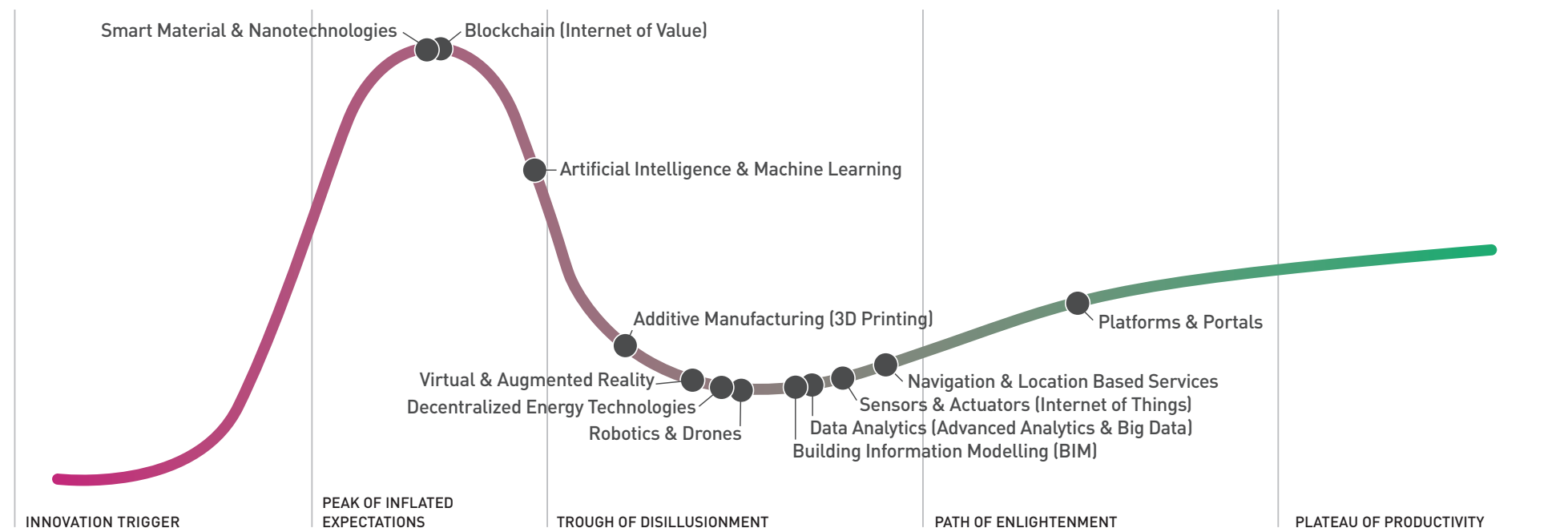
4 DIGITAL TECHNOLOGIES

Degree of technological maturity

Despite greater investments and increased digital maturity, the current Gartner hype cycle for relevant technologies in the area of construction and real estate does not indicate any (further) development last year. No noteworthy changes can be ascertained since 2020 (i.e. since the COVID-19 pandemic). The construction and real estate industry continues to experience difficulties when it comes to the productive exploitation of these technologies. Due to the increased degree of

digitalisation of owners and investors, the expectation expressed in the 2022 study that these technologies would be used increasingly across all roles, leading to an increase in the maturity of said technologies, has not (yet) been proven. The issue of smart buildings that bring together several digital technologies also failed to generate any visible boost in the level of maturity.

Figure 7: Positioning of digital technologies in the hype cycle 2023

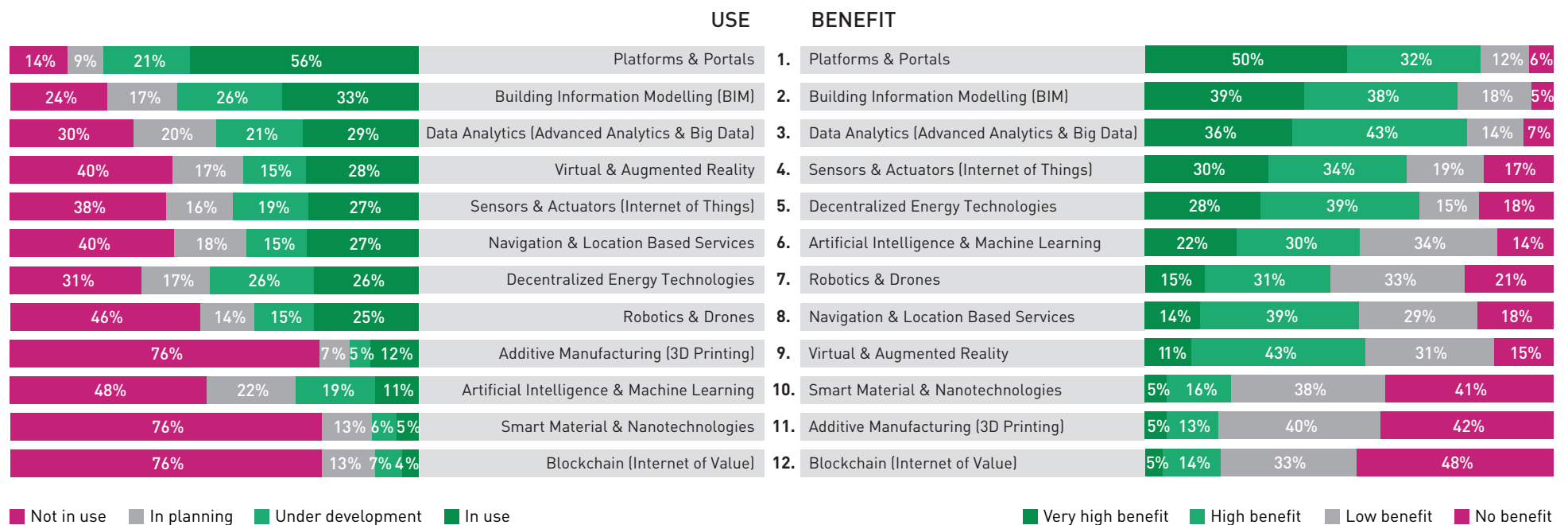


Use and benefit of technologies

A look at the frequency of use confirms the presentation in the Gartner hype cycle, namely that technologies at the peak of inflated expectations or on their way into the valley of tears are used very little. The picture of technologies in the trough of disillusionment is more nuanced as these are in part in use or under development by more than half of those surveyed.

- BIM has experienced an upswing for a second successive year. Within the year, the use or development of BIM among those surveyed increased from 56 % to 59 %. The number of respondents who do not use BIM decreased from 28 % to 24 %. BIM also increased last year in terms of the benefit evaluation, with 77 % recognising a high, or even very high, level of benefit.

Figure 8: Ranking of digital technologies with regard to the use and benefit in the construction and real estate industry



- A positive development is also apparent in the case of decentralised energy technologies. Although their use in the companies only increased from 51 % to 52 %, expectations of high to very high levels of benefit from their use increased 9 % from 58 % to 67 %. This development can in all probability be traced back to the threatened energy shortage, targets for decarbonisation and the energy transition.
- The development in data analytics technology indicates a trend in the opposite direction. While this technology was used or under development by 56 % of respondents in the previous year, the value dropped to 50 % within the year. However, the anticipated benefit remains unchanged and high at 79 %.

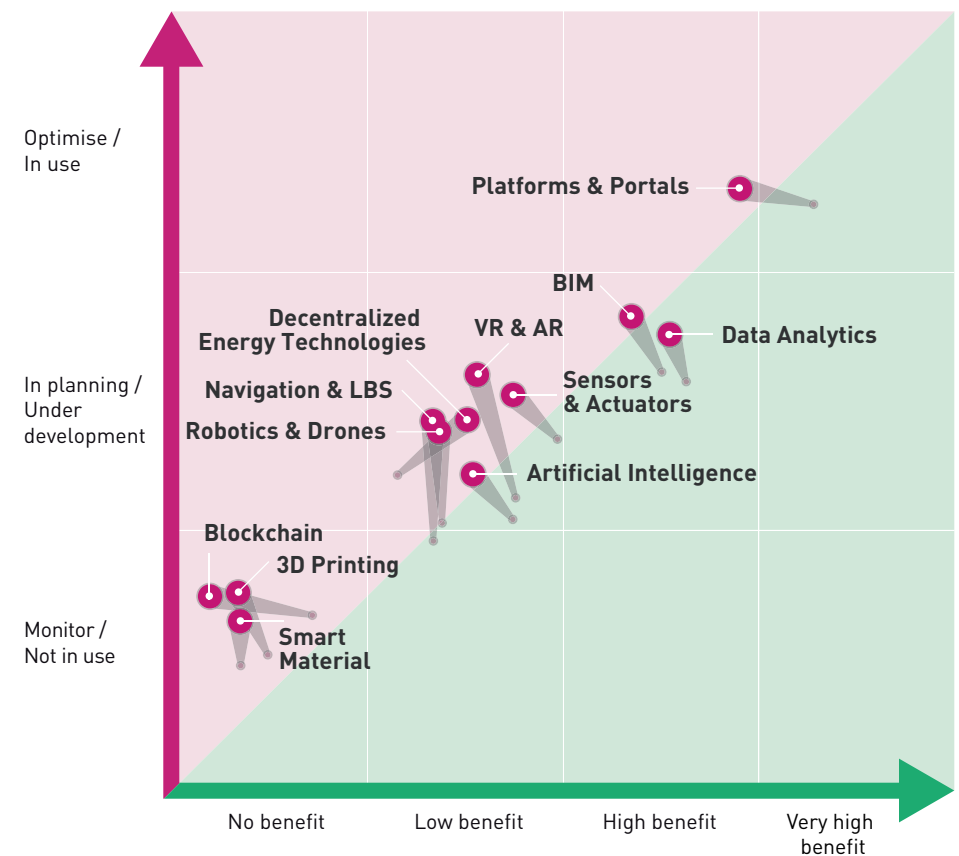
A comparison of utilisation and benefit indicates a strong correlation between these two aspects. Usage is widespread where a high degree of benefit is anticipated. If this year's utilisation/benefit matrix is compared to the results of the 2020 survey, a variety of changes can be discerned.

- The benefit of many technologies used in the construction and real estate industry is viewed more critically than three years ago. Blockchains and platform & portal technologies in particular indicate a major deficit in terms of benefits. However, the level in the case of the latter is extremely high. Simultaneously, the frequency of use of platforms & portals has increased slightly.
- The winners in terms of an increased benefit expectation and, simultaneously, growing use are decentralised energy technologies, which are increasingly employed in practice.
- While benefit expectations have remained the same for robotics & drones, navigation & location based services and smart materials technologies, noticeable growth has been registered in their level of use.

The trend towards increased use is gratifying and will boost the degree of maturity of the technologies. What is important in this regard is that the actual benefit

correlates better with expectations. It remains to be seen whether further technological developments will result in an increase in benefits.

Figure 9: Comparison of use and benefit (2023 vs. 2020)



Which technology fits which role?

Different technologies are used in different ways by different role players. Only platform & portal technologies are strongly represented across all roles. Data analytics is also used more widely in almost every role. Additive manufacturing, smart material & nanotechnologies, and blockchains, on the other hand, are rarely employed across all roles. The only exception are blockchains in the case of technology providers who use this technology comparatively heavily.

Figure 10: Technologies in use or under development in different roles

	Manager	Owner and investor	FM service provider	Planner and developer	Technology provider
Platforms & Portals	81%	79%	83%	77%	80%
Building Information Modelling (BIM)	14%	58%	42%	91%	40%
Data Analytics (Advanced Analytics & Big Data)	43%	60%	75%	26%	80%
Decentralized Energy Technologies	33%	63%	50%	30%	20%
Sensors & Actuators (Internet of Things)	14%	42%	83%	37%	40%
Robotics & Drones	33%	34%	50%	47%	60%
Virtual & Augmented Reality	29%	40%	33%	56%	60%
Navigation & Location Based Services	38%	39%	50%	33%	40%
Artificial Intelligence & Machine Learning	19%	24%	58%	19%	80%
Additive Manufacturing (3D Printing)		10%	25%	23%	
Smart Material & Nanotechnologies		15%	17%	7%	20%
Blockchain (Internet of Value)	10%	8%	8%	5%	60%

Benefit expectations with regard to technologies also differ. All roles have high expectations with regard to platforms & portals and data analytics. In the case of BIM, high to very high benefits are anticipated by planners and developers and, indeed, owners and investors. These benefit expectations are lower among remaining roles, with the exception of managers. BIM is less relevant for this role, as indicated by the frequency of use.

Figure 11: Technologies used extensively or very extensively for different roles

	Manager	Owner and investor	FM service provider	Planner and developer	Technology provider
Platforms & Portals	82%	80%	89%	79%	75%
Data Analytics (Advanced Analytics & Big Data)	71%	75%	89%	76%	100%
Building Information Modelling (BIM)	35%	75%	67%	95%	50%
Sensors & Actuators (Internet of Things)	24%	65%	100%	45%	75%
Artificial Intelligence & Machine Learning	29%	35%	78%	58%	75%
Decentralized Energy Technologies	35%	78%	56%	37%	50%
Virtual & Augmented Reality	41%	41%	22%	74%	50%
Navigation & Location Based Services	41%	51%	56%	34%	75%
Robotics & Drones	35%	31%	78%	53%	50%
Blockchain (Internet of Value)	12%	6%	11%	21%	50%
Smart Material & Nanotechnologies		25%	44%	8%	25%
Additive Manufacturing (3D Printing)		10%	11%	26%	25%

A modern office interior with glass walls and wooden floors. A large purple triangle is on the left side, containing the number 5. The text 'DATA ANALYTICS' is at the bottom left. The office has a long, open space with glass partitions on the left and a dark grey wall on the right. The floor is made of light-colored wooden planks. The ceiling has recessed lighting. A potted plant is visible in the foreground on the left.

5

DATA ANALYTICS

5 DATA ANALYTICS

High expectations of data analytics

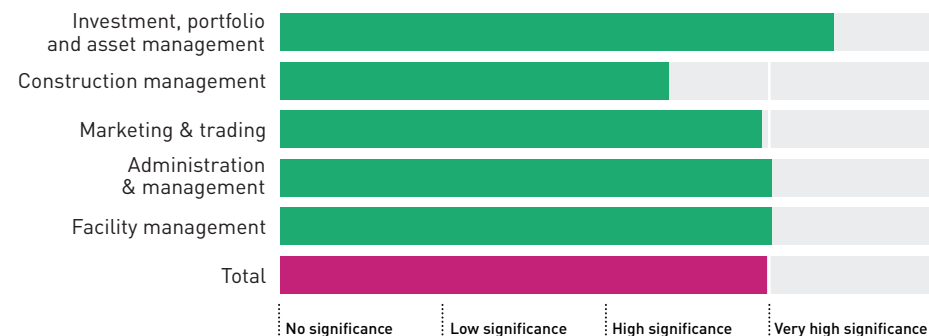
The significance of data analytics for the construction and real estate industry can be rated as high to very high as the enormous potential of this technology has clearly been recognised. In investment and portfolio and asset management powered by data and statistics in particular, data analytics is and will in future be an important cornerstone on the road to informed decision making. But data analytics can also contribute added value in other areas. Increasing standardisation and automation of business processes means that greater volumes of data need to be collected and evaluated. This data provides an important basis for the better understanding of business processes and service portfolios.

Having created a database, new insights can be gained and both internal and external processes and services optimised using data analytics. Accordingly, over

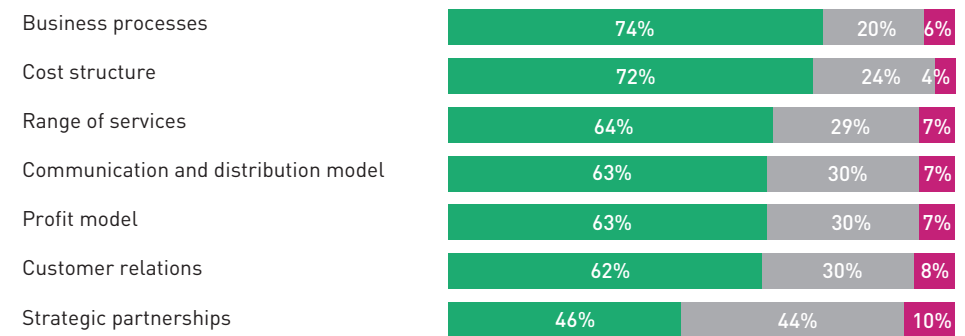
two-thirds of those surveyed believe the impact on business processes and the cost structure will be substantial. On the one hand, costs can be optimised due to knowledge and insights gained through data analytics. On the other, a better understanding of one's own business processes and service portfolios can already be gained during the development of a database and data structure. Many of those surveyed are also of the opinion that the communication and distribution model and customer relations can be improved with data analytics. Only with regard to the influence of strategic partnerships do respondents not agree with each other: 46 % anticipate exercising extensive or very extensive influence, while 44 % are of the opinion that the influence exerted will be limited.

Figure 12: Significance of data analytics for process groups and influence on corporate elements

Current significance



Influence on elements in the company



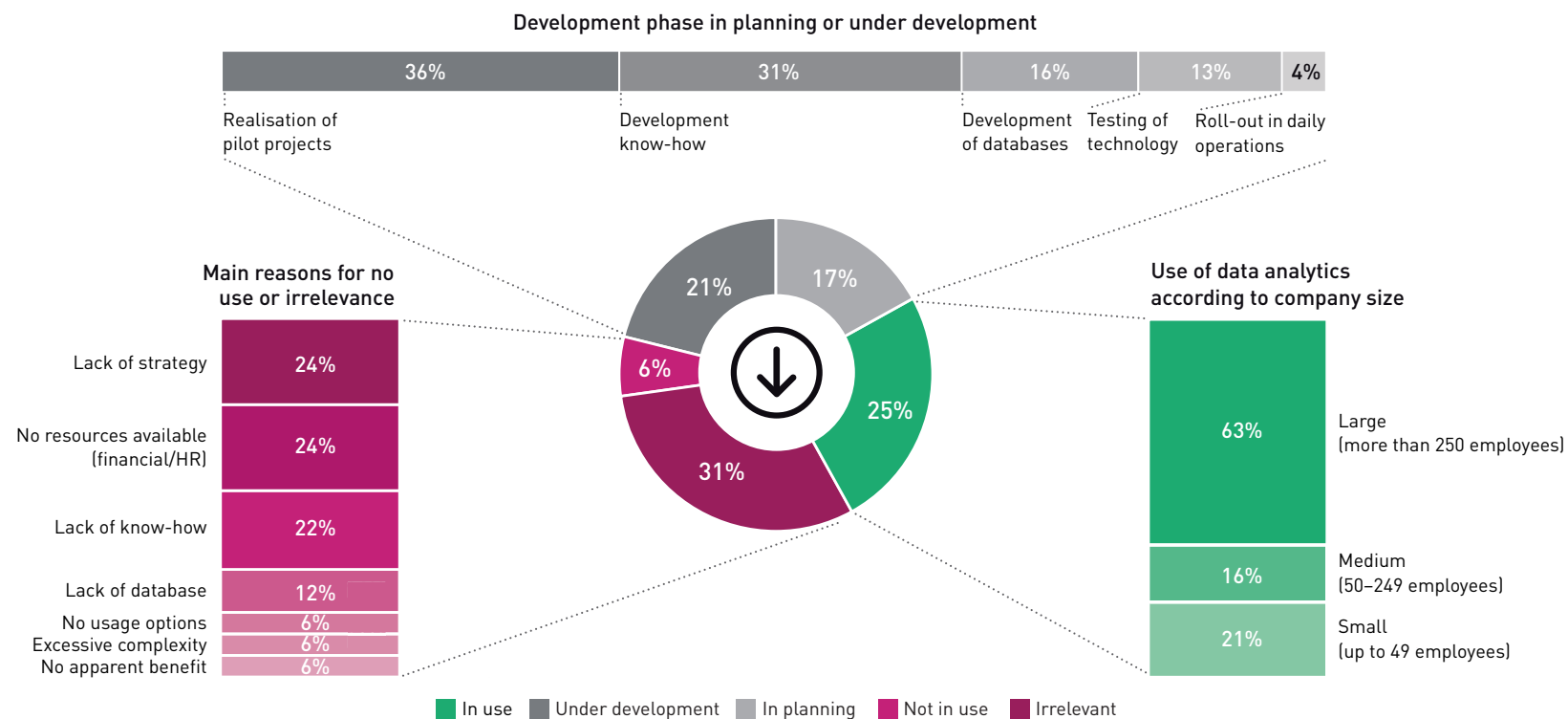
■ Large and very large influence ■ Small influence ■ No influence

Where do construction and real estate industry companies stand?

A majority of those surveyed are planning, developing or already using data analytics. Data analytics has no relevance whatsoever for 6 % of respondents. Although almost one-third (31 %) of those surveyed do not use the technology,

expectations in the construction and real estate industry are high. But one thing is certain: the fact that data analytics is not used more frequently is primarily due to the prerequisites involved, given the lack of strategies, resources and know-how.

Figure 13: Where construction and real estate industry companies stand



Know-how development and pilot projects

In the case of companies that plan to use data analytics or are already in the midst of developing its use, two main groups can be identified. One-third are currently building their expertise and knowledge, while a further third are undertaking pilot projects. Only 4 % are already rolling the technology out in their daily business and will soon be among those companies using data analytics. A small proportion of companies are either building a database (16 %) or testing appropriate technologies (13%).

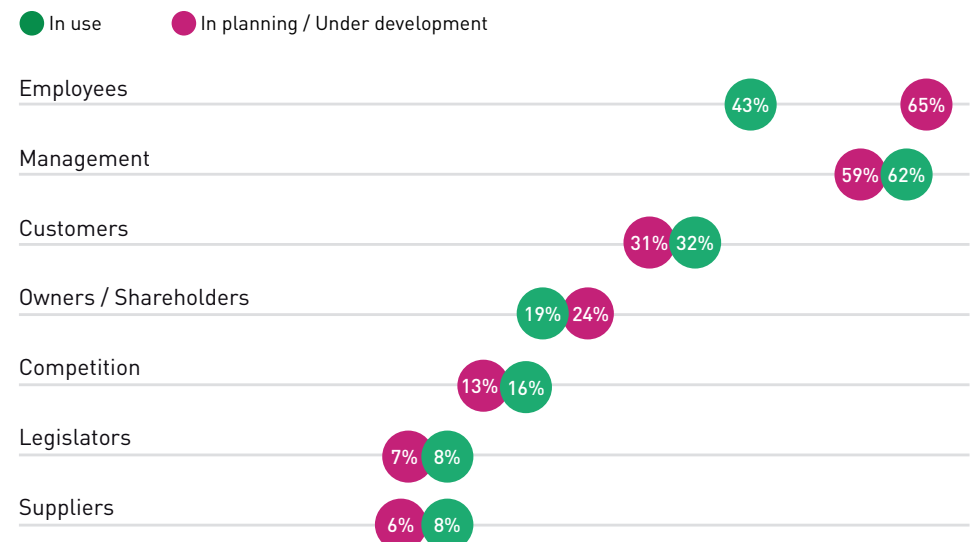
Large enterprises lead the field when it comes to usage

With a share of 63 %, large companies (with 250 or more employees) account for the clear majority of enterprises already using data analytics. This is also confirmed through their high degree of digitalisation. Large enterprises frequently have a strategy, can provide more resources due to their size and, as first or early movers, influence the market.

Employees and management as the driving force

The most important sources of inspiration for the development and use of data analytics are employees and management. Management was clearly the driving force in companies that already use data analytics, while the incentive came from employees (65%) and management (59%) in companies that are still in the planning and development phase. The high proportion of employees acting as a driving force can be explained by the fact that other sectors are considerably more advanced than the construction and real estate industry, and employees know which potential is available.

Figure 14: Who provides impulses for the use of data analytics

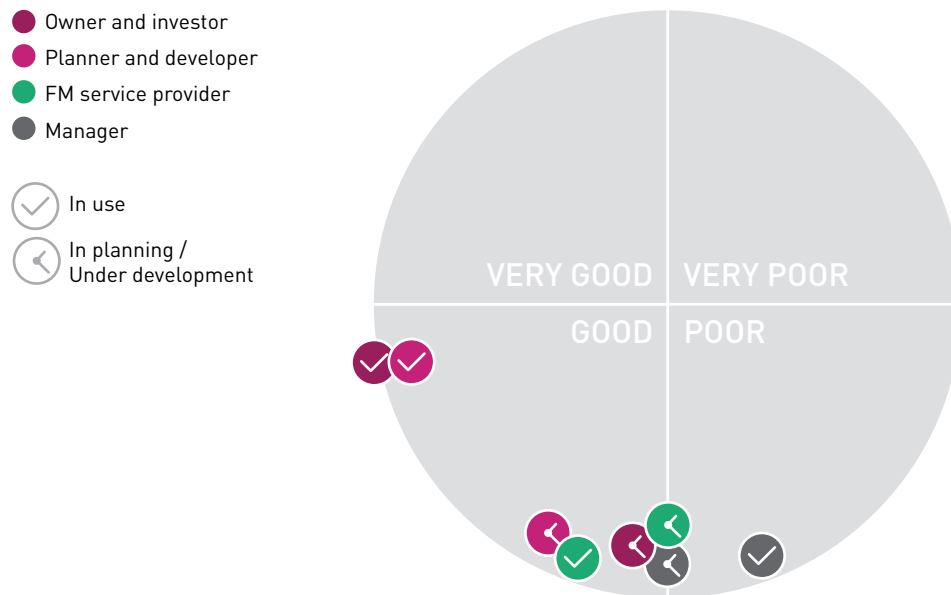


Learning from experience

High expectations of data analytics are met

Respondents with data analytics in the planning or development phase or in use were asked to assess their experience to date on a scale of 0 to 100. As expected, the assessment of those who are planning or developing the use of data analytics is relatively neutral, ranging from poor to good as they have not yet had the opportunity to gain much experience. What is gratifying is that the experience of those who use data analytics ranges from better to markedly better. The exception is managers who use data analytics, as they tend to evaluate their experience as poor.

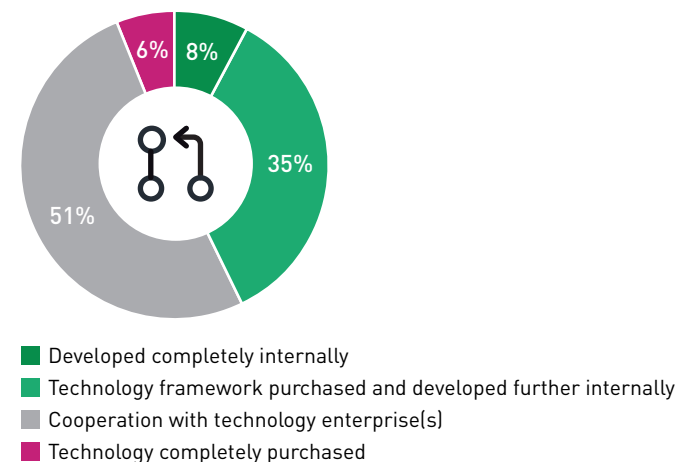
Figure 15: Previous experience of different roles with data analytics



Make or buy – collaborations are the main approach

The development and introduction of a new technology sees companies faced with a strategic make-or-buy decision. Completely internal development is impossible for many companies due to an absence of expertise. On the other hand, no major dependencies on technology providers should be created, meaning a complete purchase is also ruled out. Consequently, many companies try to find a mixture. Of the respondents using data analytics, 35% decided to purchase a framework and develop this further internally. 51% entered into cooperation with a technology company. Only 8% decided to develop the technology themselves, and only 6% indicated that they had purchased it completely.

Figure 16: Level of self-development of companies using data analytics



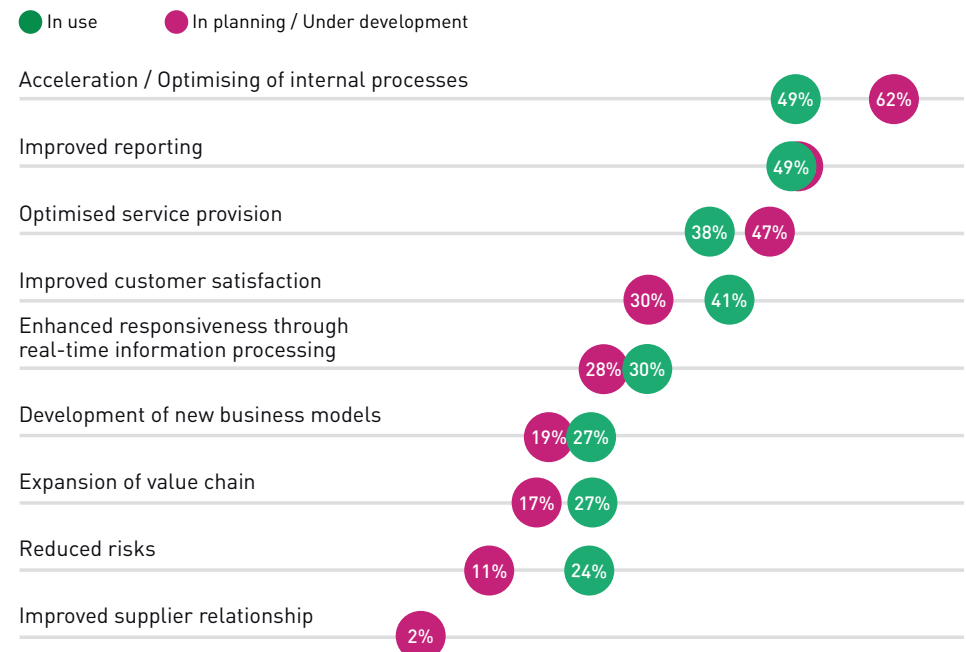
What real benefits are derived from data analytics?

The following picture emerges from a comparison of anticipated and actual benefit aspects:

- 62 % expect internal processes to be accelerated and optimised. This was only actually achieved by 49 %.
- 47 % hope for improved service provision. Only 38 % indicate that this could actually be achieved.
- The benefits achieved exceed expectations considerably in the case of criteria such as improved customer satisfaction, development of new business models, expansion of the value chain and the reduction of risks.
- Expectations and actual benefits are evenly balanced in the case of criteria such as improved reporting and the enhancement of responsiveness through real-time information processing. Expectations were therefore met.

Expectations of data analytics with regard to process optimisation and improved service provision are frequently too high at the time of introduction. Conversely, added value relating to customer satisfaction, the business model and risk reduction is usually underestimated. The actual benefit of data analytics is therefore not manifested in individual business divisions and processes but reflected in advantages that are experienced across the entire company. Data analytics helps companies to develop further and obtain a greater understanding of their own processes and influencing factors.

Figure 17: Anticipated vs. actual benefit achieved

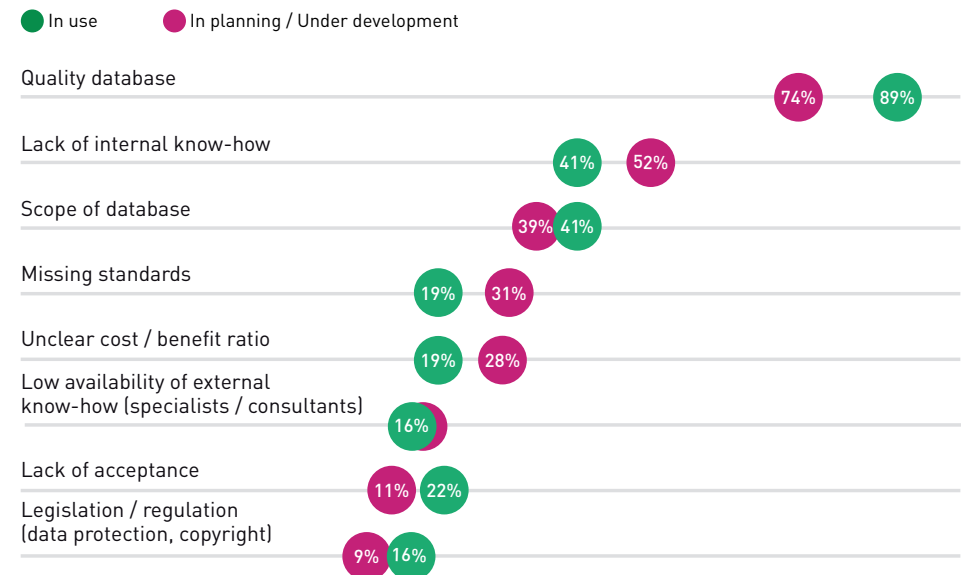


Beware of these obstacles

Those surveyed all agree that the quality of the database represents a major impediment: 74% indicate this in regard to data analytics in the planning and development phase, and 89% in regard to data analytics in use. The absence of know-how is cited by 52% of respondents with data analytics in the planning and development phase as a further major obstacle. Expertise must first be developed in this phase. But the absence of expertise is also regarded as an impediment by companies who are already using the technology (41%). The shortage of skilled personnel is likely to make itself felt here. In addition, an absence of standards is also a hindrance and can decisively affect the scope and quality of the database.

Acceptance among employees is important, so change management must be planned at an early enough stage. Employees should be introduced to the new technology and the changes resulting from its use. Moreover, it is important not to underestimate legislation and regulations, such as the new Federal Act on Data Protection (FADP) that will enter into force on 1 September 2023 and lead to changes in the use of data analytics.

Figure 18: Obstacles in planning / development and in the use of data analytics





Expert interview from a legal perspective: the legal framework should be considered from the outset in the case of life cycle data management

David Schwaninger, partner at Blum&Grob Rechtsanwälte AG

An increasing number of businesses are digitising their processes and want to use the data created during this. Which legal aspects should be given particular attention in this respect?

Data is not an article, meaning it cannot be owned. The Federal Act on Data Protection does not regulate the right to data but rather the processing of personal data, such as storing, archiving and copying. Furthermore, it is important to differentiate between data from natural and legal persons.

The new Federal Act on Data Protection will enter into force on 1 September 2023. What impact will the law have with regard to data analytics in the construction and real estate industry?

There are a few changes in the new Federal Act on Data Protection. I'd be happy to summarise the most important of these.

- In terms of what is new, it only affects data from natural persons.
- One new aspect is an obligation to inform. It is imperative that those persons affected be informed by the company if it is processing their data. Companies are liable to prosecution if this obligation to inform is wilfully ignored. What is new is that, instead of the companies being penalised, the people responsible can be fined up to CHF 250,000.00.
- If a security incident occurs, there is now an obligation to report it. This may involve a cyber attack or, on a

whole different level, leaving files on public transport. An incident of this nature must be reported immediately to the Federal Data Protection and Information Commissioner and the data subjects.

- A company employing more than 250 personnel must now establish a data processing register. Which personal data is processed and for what purpose is described in this register. However, it is advisable for smaller companies to keep a register of this kind to obtain a structured overview of existing data.
- If the company engages an external person / organisation that has access to the company's systems, it is now necessary to conclude an agreement with this person or organisation. On the one hand, there is a monitoring obligation with regard to data security while, on the other, it is recommended that an obligation to report be included in these agreements. Examples of organisations of this kind are cloud storage providers or external IT supporters.

What need for action do you perceive exists for companies in the industry?

Companies in the construction and real estate industry have already done quite a bit. In particular, they have made great progress with regard to data security and the procedure in the event of security incidents. In addition, some have already concluded detailed agreements with third-party providers. But there is still a lot to do because the new Federal Act on Data Protection will enter into force

on 1 September 2023 without a transition period or period of grace.

Have you noted any differences in the way SMEs and large enterprises deal with regulatory requirements?

Yes, there are differences. Large companies are often active on an international level and, due to European data protection law, need to establish certain structures for handling their data and the data of customers. SMEs have fallen somewhat behind in this respect and need to do some catching up. Despite this, I recommend that large companies check whether guidelines and regulations are also implemented internally.

Are there any more developments in the legal area relevant to the use of data analytics that focus on the construction and real estate industry?

Yes, a variety of things. There is a change in insolvency law with regard to cloud providers. In the event of the insolvency of such a provider, you now have a right to your own data. Up until now, this data was lost and you had to trust in the good will of the provider. There are also a number of copyright changes. These must be taken into consideration when processing structural data as a joint copyright exists to, for example, a BIM model.

The EU Digital Services Act (DSA), which is currently being prepared, will lead to changes in future. This will affect data that goes beyond personal data. Sooner or later, Swiss legislation will probably draw closer to the DSA.

Interview with David Schwaninger, partner at Blum&Grob Rechtsanwälte AG (continuation)

The use of BIM means that digital planning occurs on a common building model. How is data ownership and data usage regulated in models of this kind? What needs to be observed in this respect?

Copyright or joint copyright plays an important role where this methodology is employed as it falls into the realm of intellectual property. In the absence of contractual regulations, only joint modifications of the model can be realised. Owners are therefore recommended to regulate contractually for this before realisation. Only then can changes be made to the model following completion of the building project without the consent of other parties involved in the project. As data required for the later utilisation phase is in any case ordered during planning of a building project, legal framework conditions for a smooth transfer can be defined simultaneously after the project is concluded. However, experience shows that little attention is paid to legal components. Changes of this kind made retrospectively can be very expensive.

An increasing number of real estate owners are interested in operational data for their buildings, such as consumption data. How is the subject of data ownership regulated here. How do you recommend owners and their service providers behave with regard to these data deliveries?

Fundamentally speaking, the sharing of information from BIM databases is not a problem, except where specific know-how is involved. However, if the entire model is passed on to service providers or a third party, this needs to be regulated contractually in advance. Frequently, it is

not the legal aspects that prove to be an impediment in this case but the technical.

If data from tenants is stored in the form of files or in the system, a data protection declaration must be part of the lease agreement or appended to it. This is often neglected in the case of smaller enterprises and this can lead to legal problems.

Connection also occurs increasingly at building level or, to use the correct term, the smart building. From a legal point of view, which risks should be kept in mind?

Up until now, owners and operators have been relatively free, provided data was anonymised. However, data protection regulations come into play if, for example, consumption data is assignable and enables conclusions to be drawn as to the identity of the data subject. In this case, it must be ensured that the data is deleted as soon as the company no longer needs it. This is why I recommend compiling a list on the basis of storage limitations and statutory limitation periods that indicates when particular data can be erased.

Increasing volumes of data are stored and used on the platforms of third-party providers or in the cloud. Are there any special points that should be taken into consideration when selecting and working with the platform provider?

It is important to safeguard yourself. Third-party providers must ensure data security and may not use data for their own purposes. A variety of certificates exist that enable third-party providers to produce this evidence. In addition,

any confidentiality obligations in contracts with customers must be observed. If these exist, data usually cannot be passed on to third parties, or only under the strictest conditions. A legal right to recover possession exists in relation to the data in the event of the insolvency of the third-party provider. This is either stipulated contractually, or the right to assert claims to separate satisfaction that are legally regulated in insolvency law apply.

This interview on data analytics from a legal perspective was conducted at the beginning of February 2023.



Expert interview from a user perspective: so-called data literacy, or data competence, is the most important aspect

Christian Heuer, Head of Service Unit Data Analytics at pom+Consulting Ltd

How do you estimate the current implementation level of data analytics in the construction and real estate industry?

My estimation is confirmed in the findings of the study: data analytics, relative to the Gartner hype cycle, is stuck fast in a trough of disillusionment. Its use is currently restricted in many cases to dashboards, just to render something visible. Things have not advanced any further in the majority of cases. Data maturity is relatively low in our industry.

What do you believe to be the reasons for this low level of maturity?

The industry operates in an extremely heterogeneous environment with numerous different participants. Data should be integrated right across organisations to elevate digitalisation to a new level. Know-how and the handling of data has penetrated business much deeper in other sectors, such as the insurance industry. Business specialists collect and analyse data of relevance to them here, not IT specialists. Many in our industry are working with more of a hands-on approach, are faced with completely different issues and are not your typical monitor workers. Which is why there is a completely different relationship to digital.

What should the construction and real estate industry do?

It is important to differentiate here. Large companies are usually considerably more advanced in the area of

digitalisation than small enterprises. But many real estate organisations are relatively small. The task facing us consultants and technology providers is to introduce these companies to digital technologies. We need to show them how clearly defined improvements can be achieved with available solutions. This will enable the achievement of clearly visible added value through comparatively modest means and create an appetite for more.

So it is relatively simple, or is that somewhat deceptive?

The devil is, as in so many cases, in the detail. The biggest challenge for the industry is a low level of data maturity in conjunction with inadequate data literacy, meaning the awareness that data is an asset. Simultaneously, the demands on data architectures in the extremely heterogeneous environment of the real estate and construction industry are very complex. Clear and transparent communication in conjunction with structured data governance helps to create a better understanding of data here.

What other approaches do you believe are necessary to anchor data analytics more firmly in the industry?

I believe that enormous potential exists if data is merged more strongly. An example of this approach is to be found in Common Data Environments (CDEs). Complete end-to-end data integration generates new options for the use of data analytics and helps to promote acceptance.

Added value should also be demonstrated if, for example, the existing database is enriched with open data. Freely available, open data can be used in this manner to cover a broader spectrum of application cases.

But this also means that these applications must exist.

They already exist in large numbers. I regard the availability of the data required for an application to be more of an obstacle. This leads to many failures. There is frequently a lack of data plausibility and consistency across all properties.

Aside from the quality and volume of data, are there further technical aspects that are relevant for the use of data analytics?

Standardisation is a very important issue, particularly where there are numerous stakeholders with whom data must be exchanged. To achieve correct integration, it is very important to know which data is actually available and how it can be read. Data integration can only be achieved with enormous effort in the absence of appropriate metadata and agreed data catalogues.

The heterogeneity of the industry is, once again, also a challenge here. Different niche standards are used for particular application areas and in the associated specialist systems. The difficulty is to transfer this data from these focused systems into a universal perspective. The industry is still in its infancy in this regard, but has launched initiatives such as the International Building Performance & Data Initiative (IBPDI).

Interview with Christian Heuer, Head of Service Unit Data Analytics at pom+Consulting Ltd (continuation)

Which organisational aspects need to be considered for the development or expansion of data analytics?

Organisational aspects should be regulated in the context of so-called data governance that, in turn, must be part of the data strategy of a company. Data governance is the key to everything that happens to data in an enterprise. In addition to cultivating awareness in a company, it also spreads it throughout the organisation, enabling people to work correctly with data.

Data and data analytics are still widely considered to be IT issues in the construction and real estate industry and, on an organisational level, are usually also anchored to IT. Data is, however, a fundamental issue in the core business. Data governance is important if the shift away from IT and closer to business is to be achieved.

The issues of data and data analytics affect numerous organisational, technical and legal aspects and demand a corresponding effort in being addressed. How can smaller companies with limited resources tackle these issues?

The promotion of so-called data literacy, or data competence, is the most important thing. Employees should develop a feel for data and how to handle it. The awareness that data is an important asset must be strengthened. After all, completely new ideas and impulses can be born of data. Only companies that work actively with their data can exploit the corresponding potential.

In addition, small companies also need a type of data strategy for the successful development of data analytics. Regardless of the form in which this is created, what is important is that the requirements of one's own business are formulated and the manner in which a data landscape is designed and what exactly is to be implemented are derived from these.

Finally, can you forecast developments and trends that stand out for the future?

Many issues that may be relevant in the future are, in fact, not really new. Pertinent ideas and, in part, technical solutions are already available. But up until now, broad implementation has frequently been impossible due to technical limitations. This is why, in conjunction with a degree of data maturity, the topic of artificial intelligence (AI) will, naturally enough, be of interest. The better and more widespread AI applications become, the more important so-called AI explainability will be, meaning the possibility that statements and decisions made by AI can be understood. In addition, prescriptive aspects of AI are also attracting greater attention. The aim here is not just to be able to explain the results of AI, but that AI should also say why somebody should do something. An example would be where AI not only tells me that a system is broken but also why.

Natural language processing (NLP) also harbours enormous potential. Lots of data is still contained in

documents or PDF files in our industry, meaning it can only be accessed with difficulty or not at all. Exploitation of this data trove will continue to occupy us in the coming years.

Moreover, all the Web3 technologies such as the metaverse for the construction and real estate industry are sure to still be of interest, although the potential for the sector will need to be weighed up.

This interview on data analytics from a user perspective was conducted at the end of January 2023.

6

THE MOST IMPORTANT CONCLUSIONS



6 THE MOST IMPORTANT CONCLUSIONS

Only restrained progress, despite investment

An increasing number of companies are using digital technologies and developing these further. But even though the industry is investing in innovation, digital transformation on the construction and real estate market continues to progress only sluggishly. This leads to disillusionment on the market, and the benefits are, in part, even being questioned. Despite this, it would be wrong to reduce efforts in this area. The digital transformation is transforming the economy and society to the same degree, and cornerstones are being laid today to ensure that companies can also continue to thrive in the transformed world of tomorrow. The fact that initial expectations could not all be fulfilled should not discourage anyone as it is not just technical options that enhance the degree of maturity. Experience, competence and know-how also decisively influence successful transformation in the sector.

Inflation and the interest rate turnaround influence the digital transformation

The interest rate turnaround and increasing inflation are strongly impacting the construction and real estate industry. Rising costs, supply chain problems and market prices that have come under pressure are only a few examples of this. There is a danger that these developments could slow down the digital transformation in at least parts of the sector. For example, companies that cannot pass rising costs completely on to customers feel this directly. Investments come under pressure as a result. A consequence of this is that companies can only develop their service portfolio to a limited degree. Conversely, increasing complexity and stricter

regulation may appear to be snowballing. Owners and investors increasingly react to this through investments in digital solutions in an effort to cope with changes. Intelligent automated solutions can counter difficult situations and, for example, identify peaks in electric power consumption, use available resources cleverly or design process chains to be more effective and more efficient in the use of resources. In addition, these challenges create pressure to find new business models. Higher prices lead to a reduction in building activity, with project developers and, indeed, planners and developers being increasingly forced to question and adapt the existing business model appropriately through the use of digital technologies.

Business ecosystems continue to increase in importance

The significance of business ecosystems continues to grow in the sector. Successful digitalisation is less of an individual achievement and more of a collective effort. An increasing number of companies address the expansion and cultivation of partner networks and the development of business models in a targeted manner. These activities form an important basis for ecosystems of this nature. Studies indicate that ecosystems typically originate from the development of platforms for the exchange of data and increased collaboration, subsequently developing further through additional services to become actual ecosystems. With the involvement of numerous different roles and a broad range of services relating to a physical property, the real estate industry is a very suitable environment for such ecosystems.

Data analytics: wider benefits than expected! But data competence is decisive.

Results indicate that data analytics has a positive influence on more areas of a company than expected. The impact is often more indirect, such as in the reduction of risks, expansion of the value chain or the development of new business models. However, the greatest benefit is achieved directly as improved reporting optimises and accelerates internal processes. Admittedly, only a small proportion of companies in the construction and real estate industry are already using appropriate technologies. The reasons for this lie in the heterogeneous environment of the sector and the depth of data maturity. It is therefore recommended that an awareness for data be cultivated and strengthened in the company independently of the implementation level of data analytics. For a long time, the value connected with the topic of data was solely interpreted as availability and subsequent visualisation. But it is now clear just what role an integral database plays. A database of an appropriate scope and high quality is a prerequisite for the use of different digital technologies, and decisive competitive advantages can also be achieved through data analytics.

In addition to data, the legal aspects must also be addressed over the entire life cycle.

Digitalisation and collaboration result in the creation and processing of common and major data volumes. In the very early phases of the life cycle of a property, it is particularly beneficial for owners and investors to consider which services should be rendered and in which phase, and which data is necessary for this purpose. Only in this manner can, for example, the importing of data from project planning into operations succeed. But the more comprehensive data inventories are and the more players involved in their creation and management, the more complex and important it is to regulate appropriate rights. This not only applies to the use of data one has not collected oneself, but also, for example, the accessing and handling of one's own data during the use of a third-party provider's platform.

Homework relating to data protection must be done now!

The totally revised Federal Act on Data Protection and associated implementation provisions enter into force on 1 September 2023. No transitional periods are planned for this. The new reforms mean a few obligations for companies and also affect firms in the construction and real estate industry. It is high time that all companies prepared themselves for this new legislation.

7

ABOUT THIS STUDY



7 ABOUT THIS STUDY

Survey and methodology

The survey was conducted online from 8 December 2022 to 13 January 2023. The results of the study are based on 183 evaluable questionnaires from executives and specialists in the construction and real estate industry.

Digital Real Estate Index DRE-i

The DRE-i measures the extent to which real estate companies deal with digitalisation and the extent to which they have already implemented it. It is calculated on the basis of 25 indicators in clusters that cover strategy, organisation & processes, customers, products & IT infrastructure, as well as the use of technology (as an additional cluster), and is supported by respondents assessing these indicators for their own company. Weighting of indicators was determined through an adapted analysis of preferences conducted by experts from pom+Consulting Ltd.

Digital technologies

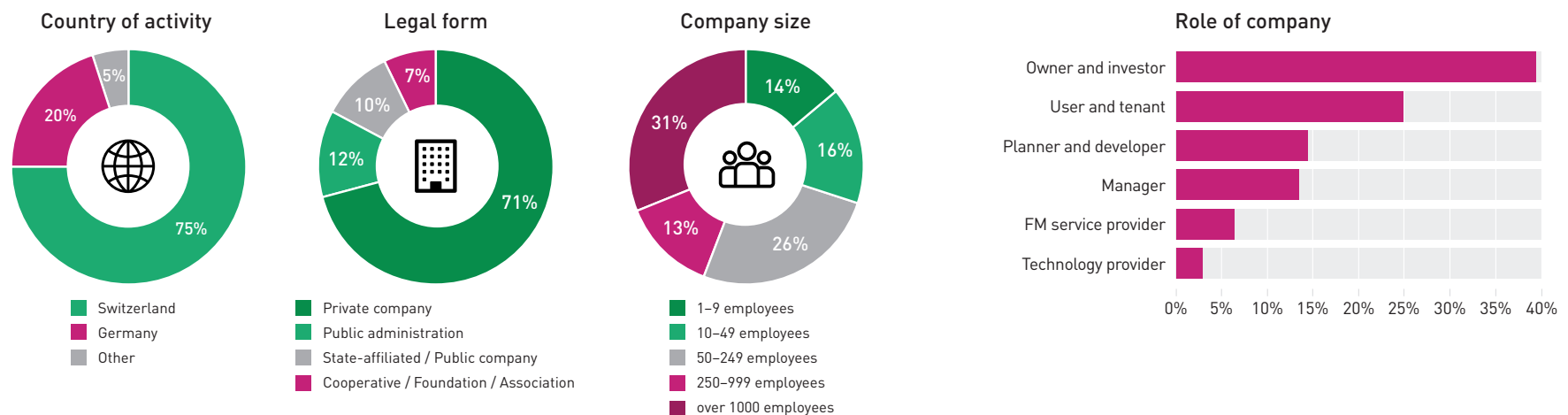
Respondents evaluated the level of implementation and anticipated benefits of technologies for their company on the basis of twelve prescribed technologies. The basis for the evaluation in each case is a closed 4-stage scale and an 'Irrelevant' response option. The allocation of technologies to a phase of the hype cycle was recorded in an additional question.

Core topic of data analytics with expert interviews

This year's core topic takes a closer look at data analytics technology. The scope and type of questions asked depended on the phase of the survey participant's application of this technology (phases: in use, under development, in planning, not in use and irrelevant).

Two expert interviews were conducted on the core topic. We would like to express our heartfelt thanks to both experts for their time and contribution!

Figure 19: Composition of sample



Digital technologies in the construction and real estate industry

The following selection of digital technologies of relevance for the construction and real estate industry is based on the publication 'Digital Real Estate – Bedeutung und Potenziale der Digitalisierung für die Akteure der Immobilienwirtschaft', SVIT Verlag AG, Zurich, 2016 ('Digital real estate – significance and potential of digitalisation for real estate stakeholders')

CATEGORY	TECHNOLOGY DEPLOYMENT
 Platforms & Portals	Technologies for social, technical or operational networks provide the foundation for all social networks, crowd models, living services, etc.
 Decentralized Energy Technologies	Technologies for decentralized generation and storage of energy as well as smart energy grids that measure, regulate, control and optimize energy consumption in buildings.
 Building Information Modelling (BIM)	Technology (and methodology) for the management of integrated data models in the life cycle of buildings and infrastructures (Digital Twin).
 Virtual & Augmented Reality	Technologies for the realistic and interactive visualization of a virtual world (virtual reality) or the presentation of digital information that enhances the real world with virtual aspects (augmented reality). The combination of both technologies is referred to as mixed reality.
 Robotics & Drones	Computer-controlled fixed or mobile machines (robots) and unmanned aerial and marine vehicles (drones).
 Sensors & Actuators (Internet of Things)	Technologies for controlling elements that record and pass on information from their environment (sensors) and trigger actions (actuators). The use of sensor technology serves as the basis for the Internet of Things (IoT).
 Data Analytics (Advanced Analytics & Big Data)	Technologies for analyzing and evaluating large data sets and forecasting future developments.
 Artificial Intelligence & Machine Learning	Technologies concerned with automating intelligent behavior with the goal of replicating or surpassing human-like intelligence.
 Navigation & Location Based Services	Technologies for localization (e.g. via GPS, RFID) and provision of location-based information and services.
 Additive Manufacturing (3D Printing)	Technologies for manufacturing material objects based on digital models.
 Smart Material & Nanotechnologies	Materials that react independently to external stimuli as a result of their internal structure (smart material).
 Blockchain (Internet of Value)	Technology that, as a decentralized crypto-transaction system, enables the recording and settlement of contracts and assets without an intermediary. The use of blockchain serves as the basis for the Internet of Value (IoV).



As a cross-sector industry along the property life cycle, construction and real estate must harness the potential of digitalisation and jointly develop long-term strategies. Digital Real Estate is the key to this world.

Blum & Grob
RECHTSANWÄLTE

 **digital**
real
estate
by **pom+**

pom+Consulting Ltd
Limmatstrasse 214
8005 Zurich
Tel. +41 44 200 42 00

www.digitalrealestate.ch