

Digital Sustainability in FM

The use of digital solutions for sustainability purposes in Facilities Management in Denmark, Norway, Sweden and the Netherlands

August 2020



DIGITAL TECHNOLOGIES AND SYSTEMS

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Thanks for financial
support to the project
from Realdania



Preface



This report presents the results of an online questionnaire conducted in the spring of 2020 in Norway, Sweden, the Netherlands and Denmark. The survey seeks to clarify how digital solutions are used for solving sustainability challenges in Facilities Management.

The FM associations involved

The following four national FM associations were involved in the survey:

Dansk Facilities Management netværk (DFM netværk)

The Danish Facilities Management network is the only forum for Facilities Management in Denmark. The members represent all parts of the FM-industry.

Norges Bygg- og Eiendomsforening (NBEF)

An association for contractors, property managers, tenants, companies and organisations that have their area of activity in the construction and real estate sector. The association is represented in several boards, councils and committees in Norway.

IFMA Sverige

IFMA Sverige is the professional network that brings together, supports and develops Facility Management in Sweden.

Facility Management Nederland (FMN)

FMN is an independent professional association of FM. The members of FMN are active in various sectors and various facility branches. FMN strives to inspire and connect its members, branches and industries.

The organisation established for the purpose of the survey is illustrated in Figure 1. All associations were represented in both the steering committee and the project group.

As part of the results, this survey project has formed a basis for future collaboration involving the four national FM associations and potentially also involving FM associations from other countries.

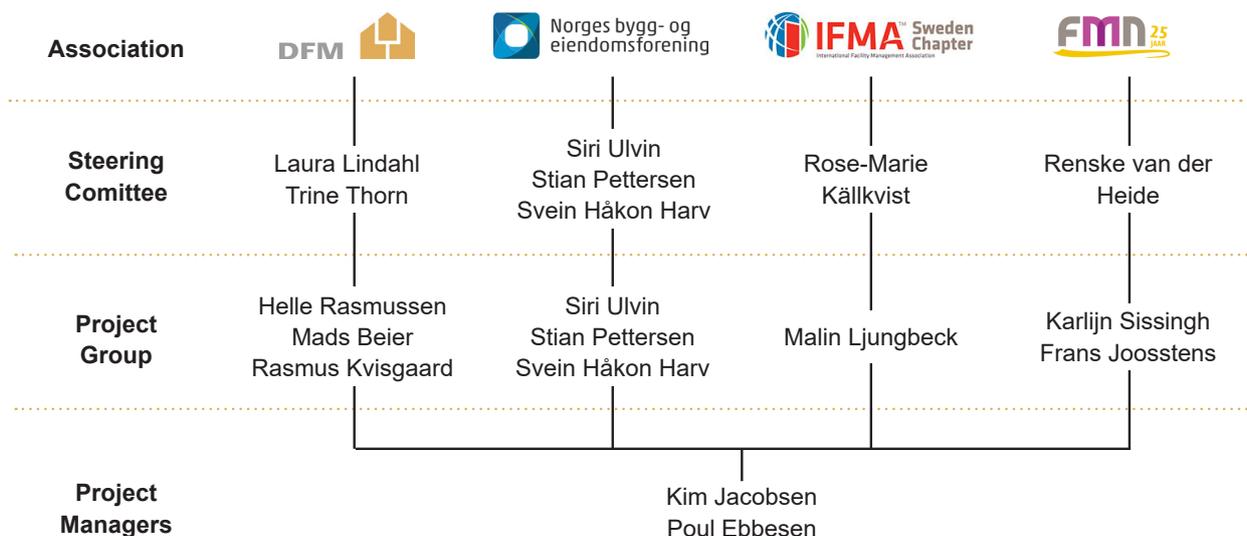


Figure 1. The organisation behind the survey

Acknowledgements

First, we would like to give thanks to *Realdania* for their indispensable financial support in carrying through this project. *Realdania* is a Danish philanthropic organisation that supports projects in the built environment.

We would also like to give credit to the national FM organisations in the four participating countries. Especially their members of the project group and steering committee for their valuable contributions and inputs.

Dansk Facilities Management netværk (DFM netværk)

- Trine Thorn, Head of Group Workplace Management & Physical Security at Nordea
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Norges Bygg- og Eiendomsforening

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- Svein Håkon Harv, Ass. direktør drift og vedlikehold, Statsbygg

IFMA Sverige

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Facility Management Nederland (FMN)

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- Karlijn Sissingh, Docent Facility Management, Hogeschool Arnhem en Nijmegen
- Frans Joosstens, Senior lecturer at Academy of Facility Management, The Hague University of Applied Science

Finally, we would like to give thanks to all the respondents for allocating time to answer our online survey.

The Authors

The survey project, including writing this report, was carried out by Poul Ebbesen, Ph.D. and Chief Specialist at Ramboll and Kim Jacobsen, Ph.D. and owner of the consultant company K-Jacobsen A/S.

Introduction

The FM industry facilitates the core business in companies and organisations. This includes facilitating the built environment, used by the core business. The use of the built environment has a significant impact on the environment, the economy and on people's well-being. These core dimensions of sustainability are issues that have top priority on the global agenda.

There is a general belief in the FM industry that digital systems and technologies can help improve sustainability in the built environment. Many FM organisations around the world have already implemented digital solutions to improve sustainability. However, the FM organisations often face challenges in their attempt to do so.

This project investigates the use of digital solutions for sustainability purposes in the FM industry. The investigation is unique because it combines sustainability and digitalisation. It is our belief that the knowledge gained in this project can contribute to future digitalisation in the FM industry and thereby make the built environment more sustainable.

In 2019, the Danish Facility Management Association (DFM netværk) published the book *Facility Management as a digital change agent* [1]. The book gained international attention, when presented at different international conferences, because it showed how strategy and structure is a prerequisite for digital support in the FM industry. The book was therefore translated into English. When presenting the book internationally it came to our attention that FM organisations internationally face many of the same digitalisation

challenges, especially when dealing with sustainability and climate issues. In addition, we realised that different countries seem to have different solutions for solving these challenges. After some discussions and reflections, we ended up with one core question; could solutions and knowledge in one country benefit all countries?

On this background, it was decided to launch an international study in collaboration with national FM associations. The Norwegian, Swedish, Dutch and Danish FM associations decided to participate and to contribute. The following was mutually decided to be the purpose of the survey:

- To gain insight into the influence of the digital technologies and systems and their impact on the practical solutions on climate and sustainability challenges.
- To identify the different approaches of the four countries regarding digital solutions concerning climate change and sustainability.
- To create a close collaboration between the countries in order to:
 - Share knowledge and maybe contribute to conferences and workshops in our sister organisations.
 - To establish a joint network for learning.
 - Build joint projects in the future.

Methodology

Basic concepts

Sustainability

The basic understanding of sustainability used in this project is based on the Brundtland report *Our Common Future* [2] and the UN's *Sustainability Development Goals* [3]. The framework for sustainability in the built environment used in this project is inspired by the Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB) system for classification of buildings in use [4].

FM-disciplines

To narrow down the survey it was decided to focus primarily on the environmental dimension in the Brundtland definition of sustainability and to a lesser degree on the social and economic dimensions. The survey therefore includes use of digital solutions in the following eight mainly environmental sustainability related FM disciplines:

- Climate Resilience/Adaptation Management
- Energy Management
- Greenhouse Gas Emission Management
- Indoor Climate Management
- Maintenance Management
- Space Management
- Waste Management
- Water Management

Digital maturity level parameters

The above-mentioned FM disciplines chosen for the survey are by nature very different and can require different digital solutions. Therefore, we choose to use the following, neutral level parameters for understanding the maturity of use of digital solutions:

- Monitoring
- Planning
- Managing
- Analysing
- Reporting
- Benchmarking
- Collaboration

Though not all digitalisation processes follow the same strict steps, it is assumed in this survey that the above listed maturity parameters can be used as steps in the process of increasing the maturity of use of digital solutions. First monitoring, then planning etc. One may argue that for instance Automation, which often is based on digital technology, should be included in the list. Automation is left out because the list is intended only to include work processes that people are involved in and that technology can support. The list is not complete. Registration

and Assessment could for instance be included, but these two work processes could also be perceived as being part of Monitoring and Analysing.

Motivations for use of digital solutions

In order to understand why digital solutions are chosen to support the FM-disciplines mentioned earlier on this page, the following list of possible motivations for using digital solutions were developed:

- Availability of the technology
- Company reputation
- Competitiveness
- Cost reduction
- Customer demands
- Legal or mandatory requirements
- Pressure from management
- Sustainability and climate issues are a part of the company strategy

Methodology

Hypotheses

The following three hypotheses were formulated as part of the survey design:

- » In the FM industry, IT solutions are used to solve climate and sustainability challenges.
- » Different IT solutions are used to identify and solve the same climate and sustainability challenges - among the four countries.
- » Available IT solutions decide, which climate and sustainability challenges the FM organisations choose to solve (technology driven solutions rather than problem driven solutions).

By testing these hypotheses, the aim of the survey, to investigate the use of digital solutions for sustainability purposes in the FM industry, is supported.

The survey

About the questions

The survey questions, which are listed in English in the Appendix, include questions related to

- The respondent
- The company
- The use of digital solutions for each of the FM disciplines listed on page 5.

The survey questions were developed in English and afterwards translated into Danish, Norwegian, Swedish and Dutch. The respondents in the four countries could then choose to read the questions in one of the five languages.

About the process

The survey was released in April 2020. In each country, the national FM association published the survey via mails distributed to the association members with a link to the survey. After two follow-up mails, the survey was closed in mid-May 2020.

Respondents and companies

A total of 326 FM professionals in Denmark (DK), Sweden (S), Norway (N) and the Netherlands (NL) responded to the survey. The numbers per country are shown in Table 1. A little more than half of the respondents (171 respondents) completed the survey. The rest (155 respondents) partially completed the survey, meaning they dropped out somewhere between the start and the end of the survey. Answers from respondents, who partially completed, are in this report assumed not to distort the results and to be just as useful and valuable as answers from respondents who completed

the survey. This assumption can only be verified though, by testing whether an identical analysis, based only on the completed responses, gives the same results, when compared to this analysis where both completed and partially completed responses are included. Such a test has not been made.

	DK	N	S	NL	Total
Completed	57	39	35	40	171
Partially completed	39	38	41	37	155
Number of respondents	96	77	76	77	326

Table 1. Number of respondents who completed and partially completed the survey per country and in total.

All respondents work in the FM industry. As shown in the bottom bar of Figure 2, approximately two thirds (32 + 30 = 62%) of the respondents are managers or employees in the FM department of their company. The remaining one third are managers or have other positions in other departments than the FM department. Figure 2 shows some variation in the distribution of positions in the different countries.

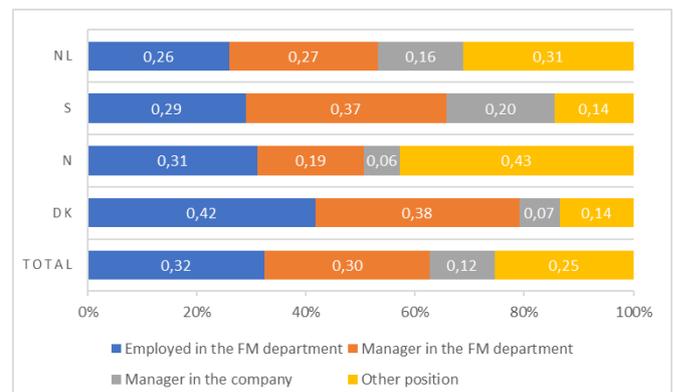


Figure 2. Type of position of respondents per country and in total.

The respondents work in one or more FM areas. As shown in Figure 3 respondents in all countries primarily work in the FM areas Building Operation, Service Management and Space Management and to a lesser degree in Investment and Finance. The distribution of the FM areas of the respondents is comparable to what is normally seen in FM department.

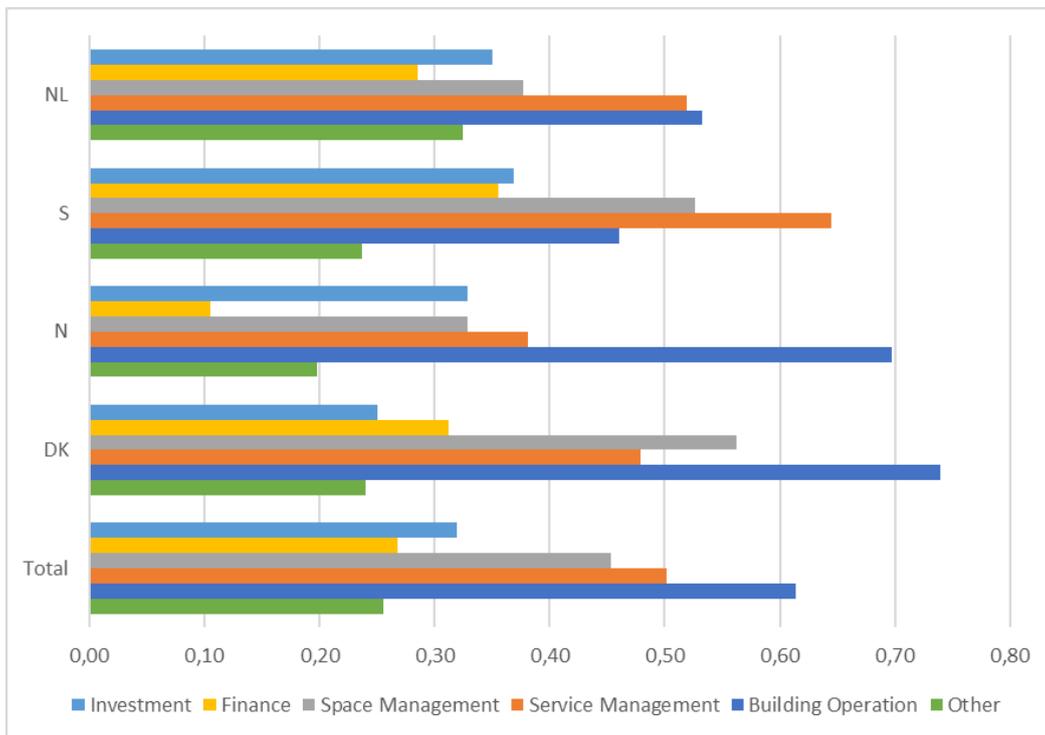


Figure 3. Distribution of FM areas the respondents work in, per country and in total.

Distribution of ownership (public, private or an NGO) of the companies the respondents work in, and distribution of national and international companies are shown in Figure 4 and Figure 5. In total, approximately half are public, and half are privately owned companies with some variations between countries. Approximately two thirds are nationally based companies and one third are international companies, again with variations between countries.

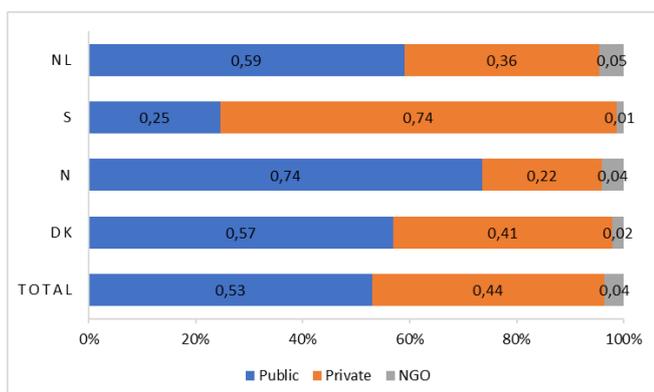


Figure 4. Distribution of ownership of companies the respondents work in, per country and in total.

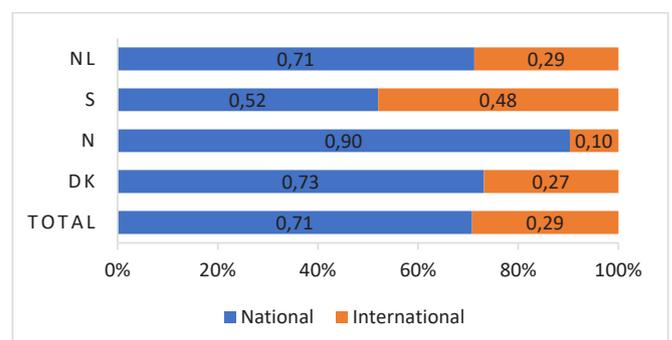


Figure 5. Distribution of national and international companies the respondents work in, per country and in total.

Distribution of size of the facilities in m² of buildings used by the companies are shown in Figure 6.

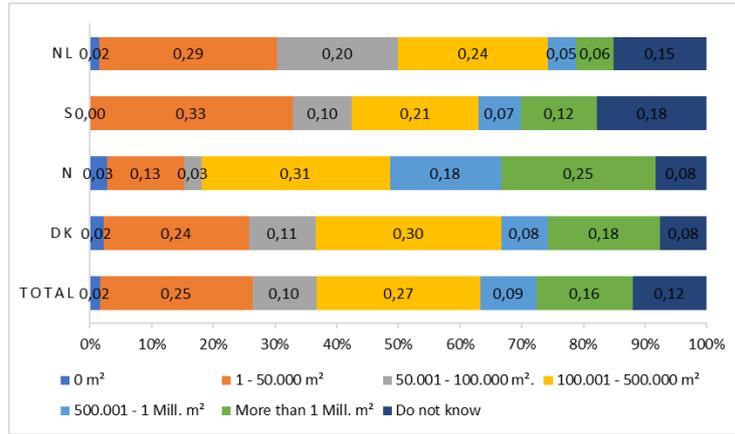


Figure 6. Distribution of size in m² of facilities used (own and/or lease) by the companies

The branch of companies that the respondents work in varies between countries as illustrated in Figure 7. Most common branches in all countries combined are real estate, public administration, construction, consulting and education.

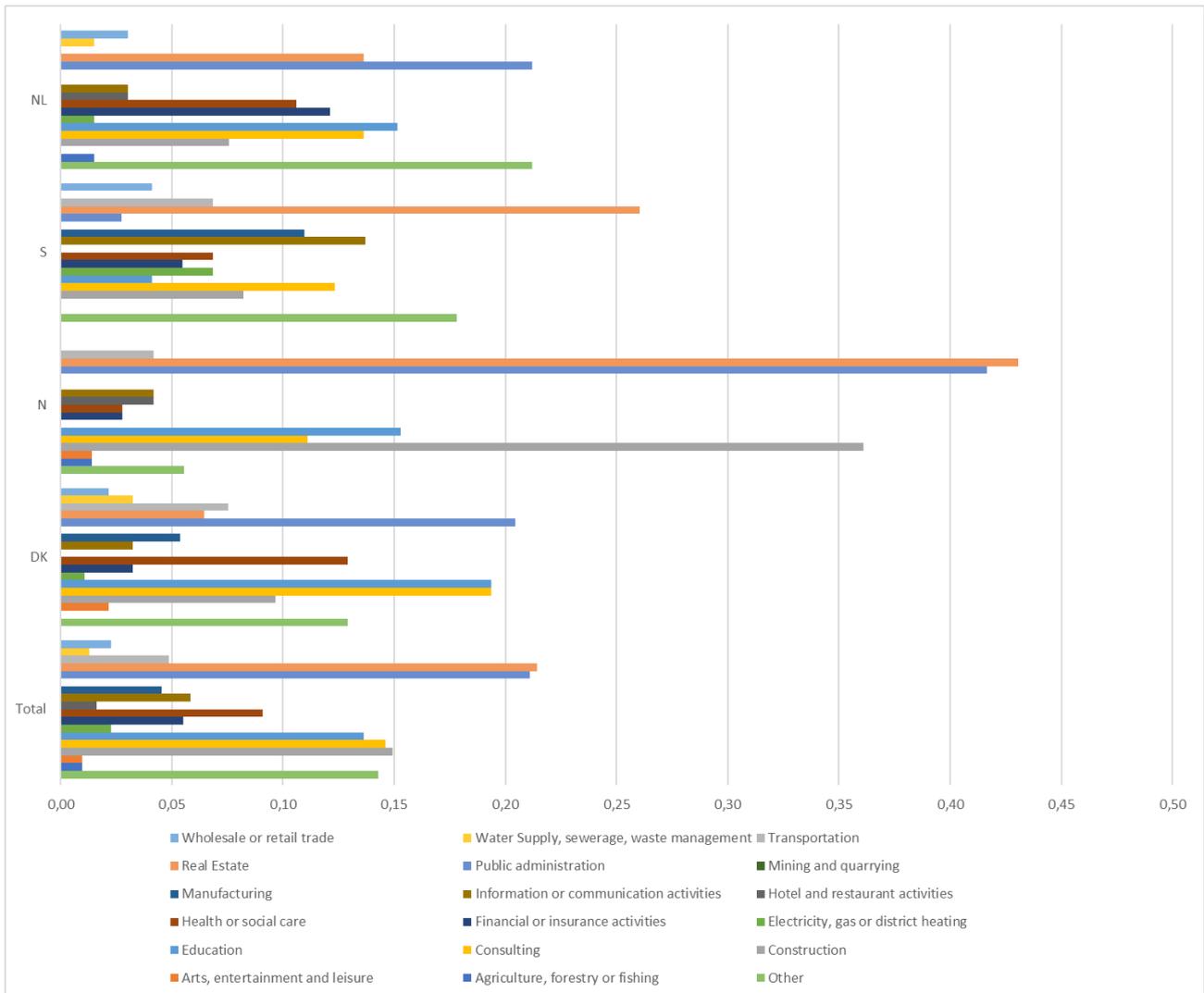


Figure 7. Distribution of branches of companies the respondents work in, per country and in total.

Variations in type of respondents and type of companies between the countries could theoretically explain some of the differences in the answers between countries, but the sample size is estimated not to be big enough to do a proper testing of this.

The information about the respondents and the companies they work in reveals that the respondents represent FM professionals, involved in a wide range of FM areas and types of companies. The results from this survey can therefore give a general picture of the level of digitalisation in the FM industry in the four countries.

Strategy and use of digital solutions

For each of the eight selected sustainability FM disciplines, the respondents were asked whether their company has defined strategies. See the exact survey question in the appendix. The rate of positive responses is shown in table 2 as well as in Figure 8 (red lines for strategy). In Table 2 the FM disciplines are sorted according to rate of defined strategy. Strategy for the FM disciplines are defined, depending on FM discipline, in 27 to 67 percent (rates 0,27 and 0,67 in Table 2) of the companies. Defined strategies are most common for energy, waste and emission.

Strategy	All
Energy	0,67
Waste	0,67
Emission	0,50
Indoor climate	0,40
Climate	0,33
Maintenance	0,33
Space	0,31
Water	0,27

Table 2. Rate of defined strategies for each FM discipline, all countries.

The respondents were also asked whether digital solutions were used to support the FM disciplines. The rate of positive responses is shown in Table 3 and in Figure 8 (purple lines for digitisation). In Table 3 the FM disciplines are sorted according to use rate of digital solution. Digital solutions are, depending on the FM discipline, used to support the FM disciplines in 16 to 67 percent (rates 0,16 and 0,67 in Table 3) of the companies. Use of digital solutions are most common for energy, indoor climate and maintenance.

Digitisation	All
Energy	0,67
Indoor climate	0,55
Maintenance	0,47
Space	0,44
Waste	0,28
Emission	0,23
Water	0,23
Climate	0,16

Table 3. Rate of use of digital solutions for each FM discipline, all countries.

The reason for defining a strategy is probably often because there is a focus on the specific area. So, there is apparently primarily a focus on energy, waste and emission. There can be many reasons why an area has been digitalised. Maybe there is available technology that is easy to adapt to the discipline, or the other way around, the discipline can be easily adapted to the technology. Or maybe a high degree of focus on the area has pushed the digitalisation process forward. Whatever the explanation primarily the disciplines energy, indoor climate, maintenance and space has been digitalised. Figure 8 shows that some disciplines have a relatively large degree of focus, for instance waste, but a lower degree of digitisation. And opposite, some disciplines have a relatively large degree of digitalisation, for instance indoor climate, but a lower degree of focus. Maybe disciplines with a present higher degree of focus, and a present lower degree of digitisation, such as waste, will encounter a high degree of diffusion of digital solutions in the future?

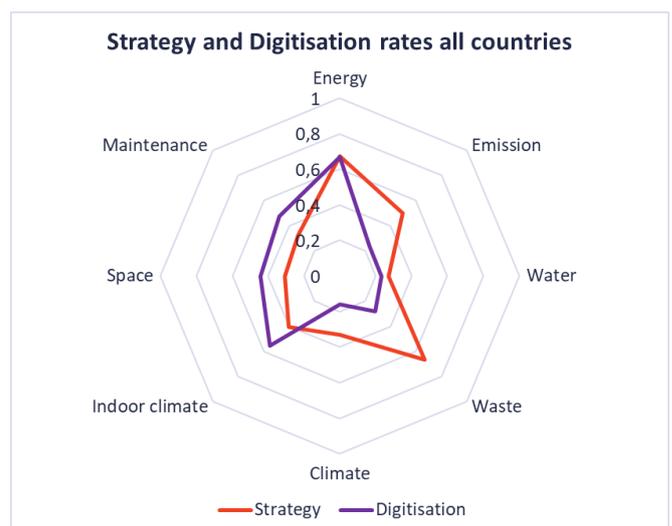


Figure 8. Rate of defined strategies and use of digital solutions for each FM discipline, all countries.

The rate of defined strategies and use of digital support per country is illustrated in Figure 9 and Figure 10. All countries seem to have almost the same level of strategy building, with Denmark having the lowest, but quite different levels, when it comes to use of digital solutions (digitisation). The use rate of digital solutions

(digitisation) for sustainability purposes is generally low, but more common in Denmark and Norway than in the Netherlands and Sweden. The focus on emission in Norway jumps in the eye when looking at Figure 9. Maybe we will see the discipline Emission Management be more digitalised in Norway in the near future?

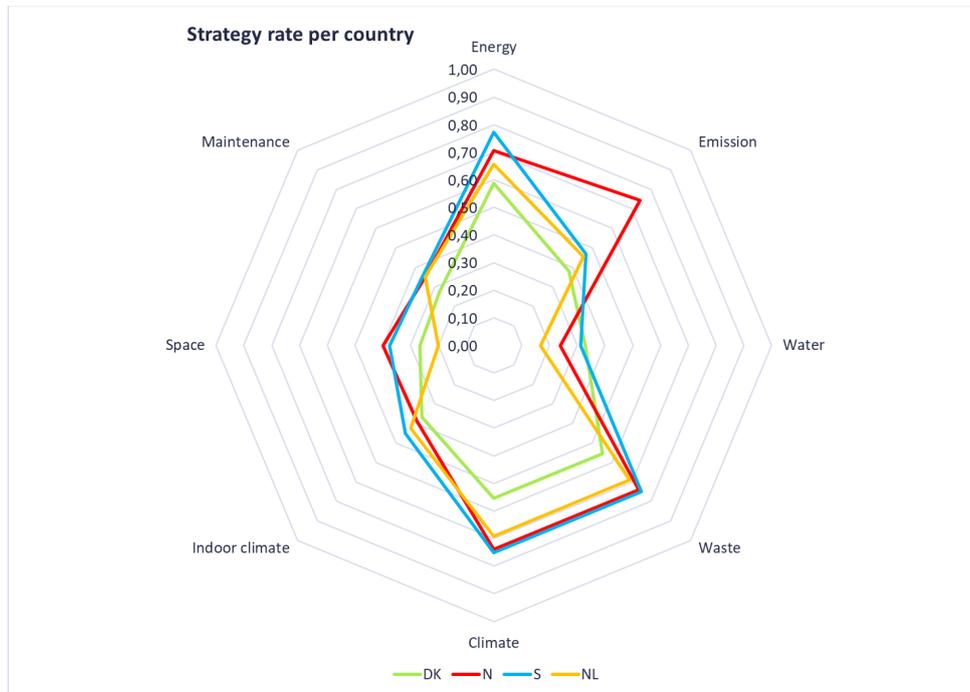


Figure 9. Rate of defined strategies for each FM discipline, per country.

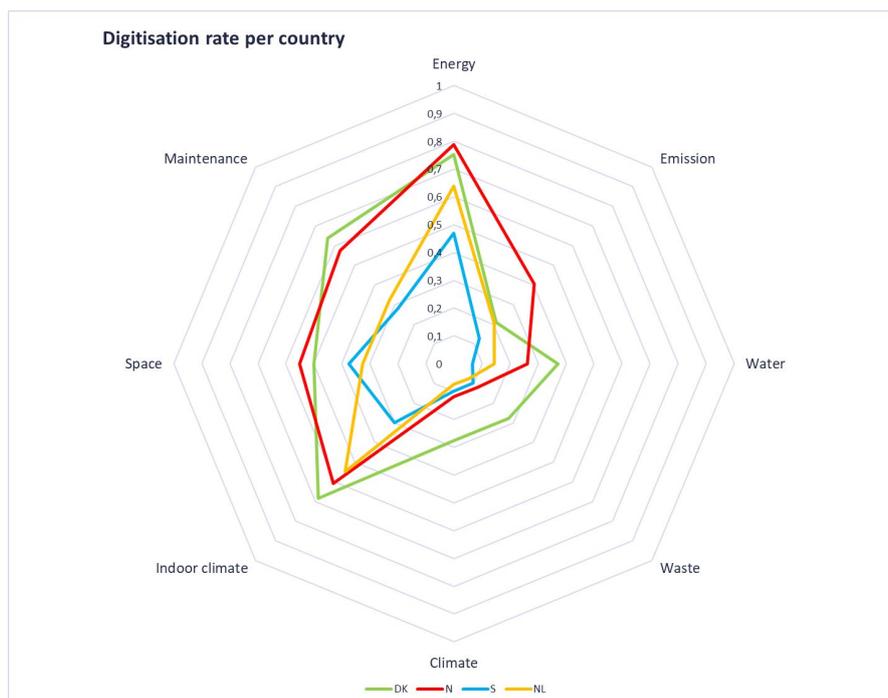


Figure 10. Rate of use of digital solutions to support the FM disciplines, per country

The digital systems and technologies used

When asking what type of digital solutions are used, the answer may vary depending on the respondent. To avoid the same digital solution described differently by the respondents, we developed two lists. One list with digital systems and one with digital technologies, where systems are mainly software and technologies are mainly combinations of hardware and software. For each FM discipline, we asked the respondents, who had responded positively on use of digital solutions for the FM discipline, to point out the digital systems and technologies that they use from the two predefined lists. The results are shown in Figure 11 and Figure 12.

Spreadsheets are commonly used in most of the FM disciplines. EMS, BMS and CAFM systems are also standard. Sensors is the most commonly used

technology, followed by cell phones/tablets and QR-codes.

At a first glance at Figure 11 and Figure 12, one may think that the use rate of most of the systems and technologies is low. This may be true considering the low use rate of digital solutions in general (low rate of digitisation) as described in the previous section. But the picture is somewhat more complex. Take for instance CAD and BIM. Figure 11 reveals that both CAD and BIM are used mainly for Space Management and Maintenance Management. Possibly CAD and BIM exclude one another so that the rates in a way should be added.

Both figures illustrate the wide range of digital solutions being used in the FM industry.

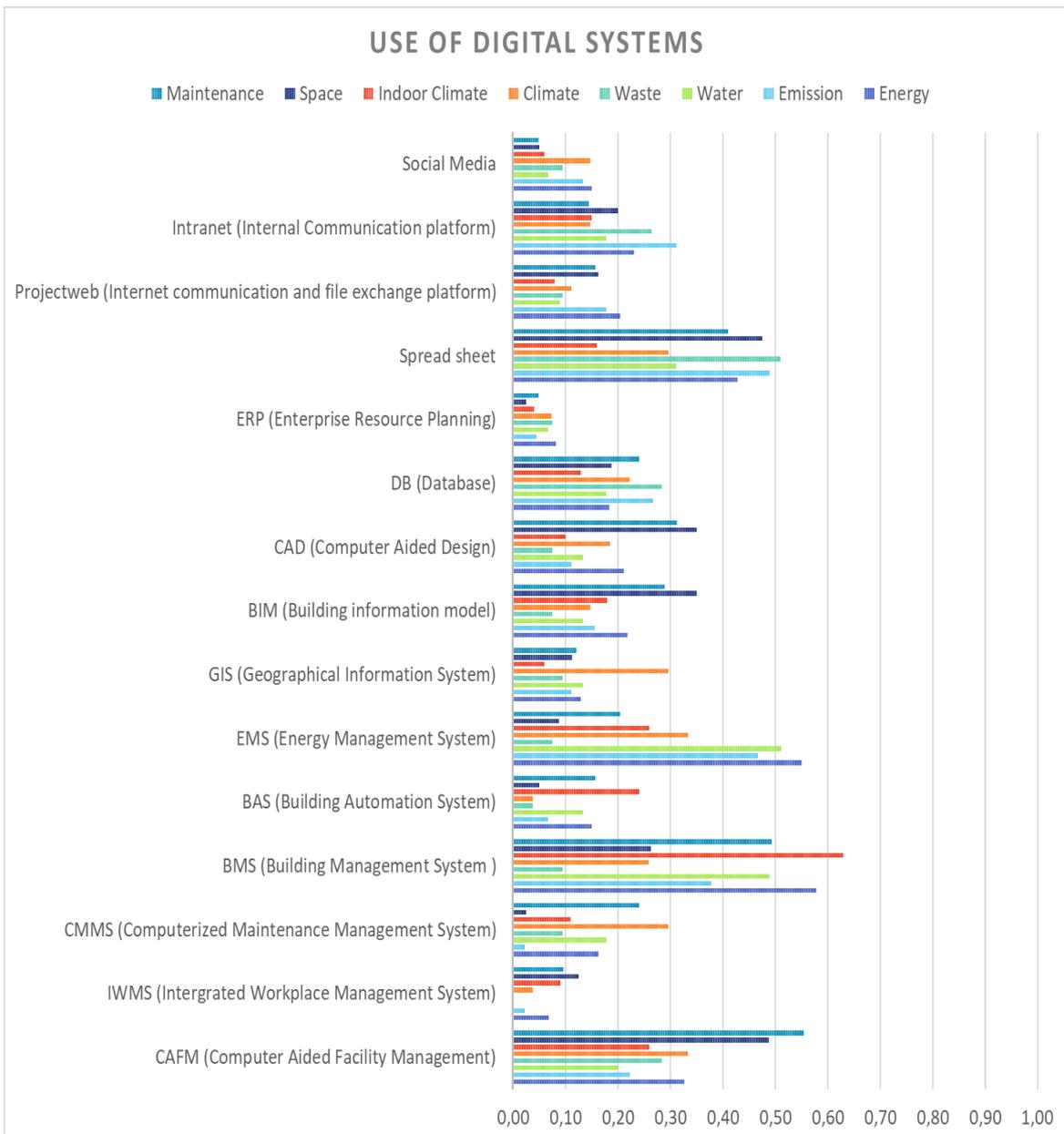


Figure 11. Rate of use of digital systems per FM-discipline, all countries

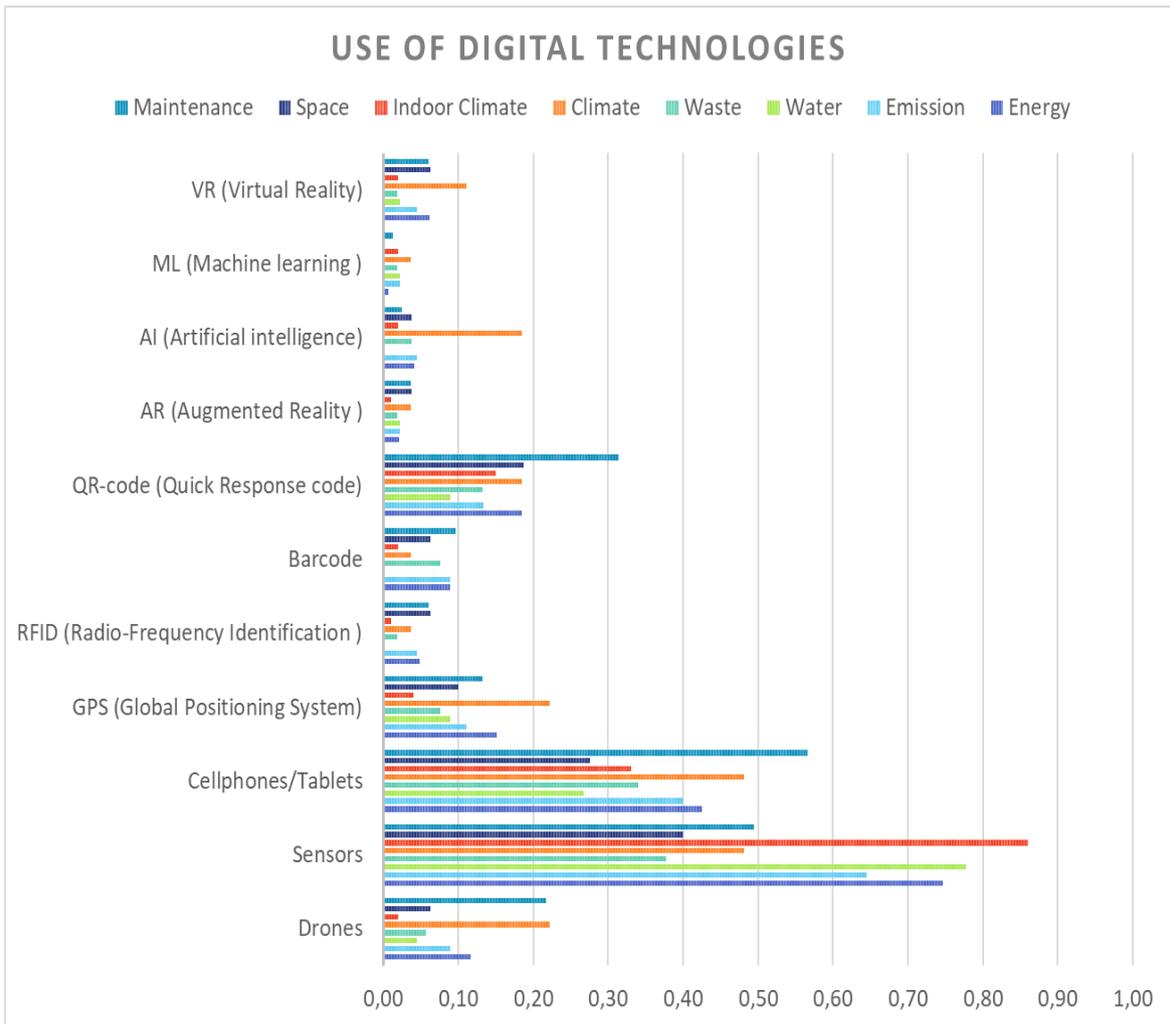


Figure 12. Rate of use of digital technologies per FM-discipline, all countries

Level of maturity in use of digital solutions

In the cases (FM disciplines) where digital solutions were used, the respondents were asked about the purpose of the use of digital solutions. This was done by asking the respondents, which of the maturity level parameters (see page 5) the use of digital solutions supported. The results are shown in Figure 13.

Digital solutions, when used, are mainly used for monitoring, planning, managing, reporting and analysing. In lesser degree digital solutions are used for benchmarking and collaboration. Monitoring is most often supported by digital solutions in Energy Management, Indoor Climate Management and Water Management. Planning and managing are supported the most by digital solutions in Maintenance Management.

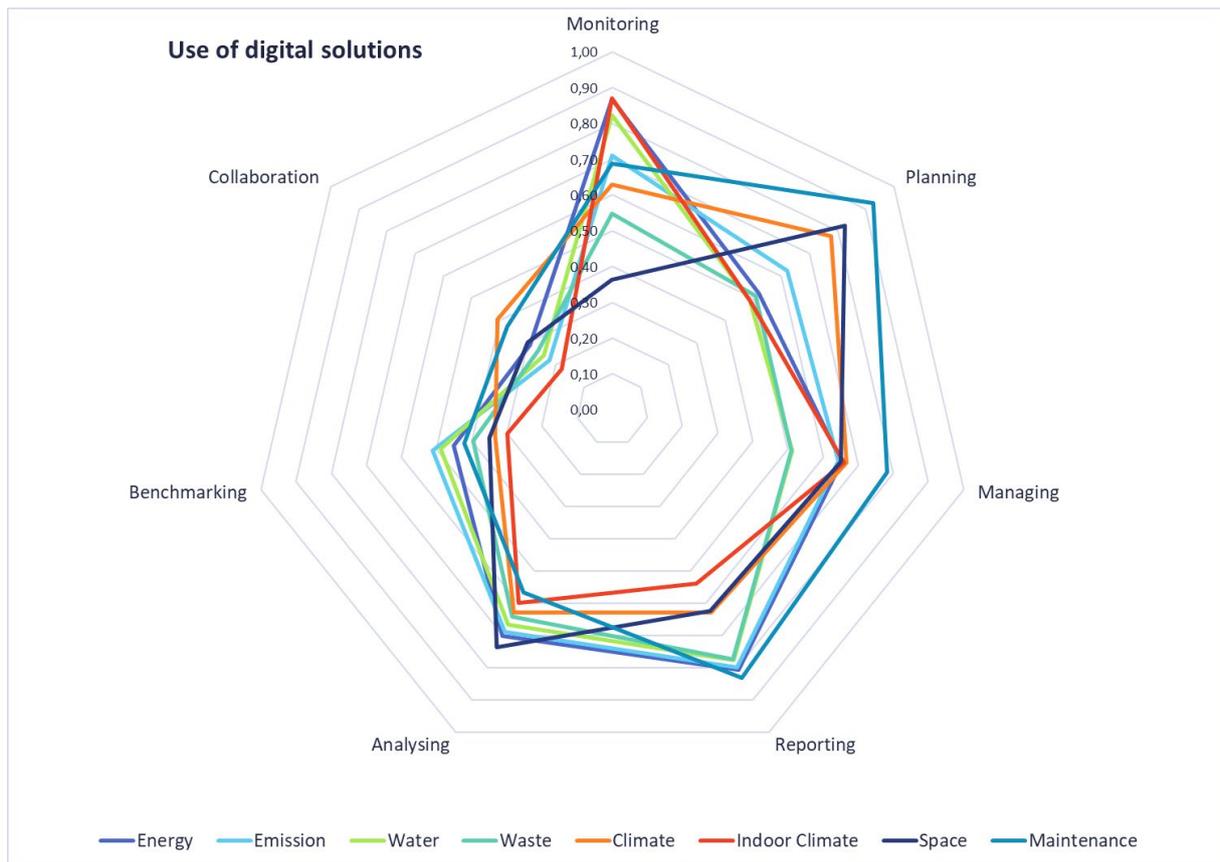


Figure 13. Rate of use of digital solutions for different purposes (maturity level parameters) per FM discipline, all countries.

To some extent, Figure 13 illustrates the maturity level of the use of digital solutions in each of the eight FM disciplines in the FM industry. The higher the use rate is for support of the defined maturity level parameters (monitoring, planning, managing, reporting, analysing, benchmarking and collaboration) the more mature is the use of digital solutions for the FM discipline. The overall maturity levels of use of digital solutions do not vary very much among the eight FM disciplines, but the way the digital solutions are used vary to a higher extent.

The FM industry could probably gain more value from the use of digital solutions if the web created by the coloured lines in Figure 13 were wider and less skewed. This would specifically require more focus on use of digital solutions for benchmarking and collaboration.

Drivers for use of digital solutions

For each of the FM disciplines, where digital solutions were used, respondents were asked about the reason for use of digital solutions. This was done by asking which of the predefined drivers contributed to the use of digital solutions. The results are shown in Figure 14.

Company strategy (sustainability and climate issues are parts of company strategy) and cost reduction are two dominant drivers, followed by availability of technology and company reputation. Apparently, decisions

to use digital solutions are most often based on mature strategic (strategy and reputation) and economic (cost) considerations, but also a question of, which technologies are available on the market. Hence, mainly problem driven, and somewhat technology driven. Pressure from management is considered low by the respondents, but this contradicts the perception that the company sustainability strategy, which can also be regarded as pressure from management, to a higher degree is a driver. Pressure from management is therefore probably higher than what the figure indicates.

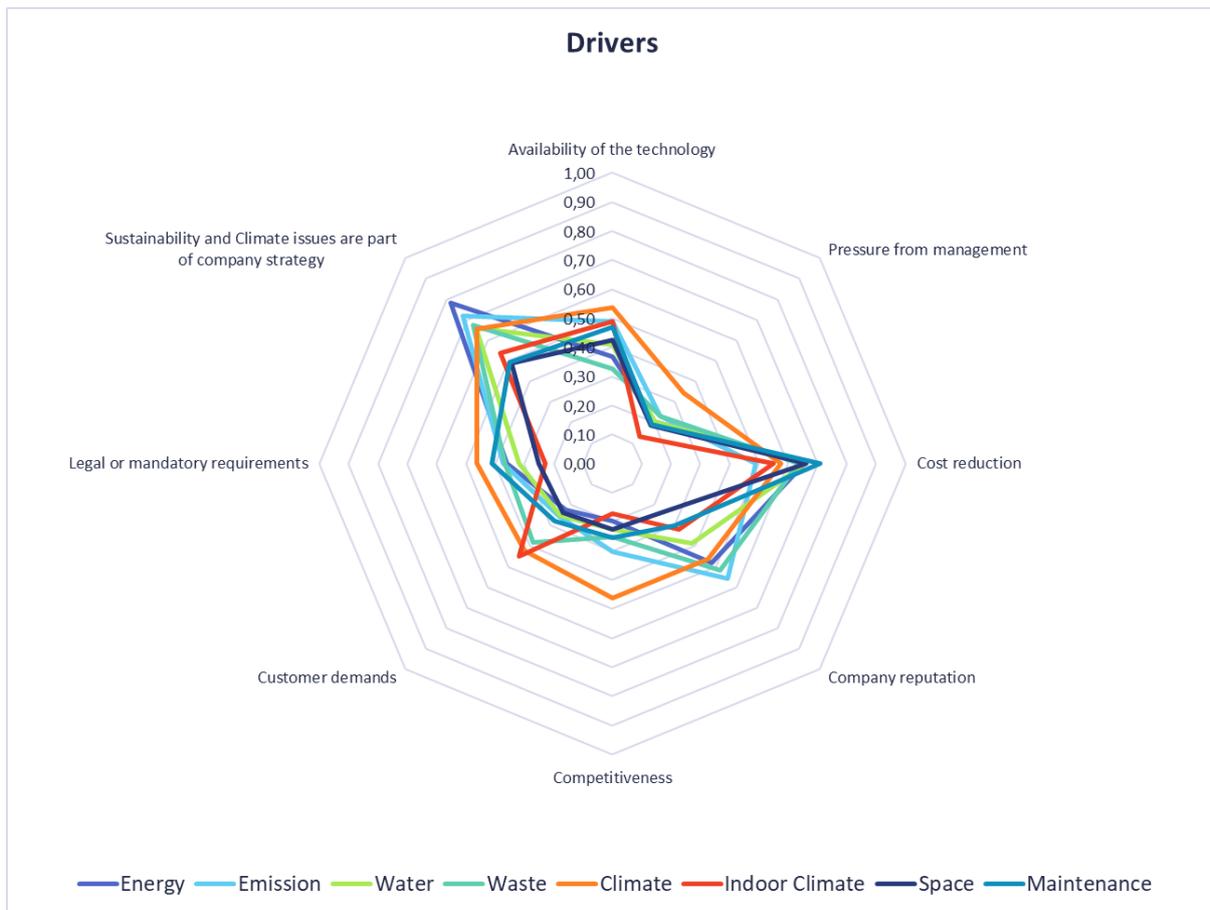


Figure 14. Rate of drivers per FM discipline, all countries.

Support of strategy from use of technology

You can set up objectives and a strategy to achieve the objectives and you can choose to use digital solutions to support these strategies and achieve the objectives. Nevertheless, how do we know if the use of digital solutions will help?

For each of the FM disciplines, we asked the respondents to what degree (high, moderate, low or none) use of digital solutions supported them in achieving their defined strategies. Note, that this question was only asked to respondents, who had responded positively on use of digital solutions for the FM discipline, and positively on whether a strategy for the FM-discipline

had been defined. The results (answers high and moderate) are shown in Figure 15 for all countries together. In Figure 16 each country is shown separately.

In general, support of strategy when using digital solutions is mainly perceived as moderate or high in all FM disciplines. FM professionals experience that use of digital solutions in 74 to 91 percent of the cases helps achieve the strategic goals to a high or moderate degree. Technology does make a difference. Differences in countries, shown in Figure 16, are unfortunately not based on enough responses to be reliable. The figure is included in this report just to show a possible focus for future research.

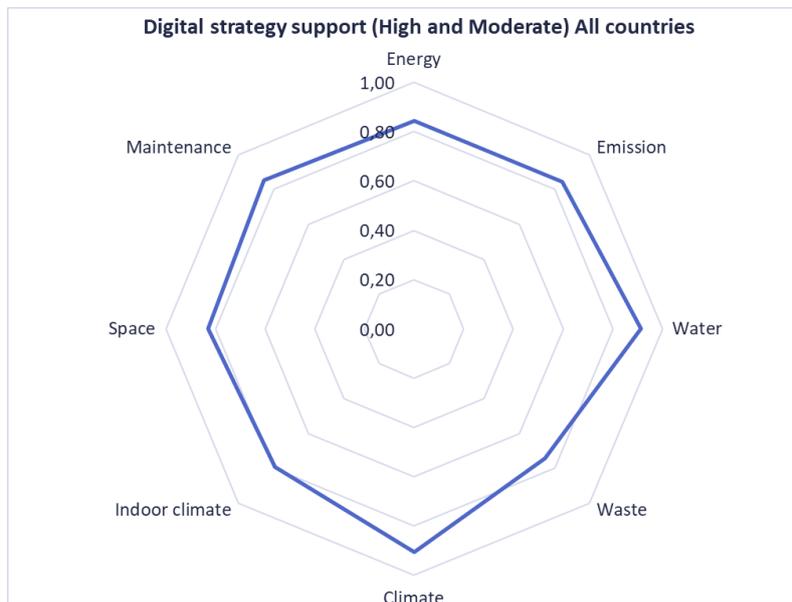


Figure 15. Degree (high and moderate) of strategy support from use of digital solutions, all countries.

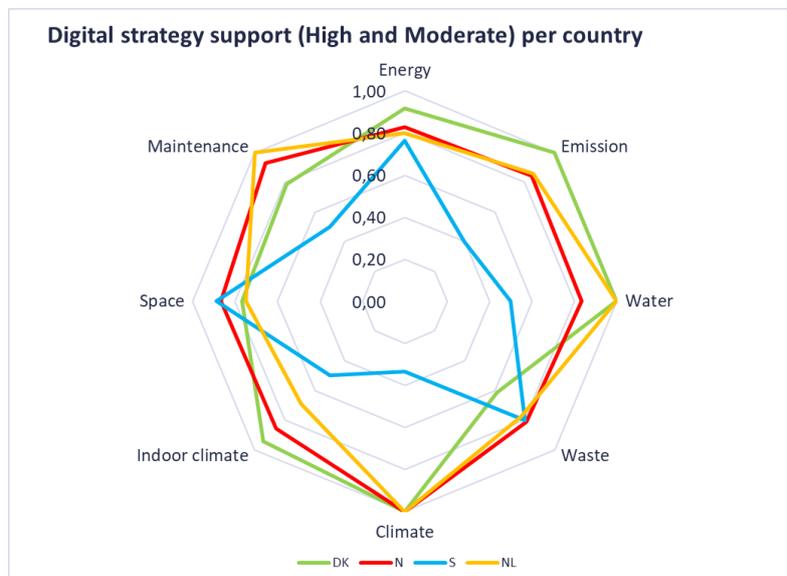


Figure 16. Degree (high and moderate) of strategy support from use of digital solutions, per country (not based on enough data to be reliable).

Future digital investments

We were curious about expectations regarding the future digital development. For each of the eight FM disciplines we therefore asked all the respondents about the likelihood (high, moderate, low or none) of new investments in digital solutions in their company the coming 5 years. The results (rate of answers moderate and high) are shown in Figure 17.

The figure shows a mainly moderate to high likelihood of future investments in digital solutions. Apparently, the FM industry in Norway and the Netherlands will be more inclined to invest in new digital solutions than what is the case in Denmark and Sweden. The likelihood of investments in digital solutions for Energy Management, Space Management, Indoor Climate

Management, Waste Management and Maintenance Management is higher than the likelihood of investments in digital solutions for Emission Management, Water Management and Climate Management.

The FM discipline Waste Management is particularly interesting. From Figure 8 we have for Waste Management that the rate of defined strategy is high (there is a high degree of focus on the discipline) and that the rate of digitisation is low (low degree of use of digital solutions to support the discipline). This can maybe explain the relatively high likelihood of future investments in this discipline shown in Figure 17. There is apparently a perceived need for investments in digital solutions for Waste Management because of a present low degree of digitisation and high degree of focus on the discipline.

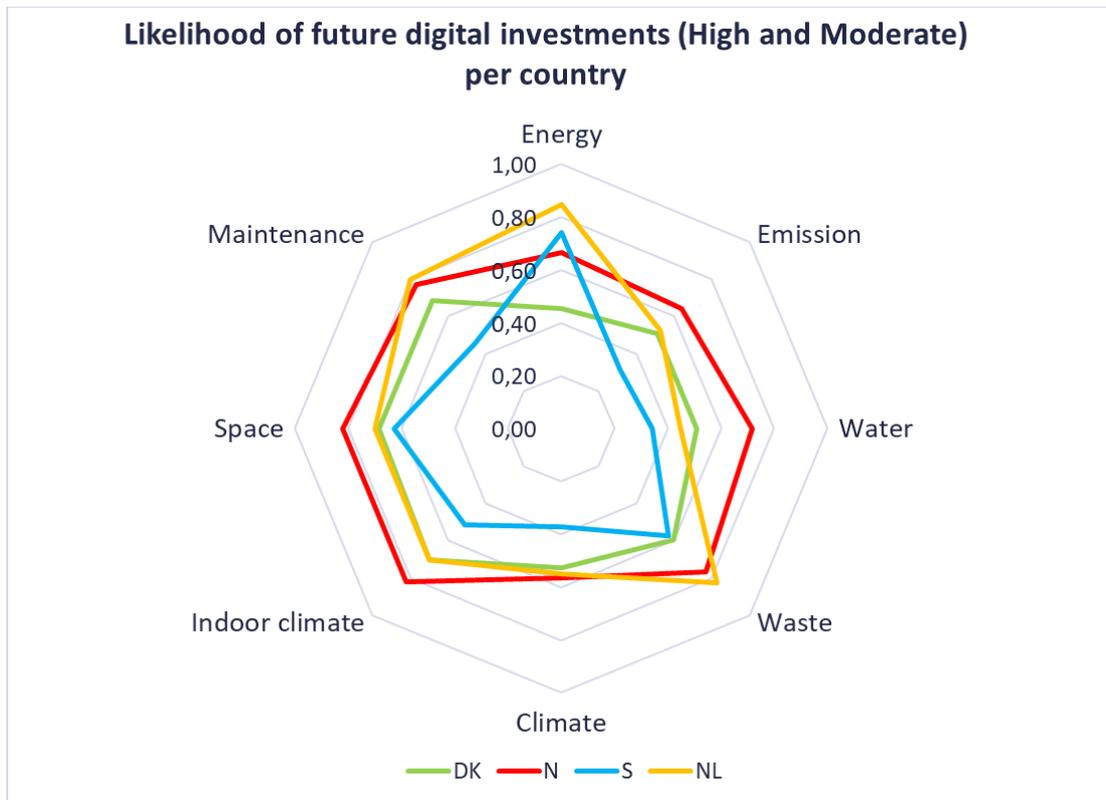
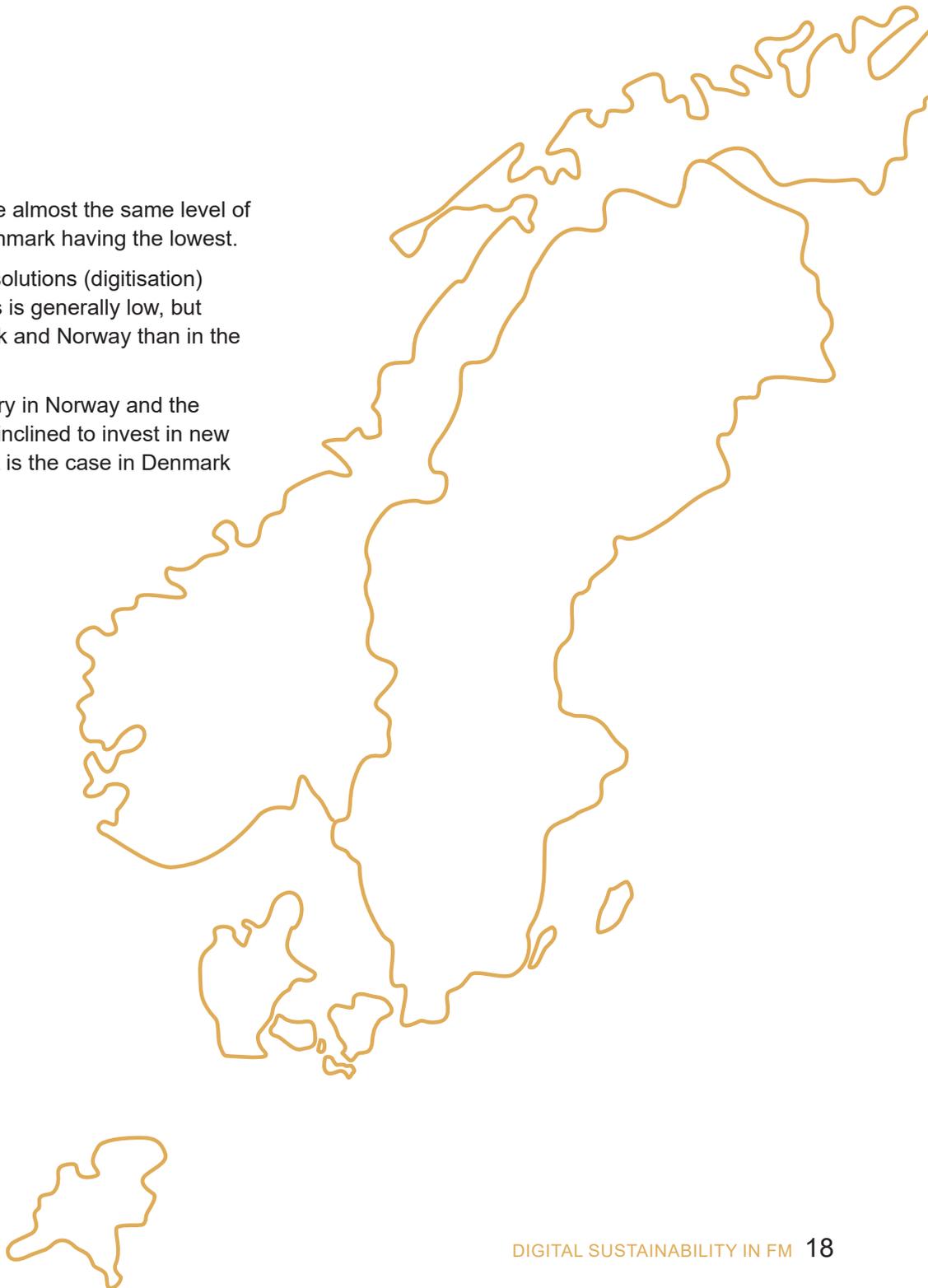


Figure 17. Degree (high and moderate) of likelihood of future investments per country

Comparing the countries

- All countries seem to have almost the same level of strategy building, with Denmark having the lowest.
- The rate of use of digital solutions (digitisation) for sustainability purposes is generally low, but more common in Denmark and Norway than in the Netherlands and Sweden.
- Apparently, the FM industry in Norway and the Netherlands will be more inclined to invest in new digital solutions than what is the case in Denmark and Sweden.



Conclusions, discussion and future perspectives

Main findings

Depending on the FM discipline, between 31 and 67 percent of the companies have defined strategies for sustainability related FM disciplines. Again, depending on the FM discipline, between 16 and 67 percent of the companies use digital solutions to support sustainability related FM disciplines. There seems to be a huge potential for digitalisation, supporting sustainability in the FM industry. Note that some companies that have sustainability on the agenda in their core business may not yet have taken the sustainability mindset into their FM-department.

When companies invest in digital solutions for support of sustainability related FM disciplines, the success rate is high. FM professionals experience that use of digital solutions in 74 to 91 percent of the cases helps achieve the strategic goals. Technology does make a difference, but what holds FM professionals back? This is a relevant topic for future research.

Based on these conclusions, the recommendation for all companies would be to build sustainability strategies and start investing in digital solutions for support of sustainability related FM disciplines in a more mature way. Both existing and new digital systems and technologies should be used in a more mature way. For instance, with more focus on use of digital solutions for benchmarking and collaboration.

The likelihood that companies will invest in digital solutions in the future is moderate to high, which is positive because as concluded; digital solutions do make a difference. But will the companies understand the

importance of defining a strategy? Without a strategy, the effect and success of implementing digital solutions may not be known.

All countries are almost at the same level when it comes to defining strategies (strategy building), but at different levels when it comes to use of digital solutions (digitisation). The use rate of digital solutions for sustainability purposes is as mentioned earlier generally low, but more common in Denmark and Norway than in the Netherlands and Sweden.

Digital solutions, when used, are mainly used for monitoring, planning, managing, reporting and analysing. To a lesser degree, digital solutions are used for benchmarking and collaboration. Benchmarking can be important, because comparing results can show how good you are performing. Collaboration is equally important, because most FM disciplines depend on deliveries from external service suppliers. The low degree of companies' use of digital solutions for support of benchmarking and collaborations shows that there is a potential for improvement in the way digital solutions are used.

Decisions to use digital solutions are most often based on mature strategic strategy and reputation and economic (cost) considerations, but also a matter of which technologies are available on the market. Hence, mainly problem driven, and somewhat technology driven.

The full picture of what technologies are being used for is complex. Not surprisingly, spreadsheets seem to be commonly used in most of the FM disciplines.

EMS, BMS and CAFM systems are also standard. Sensors seem to be the most commonly used technology, followed by cell phones/tablets and QR-codes. Some systems and technologies, such as CAD and BIM, may exclude one another, and others may be dependent on one another?

Answers to the hypotheses

As mentioned earlier, the following three hypotheses were formulated as part of the survey design:

1. In the FM industry, IT solutions are used to solve climate and sustainability challenges.
2. Different IT solutions are used to identify and solve the same climate and sustainability challenges - among the four countries.
3. Available IT solutions decide, which climate and sustainability challenges the FM organisations choose to solve (technology driven solutions rather than problem driven solutions).

The first hypothesis that in the FM industry, IT solutions are used to solve climate and sustainability challenges is moderately tested positive. Digital solutions are being used and they do help companies achieve their strategic sustainability goals. Nevertheless, many companies are still reluctant to implement digital solutions for support of sustainability purposes in the FM-industry.

The second hypothesis that different IT solutions are used to identify and solve the same climate and sustainability challenges - among the four countries, turned out to be more difficult to test. The results show that the tendency to use digital solutions in the four countries varies depending on FM-discipline. One country may be more inclined to solve a sustainability issue using digital solutions than another country. The reason for this could be different sustainability agendas in the four countries. If for instance focus is low on water consumption, investments in water management systems probably will not be prioritised.

The last hypothesis that available IT solutions decide which climate and sustainability challenges the FM organisations choose to solve (technology driven solutions rather than problem driven solutions), was quite convincingly tested primarily negative. Decisions to invest in digital solutions are mainly problem driven and only somewhat technology driven.

Recommendations for the FM industry

Sustainability is important therefore the FM industry is recommended to prioritise strategy building for sustainability in relevant FM disciplines. Defining strategies enables FM professionals to know how to reach the desired goals.

This report shows that digital solutions can help achieve strategic sustainability goals in the FM industry. Therefore the FM industry is also recommended to include digital solutions in the implementation planning of the strategies.

The FM industry could probably gain more value if existing and new digital systems and technologies were used in a more mature way. For instance, with more focus on use of digital solutions for benchmarking and collaboration.

Answers to the initial core question

The initial core question introduced in the introduction on page 4 was whether solutions and knowledge in one country could benefit all countries. One thing we can say is that this survey could only be developed because of the great commitment and engagement from all persons involved. All have contributed with knowledge and inspiration. The answer to the initial core question is therefore; yes, if we continue to collaborate.

References

- [1] DFM, Facility Management as a digital change agent, Dansk Facilities Management Netværk, 2019.
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- [3] United Nations, "Transforming our world: the 2030 Agenda for Sustainable Development," United Nations, 2015.
- [4] German Sustainable Building Council, "The DGNB (German Sustainable Building Council) Certificate for Buildings in Use," DGNB, Stuttgart, 2017.

Appendix



Survey questions

The survey questions can be downloaded from where this report was acquired.