

DFØ-report 2024 03
March 2024

Strategy – FinOps

*- Tools and guidance to reduce cost and environmental footprint
of governmental cloud services*

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1 Background

The Norwegian public sector marketplace (MPS) is a program that is organizationally part of the Norwegian Agency for Public and Financial Management (DFØ). The goal of MPS is to be the preferred meeting place between public entities and cloud system providers (CSP) when the Norwegian public sector seeks to invest in cloud technology.

Currently, MPS focuses on three different projects: Cloud Infrastructure and Platform Services (CIPS), CyberX and FinOps. CIPS will negotiate and manage IaaS and PaaS contracts on behalf of the Norwegian public entities. CyberX focuses on cyber security and aims to streamline the approach to security and privacy related to cloud services. Hereunder, CyberX will establish a portfolio of tools and guidance within the cybersecurity domain and work towards the government's goal of enhancing security in the public administration.

The last project and focus of this report, is FinOps. The goal of FinOps is to provide the Norwegian public entities with comprehensive guidance and tools to improve their understanding of cost, use and environmental impact of cloud services and ensure cost-effective and environmentally friendly cloud services.

This report presents information gathered from the public entities and relevant market actors and assess which activities the FinOps project shall prioritize going forward. The report consists of an analysis of needs, market analysis and strategic assessment. The analysis of needs summarizes key findings from a questionnaire that was sent to all entities in the Norwegian public civil sector. The market analysis presents the most important findings from the market dialogue and supplementing desktop analysis. Lastly, the strategic assessment utilizes the information gathered in the analysis of needs and market analysis to identify risks, set goals and define which activities that will be prioritized in the project.

2 Analysis of needs

2.1 Introduction

2.1.1 Scope of MPS

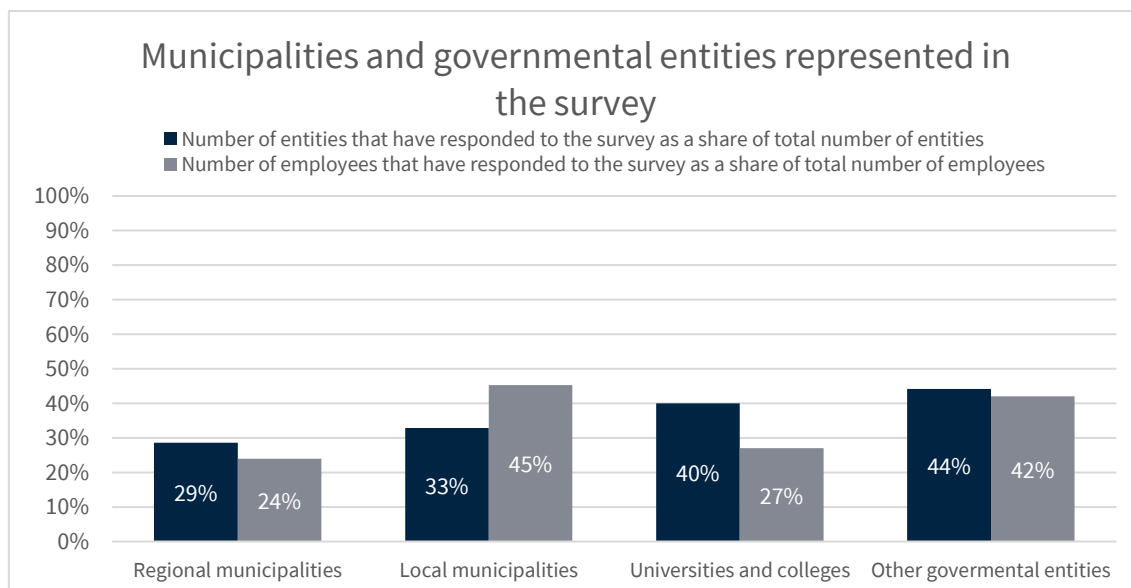
The Norwegian public civil sector consists of approximately 190 governmental entities with 147 000 employees and 135 000 man-years, 16 regional municipalities with 44 000 employees and 41 000 man-years, 356 local municipalities with 454 000 employees and 370 000 man-years.¹

2.1.2 Sample size

As part of the analysis, a survey has been distributed to all the entities in the Norwegian public civil sector. The figure below presents how many entities have responded to the survey. We have differentiated between municipalities, which consist of regional and local municipalities, and governmental entities, which consist of universities/colleges and other governmental entities.

The participation amongst the municipalities is 117 / 370 (33%) of the organizations and 215 000 / 495 000 (43%) of the total number of employees. Out of the 117 municipalities that have participated, 55 municipalities have answered on their own, while 13 different IT collaborations have responded on behalf of the rest (62 municipalities).

Amongst the governmental entities, about 8 universities and colleges as well as 76 other entities have participated in the survey. Together they constitute about 40% of the total number of organizations in this group and about 55 000 / 147 000 (38%) of the total number of employees.



¹ Sysselsetting statistikk fra KS for 2022: <https://www.ks.no/fagomrader/statistikk-og-analyse/sysselsettingsstatistikk/sysselsettingsstatistikk-om-kommunal-forvaltning/>, februar, 2024

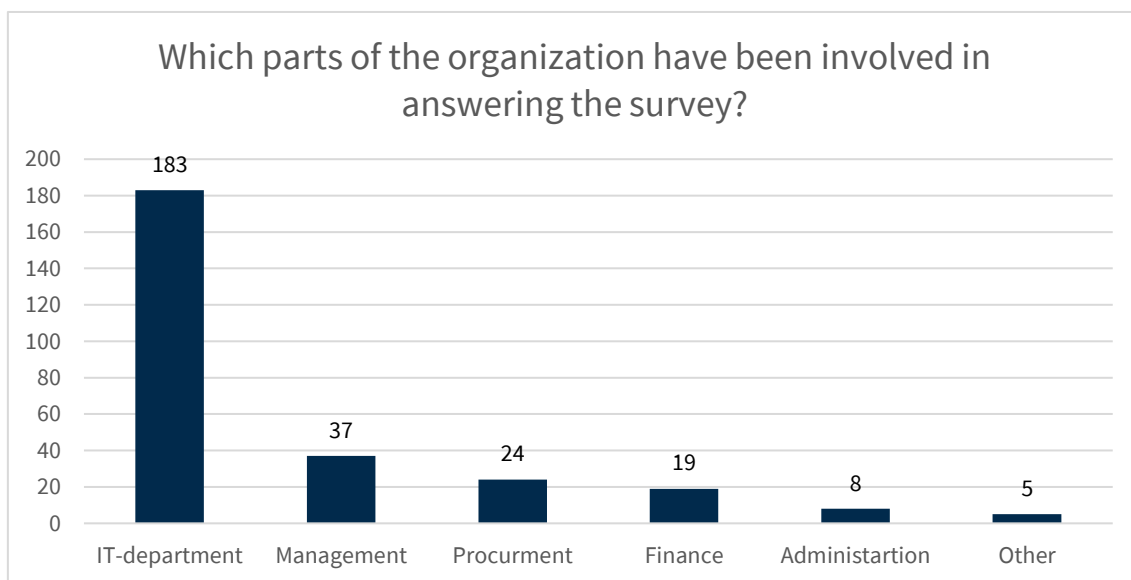
The table below further details how many entities and employees that have responded to the survey for different size-groups. I.e., out of 121 municipalities, only 3 (approximately 2%) have over 10,000 employees. These 3 municipalities account for 95,380 out of 213,935 total employees surveyed, which calculates to around 45%.

To summarize, we see broad participation of all sizes from entities amongst the municipalities and governmental sector. Relevant differences are, more participation from large municipalities compared to large governmental entities, and more participation from small governmental entities with less than 500 employees.

Size of entity (in employees)	Municipalities		Governmental entities		Total	
	Number of entities	Number of employees	Number of entities	Number of employees	Number of entities	Number of employees
More than 10000	3	95 380	1	17 844	4	113 224
Between 5000-10000	32	53 602	1	5 286	33	58 888
Between 2000-5000	40	41 383	3	8 591	43	49 974
Between 500-2000	28	19 908	14	14 050	42	33 958
Less than 500	18	3 661	65	9 615	83	13 276
Total	121	213 935	84	55 386	205	269 321

2.1.3 Respondents

The figure below visualizes which parts of the responding organizations that have been involved in answering the survey. The IT-departments are highly represented while management, procurement and finance have been involved, but to a lesser extent.



2.2 On-prem and cloud related IT-costs

In the survey, the Norwegian public entities were asked to calculate how much their organization purchase software, infrastructure, and platform services each year in NOK. It was specified that both on-prem solutions and cloud services, as well as other operating expenses, should be included in the estimate, while costs for counseling should be excluded.

The table below presents the results from this question. Given that the selection from the survey is representative for the population, we estimate that total on-prem and cloud related IT-costs is around 11,2 billion NOK excluding VAT today. It is interesting that local municipalities have a much lower cost pr employee compared to regional municipalities, and that governmental entities by far have the highest cost per employee.

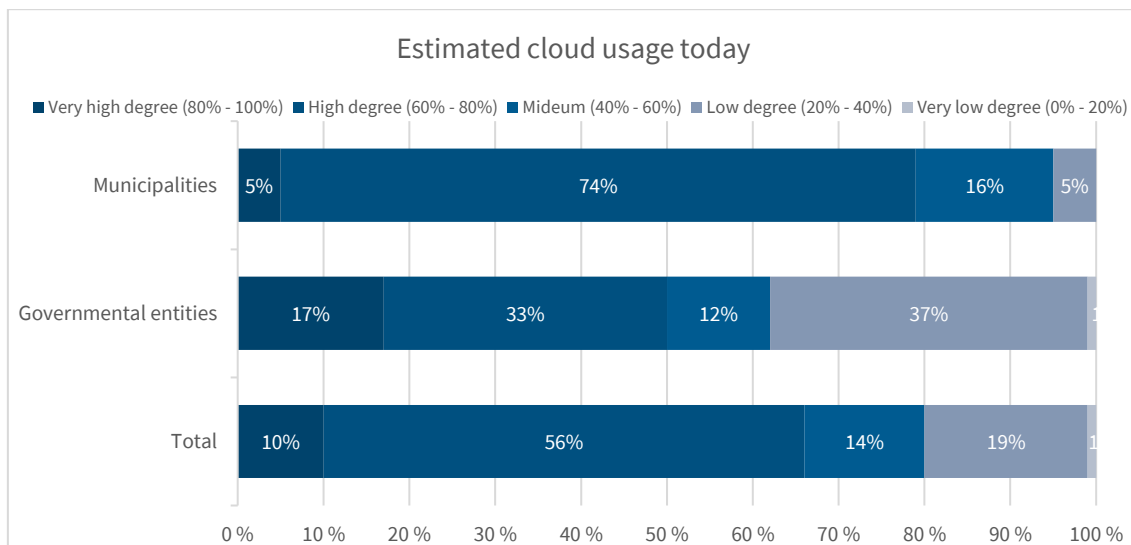
	Number of employees (selection)	Number of employees (total)	Estimated cost (selection)	Estimated cost excluding VAT (total)	Average cost per employee
Regional municipalities	10 600	44 103	223 000 000	927 827 264	21 038
Local municipalities	200 222	454 469	1 971 534 086	4 409 568 895	9 847
Universities and colleges	9 682	43 632	186 400 000	840 012 890	19 252
Other governmental entities	42 177	103 370	2 049 128 800	5 022 131 590	48 584
Total	262 681	645 574	4 430 062 886	11 199 540 638	16 865

*All costs are stated in NOK excluding VAT

2.2.1 Cloud usage today

As an extension to the previous question, the respondents were asked to estimate how much of the spend from the previous question is associated with cloud services. The figure below summarizes the results.

Based on the answers, we estimate that total cloud costs for the Norwegian governmental sector on average constitutes about 53% of on-prem and cloud related IT cost today (about 5,95 billion NOK ex VAT).

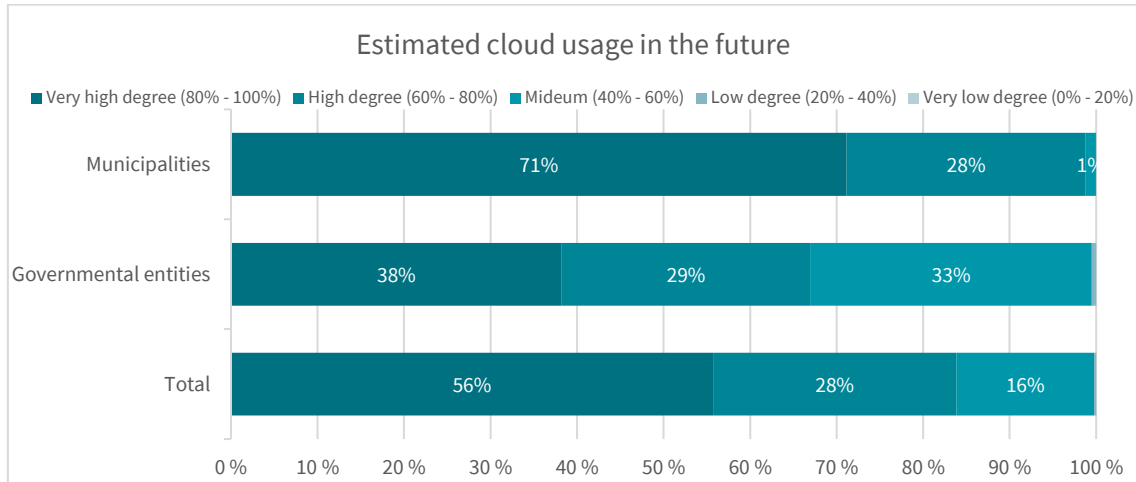


* Answers have been weighted for each entity's software related IT costs

As we can see, there is a big difference between municipalities and governmental entities. On average the municipalities state that cloud spend constitutes 63% of on-prem and cloud related IT costs (about 3,35 billion NOK ex VAT), while the governmental entities state the same cost as 44% (about 2,6 billion NOK ex VAT).

2.2.2 Expected cloud usage in the future

The respondents were also asked to estimate how much of the spend they expect to be related to cloud services in the future. The figure below summarizes the results. Based on the answers, we estimate that total cloud costs for the Norwegian governmental sector on average will constitute about 74% of spend in the future (about 8,3 billion NOK ex VAT).



* Answers have been weighted for each entity's software related IT costs

As we can see, there is still a big difference between the municipalities and governmental entities. On average the municipalities state that cloud services will constitute about 83% of their spend in the future (about 4,4 billion NOK ex VAT) while the governmental entities state the same cost as 67% (about 3,9 billion NOK ex VAT). These estimates do not consider budget changes.

2.2.3 Largest suppliers/systems

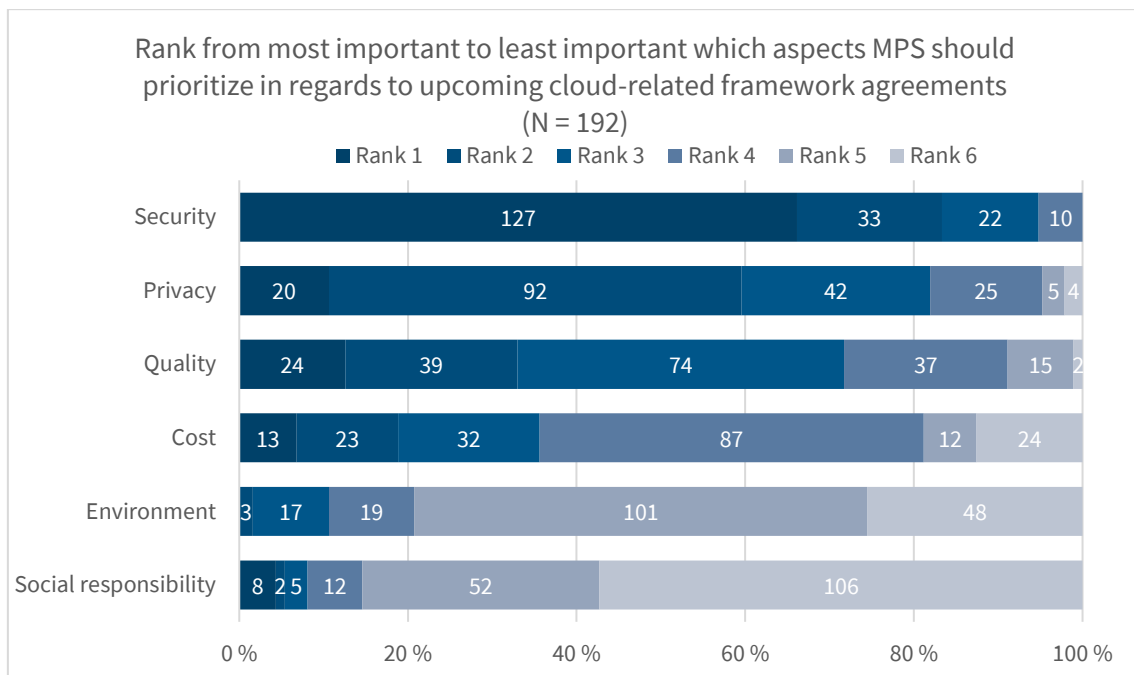
The respondents were also asked to state their 5 largest cloud-related suppliers/systems. The figure below visualizes the answers. Microsoft is by far mentioned by most respondents followed by Visma and Acos.



2.3 Important priorities and maturity

2.3.1 Key aspects

To gain a better understanding of the respondent's main priorities, they were asked to rank which aspects they think should be given the highest priority in upcoming framework agreements by MPS. Not surprisingly, security is ranked at the top with more than 60% making it their highest priority. Privacy dominates the second spot closely followed by quality. Cost is ranked fourth while environment and social responsibility is ranked low by most of the entities.

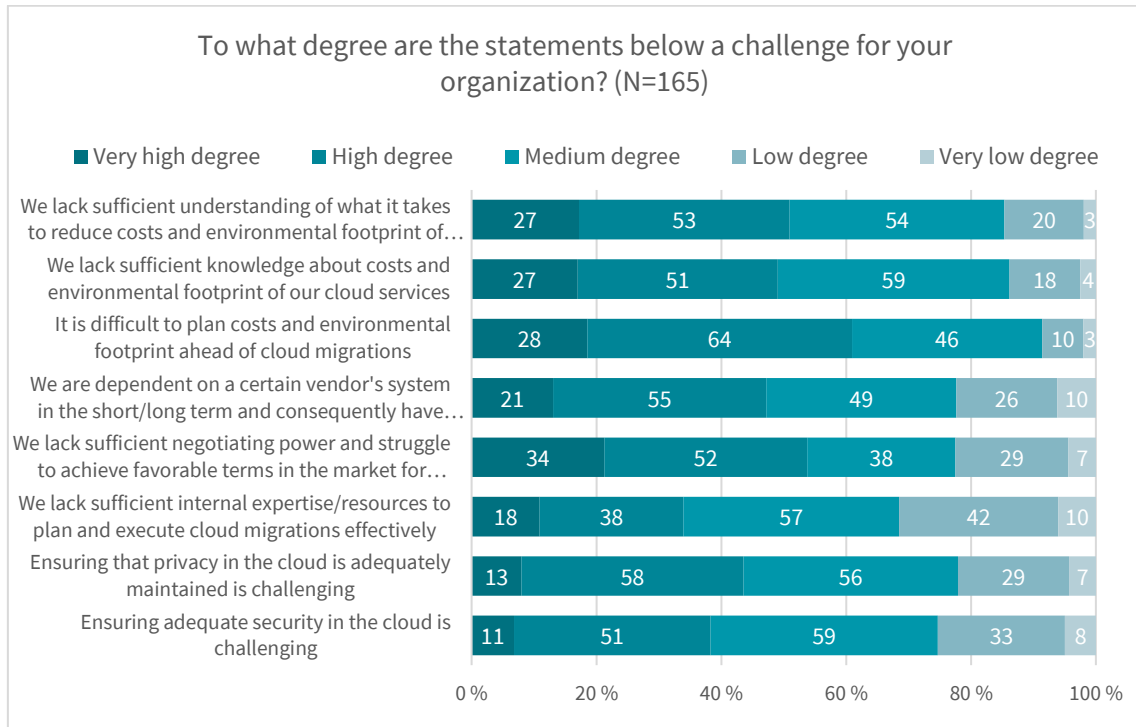


2.3.2 Common challenges

In the survey, the respondents were asked to evaluate the following statements and assess to what extent they are challenges for their organizations.

- We lack sufficient understanding of what it takes to reduce costs and environmental footprint of our cloud services
- We lack sufficient knowledge about costs and environmental footprint of our cloud services
- It is difficult to plan costs and environmental footprint ahead of cloud migrations
- We are dependent on a certain vendor's system in the short/long term and consequently have limited opportunity to negotiate terms
- We lack sufficient negotiating power and struggle to achieve favorable terms in the market for cloud services
- We lack sufficient internal expertise/resources to plan and execute cloud migrations effectively
- Ensuring that privacy in the cloud is adequately maintained is challenging
- Ensuring adequate security in the cloud is challenging

Although a respondent primarily utilizes cloud services today, they were asked to respond based on the challenges they experienced prior to the migration. The respondent’s answers are shown in the model below.



As the model illustrates, most entities state that they face challenges within all areas. Hereunder, at least 68 % of the respondents answered that they had challenges at a medium degree or higher within all statements. It is interesting from a FinOps perspective that the first three statements regarding understanding, knowledge and planning of cloud costs and environmental footprint is viewed as a greater challenge than lock-in, lack of negotiating power, resources/expertise, privacy and security.

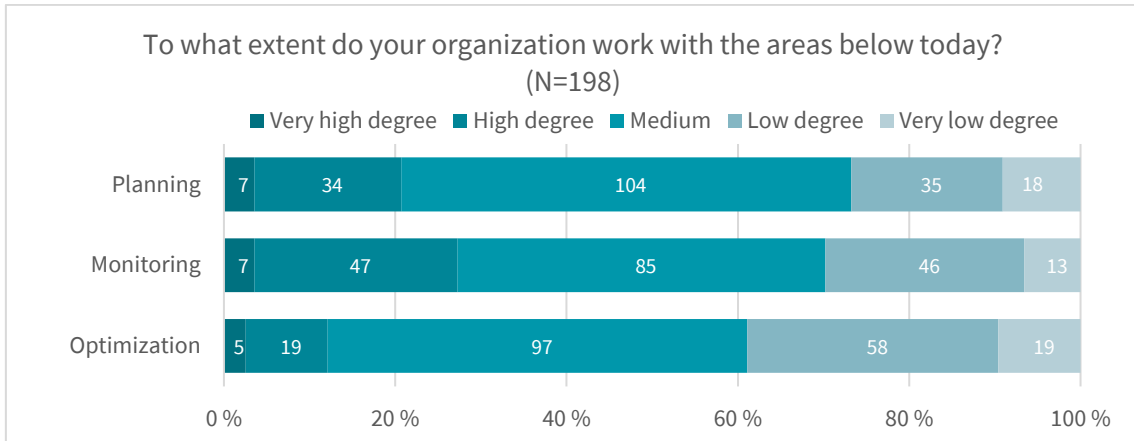
2.3.3 Planning, monitoring and optimization

The survey also included questions regarding the respondents need for tools and guidance within three different areas: planning, monitoring and optimization of cloud cost and climate footprint.

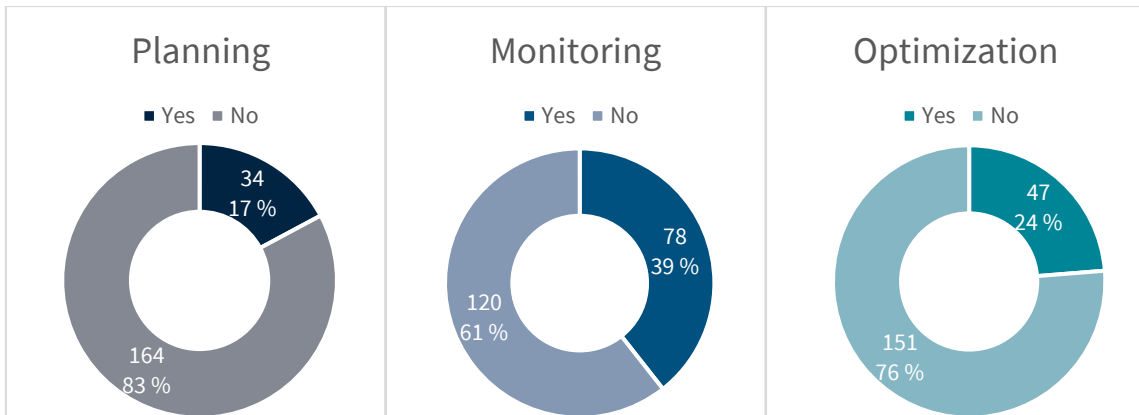
- Planning was defined as tools and guidance that enable the organization to plan for costs and climate footprint before migrating to the cloud or between different cloud providers.
- Monitoring was defined as tools and guidance for continuous monitoring of their organizations cloud consumption.
- Optimization was defined as tools and guidance that enables cost efficient and sustainable use of cloud services by proposing and/or implementing changes in their organizations cloud consumption.

2.3.4 Maturity

Firstly, the respondents were asked to consider to what extent their organization works with planning, monitoring, and optimization of cloud services today. From the figure below, we see that the respondents focus slightly more on planning and monitoring compared to optimization. Most of the respondent’s (70-80%) state that they work with these areas to a medium degree or less.



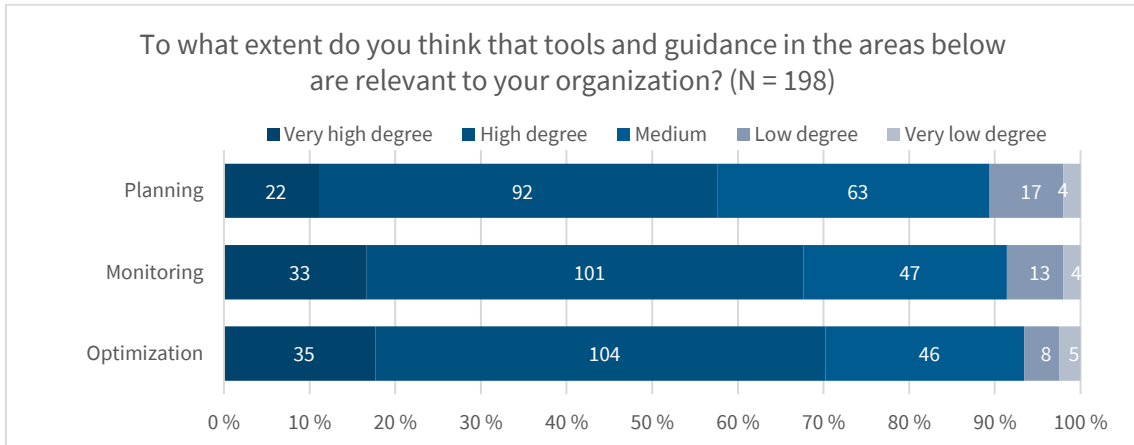
Secondly, the respondents were asked to state if they have active contracts with suppliers of tools within planning, monitoring, and optimization. 39% of the respondent’s state that they utilize tools to monitor their cloud consumption, 24% have tools with optimization capabilities and only 17% have active contracts for planning tools.



The entities that answered yes on the question above was asked to state the name of their suppliers/tools. From the answers it is reasonable to assume that a vast majority of the respondent’s use native tools ref. chapter 4.1.2, mostly from suppliers such as Microsoft and Google. Additionally, many respondents outsource management of their cloud environments to third parties like consultant firms and IT collaborations.

2.3.5 Relevance

Lastly, we asked the respondents to consider to what extent tools and guidance within planning, monitoring and optimization is relevant for their organization. The answers indicates that all areas are considered highly relevant by most respondents.

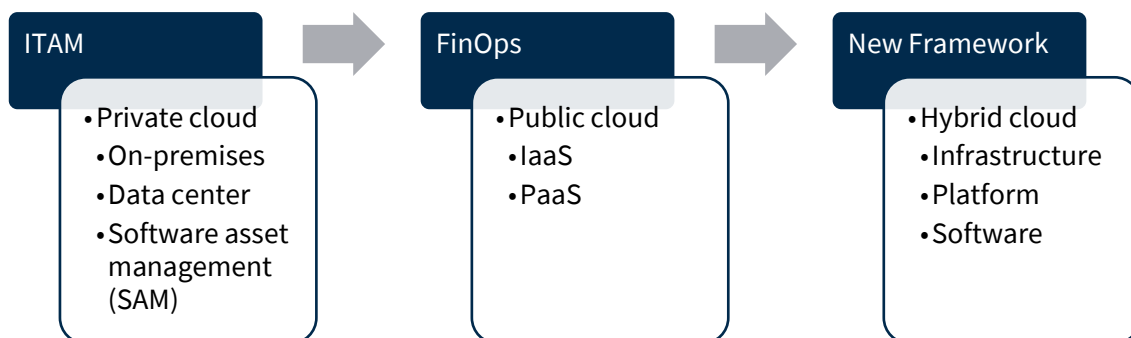


3 Framework

Due to the complexity and consumption-based nature of cloud services, it is necessary to create a flexible organization that continuously work towards optimizing the cloud environment with regards to cost, environmental impact, and performance. To achieve this, we believe it is important to have a common framework consisting of best practices and guidance for the Norwegian governmental entities.

IT asset management (ITAM) is a framework that historically has been used to manage on-premises environments. With the entrance of cloud services, new frameworks for managing cloud environments have appeared. The most used, is the FinOps framework, which is managed by the FinOps foundation, a meeting place for FinOps practitioners around the world.

The figure below illustrates that a new framework for the Norwegian government should encompass elements from both ITAM and FinOps. The reason is that hybrid cloud environments is widely used by both the Norwegian governmental entities and cloud users globally. We don't believe this tendency will change in the near future, and it might even become the long-term norm for most companies going forward.



Considering that mps is primarily focused on cloud services, it is natural that we base our framework on the FinOps framework and try to incorporate aspects from ITAM that are important to our userbase, like license management and management of on-prem resources. Luckily, The FinOps framework is continuously developed and adapted to meet user needs. The FinOps foundation recently stated that they have updated their framework to better suit the everyday challenges of FinOps personas. It includes, among other things, licensing and SaaS and a shift in focus from costs to the value of cloud services. Hereunder an increased focus on sustainable cloud services.²



According to the FinOps foundation: “*FinOps is an operational framework and cultural practice which maximizes the business value of cloud, enables timely data-driven decision*”

² FinOps Foundation: <https://www.finops.org/insights/2024-finops-framework/>, 2024

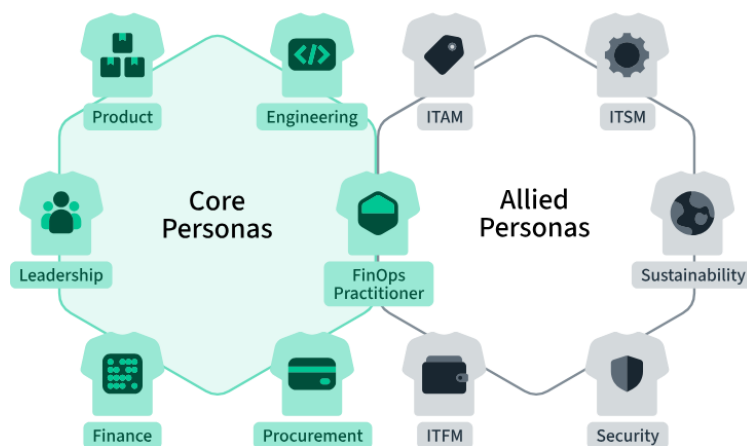
making, and creates financial accountability through collaboration between engineering, finance, and business teams”.³

FinOps consists of three phases; inform, optimize, and operate. The inform phase involves gathering necessary information like billing- and usage data, defining KPIs/goals and allocating costs to the correct stakeholders in the organization. Allocation is the process of enriching data by adding relevant tags and metadata about: person, team, department process, project etc. Allocated data lay the foundation for internal budgeting, forecasting, and benchmarking and makes it easier to manage and increase the value of an organizations cloud environment.

The optimize phase involves using the data gathered in the inform stage to improve cloud efficiency. This involves rightsizing workloads, storage, and licenses, utilizing commitment-based discounts like reserved instances and the spot market as well as increasing the level of automation. Important aspects to keep in mind when optimizing your cloud environment is described in more detail in chapter 4.8. Additionally, this stage involves cross-organizational collaboration to identify and remove/reduce inefficiencies where KPIs indicate that goals are not met.

The operate phase involves making necessary changes to enable the organization to take advantage of the data and knowledge gathered in the inform and optimize stages. This includes defining policies and guidelines, monitor KPIs and develop training programs/other activities to drive desirable organizational change. The goal is to develop a culture that continuously utilize the information and actions gathered in the other stages to increase the value gained from the cloud. This is a continuous effort which requires that the organization moves back and forth between the inform, optimize, and operate phases to reevaluate and learn.⁴

The FinOps framework highlights the importance of cross-organizational collaboration. The figure bellow is taken from the FinOps foundation and illustrates that there are many possible stakeholders in an organization.



Source: *FinOps Personas* by FinOps Foundation: [FinOps Personas](https://www.finops.org/framework/personas/)

³ FinOps foundation: <https://www.finops.org/framework/>, 2024

⁴ FinOps foundation: <https://www.finops.org/framework/phases/>, 2024

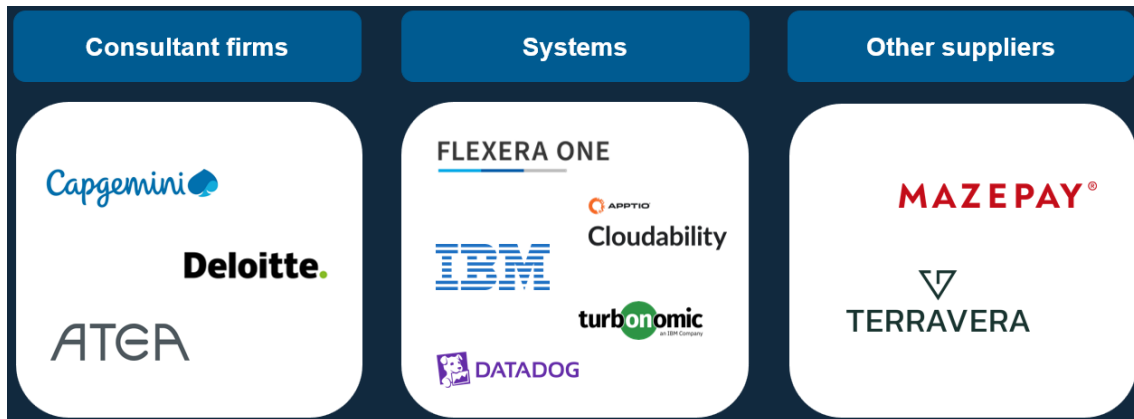
4 Market analysis

4.1 Market description

This chapter presents relevant suppliers, and describes their solutions, with focus on key characteristics. The market analysis consisted of an initial dialogue phase where we reached out broadly and talked to suppliers within several industries. Following the dialogue phase, we investigated several cost management tools in detail and focused on understanding different market actors with regards to their key services and functionality.

4.1.1 The dialogue phase

The dialogue phase started with a request for Information (RFI), published on Doffin and TED, where all relevant suppliers were encouraged to answer a survey and set up a one-to-one meeting with us. The figure bellow shows the suppliers we have been in contact with as a result of the RFI.



From meetings and the survey, we learned that FinOps is mostly associated with managing cloud costs. We see that different supplier types, like consultant firms, systems providers and other suppliers approach cloud cost management differently. Many consultant firms, as shown in the left part of the figure, help customers with cloud cost management on a project-to-project basis. Consultants are usually flexible and can tailor their services to specific customer needs. Examples of relevant services are: help with cloud migrations, cost analysis of cloud environments, development of homegrown cloud cost management tools, operating/management of cloud environments, and guidance/training to enable an organization to take advantage of their cloud environment.

Systems, as illustrated in the middle part of the figure, have a different approach compared to pure consulting firms. The focus is on continuous monitoring and optimization of cloud environments when it comes to e.g. cost, utilization, environmental impact and/or performance. Systems are usually standardized, and it is therefore necessary that customers allocate sufficient resources and go through training in order to maximize their benefits.

We've also spoken with specialized providers of payment and budgeting solutions as well as decision models. For example, Terravera develops highly customizable decision models

tailored to a clients' specific needs. These kinds of suppliers are illustrated in the right part of the model.

Early in the dialogue phase we decided to narrow down the scope to focus more on systems. The main reason is that we believe automation will be a crucial part in succeeding with cost and sustainability management in the cloud. As described later, managing public, hybrid and multi-cloud environments is complicated.

4.1.2 Other relevant suppliers

To supplement the findings from the market dialogue phase and understand the larger market dynamics, we have researched other suppliers. The figure below categorizes relevant suppliers into three categories: Native cost management tools, specialized cost management tools, and homegrown tools and other adjacent solutions.



Most of the Cloud Service Providers (CSPs) provide their users with native cost management tools to monitor spend within their platforms. The advantage is that these tools are usually free of charge, whilst the downside is that they focus on a single public cloud.

Specialized cost management tools are independent from the CSPs. The advantage of these tools is that they can offer multi-cloud functionality across different delivery models like Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), System-as-a-Service (SaaS) and on-premises. Additionally, governance capabilities enable organizations to take advantage of the increased flexibility offered by cloud services. On the other hand, to take full advantage of the system, it is necessary that customers allocate sufficient resources, and structures their organization properly. This is not an easy task, and it can appear expensive to have a specialized system if the organization does not take advantage of all its capabilities, especially since there are less expensive alternatives available.

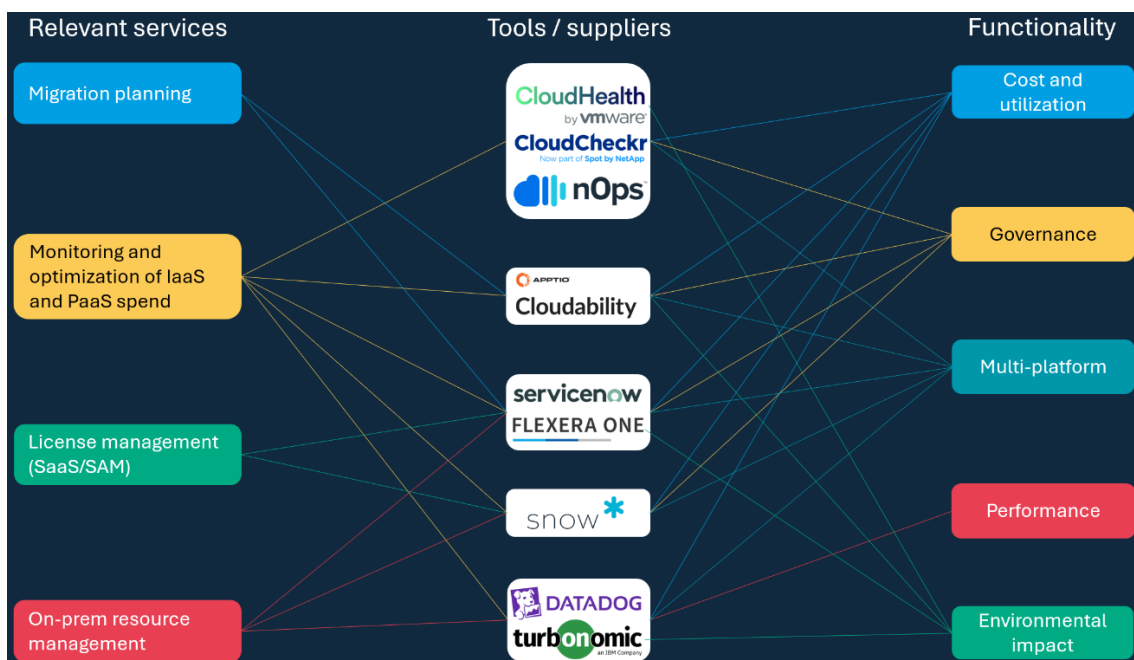
Many organizations have developed their own homegrown tool for managing their cloud environment. We believe the reason for this is that most organizations utilize a hybrid cloud and utilize several delivery models in their cloud environment. To get an overview and simplify management, it is necessary to gather information from several different sources and visualize it in one place.

Based on the findings above, the project scope was further narrowed down to focus mostly on specialized cost management tools. We believe that the number of services and functionality offered by native tools will limit our flexibility, while homegrown tools are considered complicated to develop, maintain and operate on behalf of several entities with different needs and maturity levels.

4.2 Market for specialized systems

As described in the previous chapter we have identified several suppliers that we think are relevant. Based on initial findings, the project scope has been narrowed down to focus on the specialized cost management systems. In this chapter we will investigate solutions that cover one or more delivery models (IaaS, PaaS, SaaS and on-prem). We also want to make sure that we look at multi-cloud solutions to avoid limiting ourselves to one CSP. Lastly, in addition to the obvious cost and utilization element, the project has found that functionality for in-house governance and the possibility to measure environmental impact is important for the project.

The figure below gives a coarse overview of the relevant market actors and shows which relevant services and functionality they deliver. We have described each service and functionality in more detail further down.



The figure is not a precise depiction of the market for specialized cost management systems and should therefore be interpreted accordingly. We cannot rule out that some connections might be missing. The figure also does not describe relevant differences between the suppliers when it comes to how services and functionality is designed and operate within the tool. For example, a tool can offer a more detailed and user-friendly view of environmental impact and have more advanced functionality for governing teams compared to other tools. This is not apparent from the figure.

4.2.1 Relevant services

Relevant services have been identified as migration planning, monitoring, and optimization of IaaS and PaaS spend, license management, and on-premises resource management. Migration planning has been defined as the task of moving from an on-prem environment to the cloud or between different cloud platforms. Even though only two suppliers state that they deliver this service, one can argue that providing multi-cloud functionality will make it easier for organizations to plan migrations.

Monitoring and Optimization of IaaS and PaaS spend has been merged into one category. Among other things, it involves taking advantage of discounts for reserved instances, utilizing the spot market, and removing digital waste by rightsizing. License management includes both SaaS license management and software asset management (SAM). Licenses are usually managed differently compared to private infrastructure and public infrastructure/platform. On-prem resource management involves managing on-premises infrastructure assets. Since the investment is made up front, it changes the goal from minimizing usage (cloud services) to maximizing utilization (on-premises).

As we can see from the figure in chapter 4.2, all the suppliers deliver monitoring and optimization services for IaaS and PaaS while fewer offer migration planning, license management and on-prem resource management. Four suppliers only cover public IaaS and PaaS while five suppliers take a more hybrid approach. Lastly, three suppliers cover everything from IaaS and PaaS to license management and on-prem resource management.

4.2.2 Functionality

In addition to offering different services, each tool also comes with key functionality. Every single tool we have looked at has functionality to control cost and utilization. This functionality lets customers monitor their expenses on an aggregate level and drill down to see cost per supplier, product group, product etc. These systems usually provide specific recommendations as to how costs can be reduced and, in some cases, implement the changes automatically or after approval within the system.

Most of the suppliers have functionality for governance built into their tools. This includes capabilities such as budgeting, forecasting, access control for different teams, and functionality for tagging cloud bills. In the cloud, purchasing decisions are made on a lower level in the organization and with a higher frequency than before. To reduce cost and environmental impact, it is therefore necessary to hold the correct people in the organization accountable. According to the FinOps framework, governance capabilities is a prerequisite for organizations to successfully optimize their cloud environment.

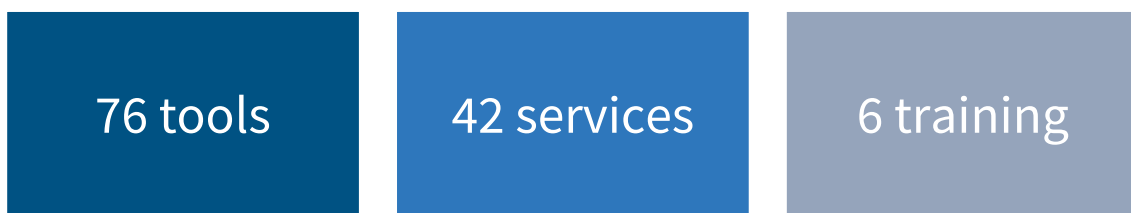
It's interesting that every single tool that we have looked at, except one, have multi-platform capabilities. By multi-platform we mean that the tool supports multiple different cloud-platforms, such as Azure, GCP, AWS, Oracle cloud, IBM cloud etc. It should be noted that we haven't investigated how the multi-platform functionality works. There is a difference between systems that optimize by giving recommendations across different cloud-platforms and systems that only offer recommendations within the currently used cloud-platform, even though the system can support several cloud platforms.

Some of the systems come from the operations side. In addition to cost management, they provide functionality that let the customer monitor the performance of their IT-environment. We won't go into detail about this functionality, but their approach is relevant. It lets the customer optimize around more than just cost. For instance, a customer might want to reduce costs but only under the premise that performance is kept at a certain level. This might seem easy on paper, but in complex cloud environments, where workloads are scaled up and down frequently and forecasting is necessary to predict future cloud needs, automation is key.

Lastly, environmental impact is becoming more and more important for companies, and it isn't any different within cloud services. There is currently a lot of work done by suppliers in all parts of the value chain to make environmental impact more transparent. From the figure in chapter 4.2, quite a few of the tools we have looked at can calculate environmental impact on behalf of their customers. Based on the dialogue meetings, we sit with an impression that this is a focus area in the industry, but that more work is needed before environmental impact can be measured with accuracy. Important considerations when measuring environmental impact of cloud services are: resource utilization, the level of renewable energy utilized, energy efficiency and water consumption ref chapter 4.8.2.

4.3 High degree of competition, but consolidation is looming

The FinOps Foundation maintains an overview of relevant suppliers. The figure below summarizes the number of different tools, services and training programs that is registered on their webpages. Keep in mind that one supplier can offer several systems and services so the total number of suppliers will be less than the number in the figure.



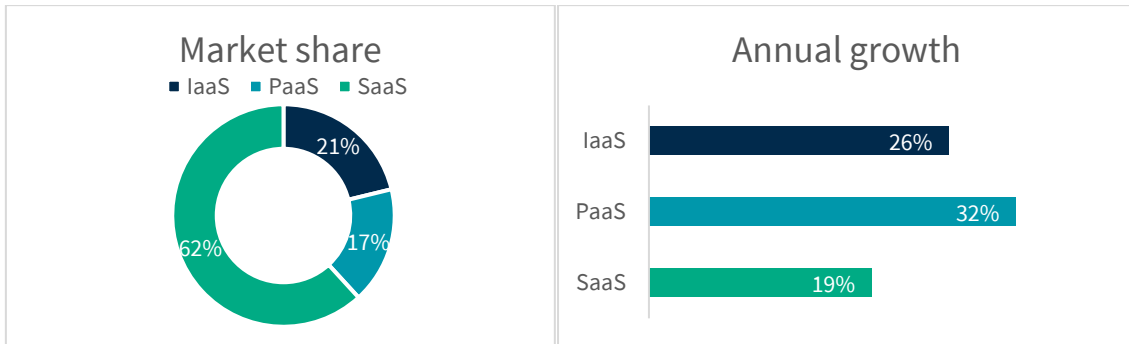
Source: FinOps Landscape by FinOps Foundation: [FinOps Landscape - FinOps Tools, Services & Training](#)

As of writing this report, we learned that IBM have bought Apptio and Turbonomic, while Flexera recently purchased Snow software. Even though there are many tools out there and the competition is high, there is an ongoing consolidation which might reduce competition in the future.

4.4 SaaS is dominating but IaaS and PaaS is picking up pace

The information in the figures below, is obtained from the international data corporation's (IDC) semi-annual report. The report tracks revenue, market share and growth across IaaS, PaaS and SaaS, as well as the largest suppliers of each service. As we can see, SaaS is dominating with 62% of the market share, while IaaS and PaaS is far behind with

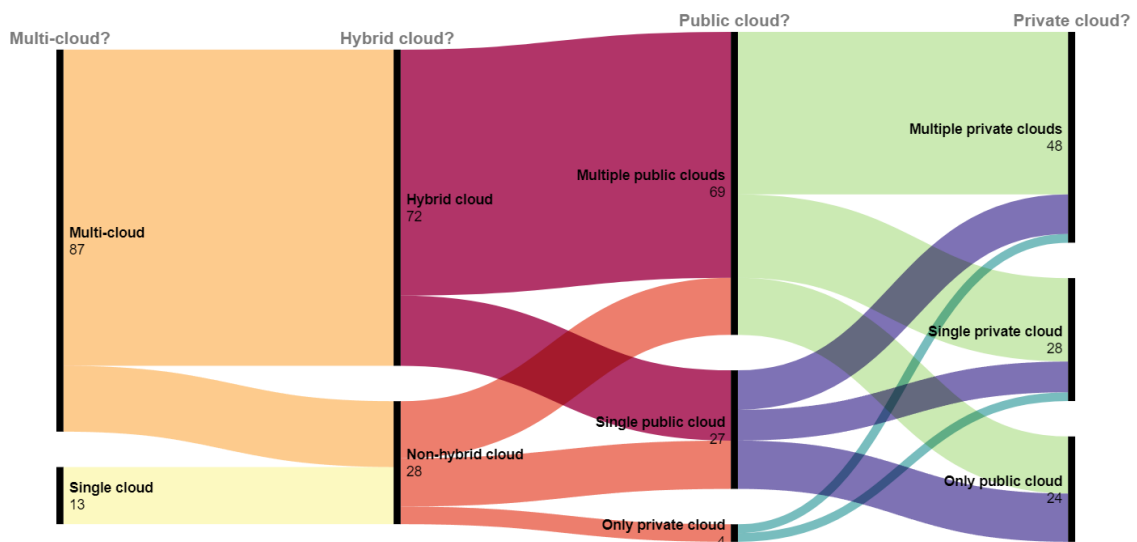
respectively 21% and 17%. On the other hand, IaaS and PaaS have a higher growth rate compared to SaaS.



Source: IDC Worldwide Semi-annual Public Cloud Services Tracker, H2 2022: <https://www.idc.com/getdoc.jsp?containerId=prUS51009523>

4.5 High degree of hybrid cloud and multi-cloud usage

Flexera's state of the cloud report is an annual survey which had 750 respondents in 2023. The survey includes questions about how the respondents organize their cloud services, what their biggest challenges are, and much more. Respondents represent companies from all around the world, but America and UK dominate with respectively 67% and 13% of the respondents. Additionally, it is important to keep in mind that Flexera is a supplier of multi-cloud and hybrid cloud cost management solutions which may have influenced which organizations that have participated in the survey.



Numbers represents percentages. Generated using RAWGraphs 2.0 and data from Flexera 2023 State of the cloud report: [Flexera 2023 State of the Cloud | Report](#)

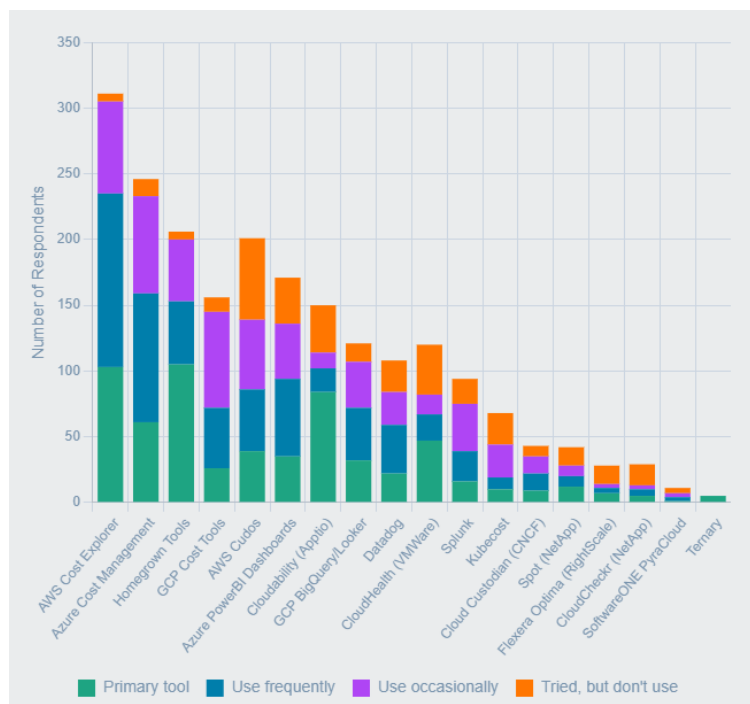
The figure summarizes results from the survey. Hybrid cloud is widely used by 72% of the respondents while 24% only use public cloud and 4% only use private cloud. The survey also investigates whether the responding organizations operate in a multi-cloud or single cloud environment. As we can see, 87% state that they operate in a multi-cloud environment. Among these, 69% utilize multiple public clouds, compared to 27% that utilize one single

public cloud and 4% that utilize private cloud only. The widespread use of hybrid and multi-cloud environments can be verified from other sources, and many believe that this is the future. On the other hand, Flexera’s 2023 survey identified an increase in single public cloud usage to 11% compared to the previous year’s 9%. This could indicate that more organizations will standardize on a single public cloud in the future.

4.6 Widespread use of native and homegrown tools on the global market

FinOps Foundation’s state of FinOps is an annual survey, which had 1245 respondents in 2023. The survey includes a lot of relevant questions pertaining to how the respondents practice FinOps within their organization. It should be stated that respondents are from all around the world with relatively high, cloud related spend. Results from this survey should therefore be used as a snapshot of the state of the more mature users of cloud services and market as a whole.

The survey reveals that, on average, each responding organization utilizes 4,1 different tools. Among the respondents, 57% use native tools, 21% employ FinOps tools, and 14% utilize homegrown solutions. The figure below further visualizes which tools are used and how frequently. Native tools are utilized to some degree by most organizations and is used as the primary tool by many. We believe that the reason for this is that native tools are free of charge and easily accessible in the respective CSPs platform. On the other hand, homegrown tools and FinOps tools also serve as primary tools for many respondents. This might be because of the high degree of hybrid cloud and multi-public cloud usage reported in Flexera’s state of the cloud report, ref. chapter 4.5.



Source: State of FinOps by FinOps Foundation: [The State of FinOps](#)

4.7 Challenges

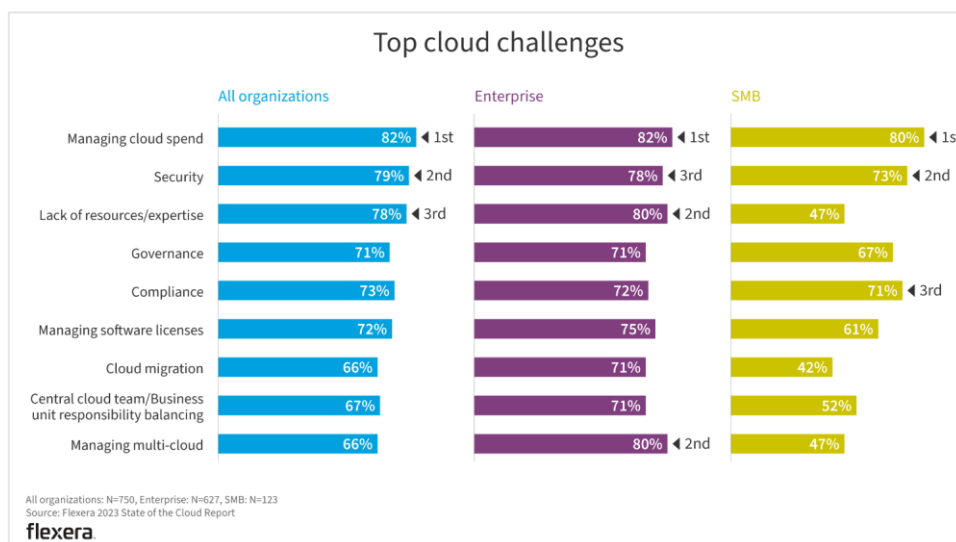
This chapter presents common complicating factors and challenges when managing cloud environments.

4.7.1 General complicating factors

Before moving on to more specific cloud and FinOps related challenges, it is important to understand that there are some general complicating factors that will apply to anyone that decide to buy cloud services. Firstly, each CSP offer thousands of unique product lines. It can be challenging to become familiar with all the available options and their respective pricing models to determine what best suits your company's needs. Secondly, different cloud system providers operate with different product compositions, product definitions and price models, which can make orientating- and managing cloud environments difficult. This complexity can serve as a lock in, due to the barriers of switching to a new cloud platform, or the added complexity of working in a multi-cloud environment.

4.7.2 Cloud challenges

The figure below is from Flexera's state of the cloud report from 2023. As the figure illustrates, managing cloud spend is considered the top challenge among all the respondents, including both large enterprises and small and medium-sized businesses (SMBs). Other interesting results is that cloud migration and managing software licenses is rather low on the list. Also, managing multi-cloud is rated lowest by all organizations but is stated as the second biggest challenge for larger enterprises. It is reasonable to assume that large enterprises utilize multi-cloud to a higher degree than SMBs.



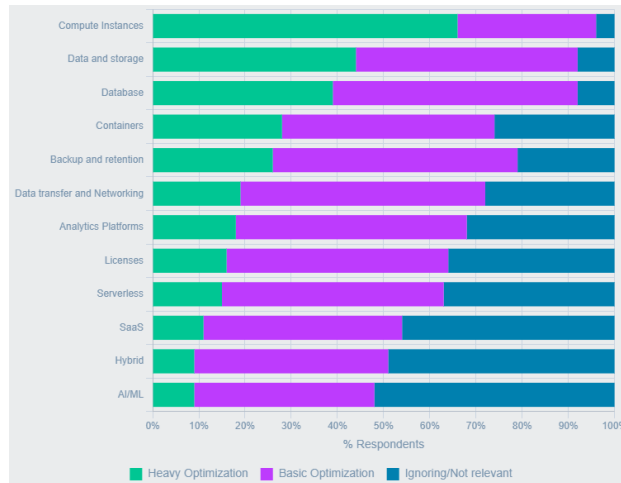
Kilde: Flexera 2023 State of the cloud report: [Flexera 2023 State of the Cloud | Report](#)

4.7.3 FinOps challenges

The State of FinOps report by the FinOps Foundation also show their respondents' biggest challenges and key priorities. Amongst others, respondents prioritize rightsizing their cloud environment, managing commitment-based discounts, forecasting and allocating cloud spend, adopting FinOps, implementing policy and governance, enabling automation and

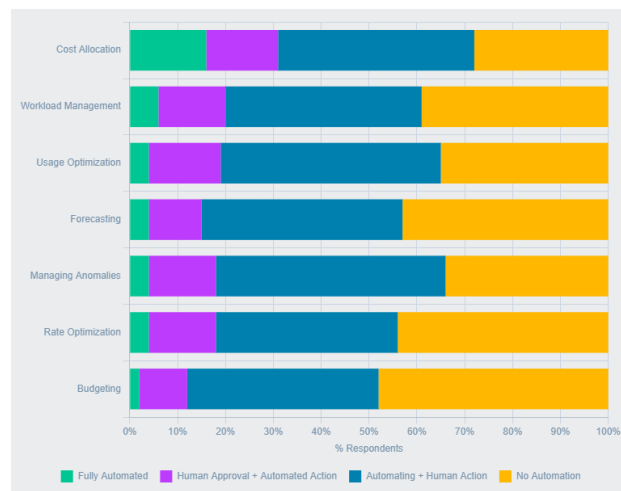
multi-cloud reporting. The survey indicates an increase in priority for automation and adoption of FinOps and a decrease in managing non-IaaS costs and hybrid cloud cost reporting.⁵

Optimization and automation are ongoing challenges within FinOps. The figure below visualizes the level of optimization for different cloud services. It is interesting that services associated with IaaS and PaaS is optimized to a much higher degree than licenses, SaaS and hybrid environments. On a general note, FinOps foundation state that they see room for more optimization amongst the respondents.



Source: State of FinOps by FinOps Foundation: [The State of FinOps](#)

FinOps foundation also asks about level of automation. We won't go into too much detail on this subject, but the results indicate that the level of automation is relatively low in most areas, and that human involvement is needed for most FinOps tasks. The reasons might be many, but we suspect that cloud complexity in conjunction with lack of competence and system support are the main reasons. Either way, we expect to see this change in the future due to the maturing cloud service industry as well as the application of more artificial intelligence (AI) and machine learning (ML).



Source: State of FinOps by FinOps Foundation: [The State of FinOps](#)

⁵ State of FinOps by FinOps Foundation: [The State of FinOps, 2024](#)

4.8 Cost-effective and sustainable cloud services

This chapter explains the most important aspects to ensure that cloud environments are run in a cost-effective and sustainable manner. Keep in mind that this explanation is general and that price models vary a lot between different CSPs and delivery models (IaaS, PaaS, SaaS, on-premises).

4.8.1 Reducing costs require continuous effort

As mentioned before, public cloud services utilize consumption-based pricing. This entails that each customer only pays for what they use and that CSPs tune their price model to maximize profit across all customers within their cloud platform. Consequently, customers have a strong incentive to maximize the efficiency of their cloud environment. This is called rightsizing and involves removing unnecessary storage, workloads, licenses etc. It has also become more important than ever to write efficient code and maximize the utilization.

According to Flexera's state of the cloud report from 2024, 27% of all cloud spend is wasted, down from 30% in 2020⁶. This potential seems to be supported from other sources as well. It is important to keep in mind that the estimate is based on a survey and that the quality of the estimate is dependent on how the question was formulated and each responding organizations knowledge. It is also uncertain whether the savings potential accounts for cost savings achieved by negotiating better terms and conditions and utilizing discounts. By taking advantage of discounts like reserved instances, savings plans and consumption-based commitments, choose cheap regions/CSPs and utilize the spot market, organizations can likely bring down costs even further.

4.8.2 Measuring environmental impact

FinOps foundations state of FinOps highlight a lack of collaboration between FinOps practitioners and sustainability teams with less than 20% that are currently collaborating. On a more positive note, 50% of the respondents expect this collaboration to be more pronounced in the future.⁷ Based on answers in the analysis of needs, we expect that the situation is similar amongst the Norwegian public entities going forward.

We argue that cloud services are usually more sustainable when compared to on-premises environments. The main reason for this is that dedicated data centers can achieve better energy efficiency and higher resource utilization due to economics of scale. An important premise is that datacenters have a similar use of renewable energy and environmentally beneficial cooling systems as the on-premises alternative. Consequently, a lot of the environmental impact of cloud services is dependent on the data center that is used.

Additionally, the need for continuous rightsizing in a consumption-based cloud environment will reduce both costs and environmental impact. Provided that CSPs build their price models in a way that incentivize efficient resource allocation, there are no conflicts between reducing costs and environmental impact. On the other hand, according to the FinOps

⁶ Flexera 2024 State of the cloud report: [Flexera 2024 State of the Cloud | Report](#)

⁷ State of FinOps by FinOps Foundation: [The State of FinOps, 2024](#)

foundation this is not always the case: “*Generally speaking, Workload Optimization recommendations correlate closely with lower carbon emissions by only using what is needed, and only when it is needed (i.e. turn the lights off when not in use, use the correct size tool for the job). However, cloud sustainability efforts can run counter to cost savings in Rate Optimization efforts, where reserved discounts on certain resources might discourage optimizing them or turning them down*”.⁸ It is therefore important that optimization efforts consider the tradeoffs between cost and environment.

It is difficult to obtain data that is detailed enough to estimate environmental footprint with a high degree of precision. From the market dialogue, it seems that the largest CSPs are focused on improving their measurements. Additionally, several of the specialized systems we have studied, measure environmental footprint on behalf of their customers. We are not certain about the level of detail in these measurements, and they are probably lacking in some areas, but the industry seems to be focused on improving the measurements.

Lastly, EU regulatory measures such as the [corporate sustainability reporting directive \(CSRD\)](#), the [EU taxonomy and the EU Energy efficiency directive](#) is also expected to be a significant drivers of more standardized and precise methods of environmental impact measurement in the upcoming years.

4.9 Security

The market analysis has uncovered a few possible safety concerns which must be explored and addressed going forward. Most of the suppliers that we have talked to state that their cost management system is delivered as a SaaS service, but there are providers that can deliver the system on-premises if desired. Additionally, it seems like most suppliers are flexible with regards to where user data is stored, but this must be verified.

These systems require detailed billing and usage information to operate properly, and it is important to ensure that the right permissions are granted to the correct individuals in the organization. Only administrators should have read-write access to data, and read-only data should be given only to relevant resources, such as the finance team, or head of the department. Different access types can affect how frequent datapoints are updated and what functionality is available to the user. A read-only access will give the user access to real time data but in order to utilize most automation options, a read-write access is needed.

An important aspect when considering the level of security needed, is whether the data that is gathered and used by the system is sensitive. Our initial assessment is that data may contain trade secrets where user specific discounts is negotiated, but that most of the price information is based on publicly available price lists. At this stage, we cannot see that the data contain any personal information and information that can pose a threat to national security, but there might be exceptions.

⁸ Cloud sustainability by FinOps Foundation: [Cloud Sustainability FinOps Framework Capability](#), 2024

Lastly, license management systems utilize inventory scanners or agents to scan systems for active licenses. This naturally entail some security concerns depending on where the agent is deployed.

5 Strategic assessment

In this chapter we compare and highlight key findings from the analysis of needs and market analysis. The goal is to make an argument and prioritize what guidance, proof of concepts, and contracts that will be prioritized in the MPS FinOps project.

5.1 Prioritized activities

The table below summarizes key focus areas and goals for the FinOps project. We shortly describe our challenges and how we plan to address them going forward.

Goals	Risk	Planned activities to reduce risk
5.1.1 Increase awareness of the importance of FinOps and improve cloud management capabilities in the Norwegian public sector	High	<ul style="list-style-type: none"> • Develop a framework for cloud management with emphasis on cost, environmental impact and system performance. • Proof of concept will test tools with governance capabilities. • Carry out an annual survey to monitor maturity, map areas of improvement and raise awareness.
5.1.2 Make it easier for public entities to optimize their cloud environment	Moderate	<ul style="list-style-type: none"> • Optimization will be included in the framework for cloud management. • Proof of concept will test optimization capabilities. • Important aspect in upcoming tenders and negotiations.
5.1.3 Enable public entities to take advantage of hybrid and multiple public cloud environments	High	<ul style="list-style-type: none"> • Proof of concept will test tools with multi-cloud capabilities. • Negotiate parallel agreements to ensure that different needs are met.
5.1.4 Make it easier for public entities to utilize automation to manage their cloud environment	Moderate	<ul style="list-style-type: none"> • Optimization will be included in the framework for cloud management. • Proof of concept will test automation capabilities and map barriers.
5.1.5 Ensure that cloud management tools can be deployed with the correct level of security	Moderate	<ul style="list-style-type: none"> • Proof of concept will test and address security issues. • Important aspect in upcoming tenders and negotiations.
5.1.6 Facilitate for a broad userbase with varying degrees of maturity and available resources	Low	<ul style="list-style-type: none"> • Negotiate parallel agreements to ensure that different needs are met.
5.1.7 Enable efficient license management	Low	<ul style="list-style-type: none"> • Proof of concept will test tools with SaaS license management capabilities.
5.1.8 Support existing portfolio on MPS	Low	<ul style="list-style-type: none"> • Proof of concept will test tools for IaaS and PaaS management

5.1.1 Increase awareness of the importance of FinOps and improve cloud management capabilities in the Norwegian public sector

The analysis of needs gives us reason to believe that cost management is mostly handled by the IT department and that important functions like finance, procurement and management isn't sufficiently involved. The FinOps framework advocates that cross organizational collaboration is necessary to succeed with cloud cost optimization. Due to a lack of mandate, it will take time to implement such a philosophy into an organization that not necessarily see the benefit immediately. Additionally, tools for cost management can be perceived as expensive and will demand resources and dedication from the whole organization. It is also important that we facilitate for different types of organizations so that effort is proportional to the size of their cloud environment.

To address this, we propose that MPS develop a framework tailored to the needs of the Norwegian public sector. We also suggest that upcoming proof of concepts tests a tool that have functionality for governance, ideally based on the FinOps methodology. To keep track of the maturity level, map areas of improvement, and raise awareness, we will conduct an annual survey e.g. "State of the Norwegian public cloud". The plan is to publish results on our web pages and information meetings. It might be relevant to offer FinOps training in the future, but we believe that it is necessary to build a proper portfolio of contracts and guidance first.

5.1.2 Make it easier for public entities to optimize their cloud environments

During the market analysis we discovered that most organizations have a huge savings potential, and consequently also a big potential to further optimize their cloud environments. We also discovered that many cost management tools consider other factors than cost when recommending changes and improvements. Different user groups have different priorities. A developer might want to ensure good system performance with a high enough degree of certainty, the finance department is focused on reducing costs, and management want to minimize environmental impact. Although one goal doesn't automatically exclude the other, there is bound to be areas of conflict, and trade-offs is necessary.

To address this, optimization will be a key aspect in upcoming proof of concepts and preparation for tenders. Additionally, the framework mentioned above must define responsibilities for each user group to ensure that the organization continuously works toward optimizing and improving their cloud environment.

5.1.3 Enable public entities to take advantage of hybrid and multiple public cloud environments

Most of the entities we've been in contact with states that a large part of their consumption is cloud services, and that it will likely increase in the future. On the other hand, their answers also indicate that they will continue utilizing a hybrid environment in the future.

This is in line with what we see in the market analysis, where most organizations state that they use hybrid cloud. As of writing this report, we believe that hybrid cloud environments will continue to be commonly used.

The vast majority of the public entities state that Microsoft is their largest supplier. Widespread use of Microsoft 365 can help explain the dominance, but it is interesting that only a very small minority states Google, Amazon, Oracle, or IBM as one of their largest suppliers. From the market analysis we know that many organizations utilize multiple public clouds. To take full advantage of specialized cost management tools, increase competition amongst the CSPs and prevent lock-in we believe that a multi-cloud approach is best suited for the Norwegian public sector.

To address this, upcoming proof of concepts will test tools that support multiple public clouds and make it easier to optimize a multi-cloud environment. Upcoming guidance, and the framework, will also try to be as general as possible so that it can be applied to any public cloud. We will also consider negotiating parallel agreements to ensure that MPS have a portfolio of tools that support different cloud environment compositions.

5.1.4 Make it easier for public entities to utilize automation to manage their cloud environment

Another important aspect that we discovered in the market analysis is automation. Due to the vast number of products and product compositions, the consumption-based nature of public cloud and the widespread use of hybrid- and multiple public cloud environments, the optimization problem is becoming more and more complex. Also, with the increased focus on AI and ML, we believe that automation will become a significant part of FinOps in the future. From the market analysis we see that the use of automated solutions is still rather low even in a global perspective, and that manual actions are still widely used.

To address this, upcoming proof of concepts will test automation capabilities within the tools and consider what is the biggest barriers to achieving automation. Dependent on the barriers, e.g. cost, security, competence and/or technology, upcoming tenders and guidance will seek to reduce these.

5.1.5 Ensure that cloud management tools are deployed with the correct level of security

In the market analysis we mapped possible security issues. Our initial assessment is that the risk associated with cloud management tools is limited. On the other hand, security can become a barrier of entry for many public entities if not taken seriously. From the analysis of needs and market analysis, we know that most organizations don't utilize third party cost management tools. To ensure high participation and usage of upcoming contracts, it is necessary to remove all barriers. Additionally, to achieve automation, real time data access, and license management, a more advanced system integration is required (read/write). These integrations may entail some security concerns.

To address this, upcoming proof of concepts and tenders will explore how we can mitigate possible security threats as much as possible.

5.1.6 Facilitate for a broad userbase with varying degrees of maturity and available resources

From the analysis of needs we see that our userbase consists of a wide range of different entities. Core business, budget sizes and number of employees vary a lot. Consequently, maturity levels are different and must be considered in upcoming procurement processes. For some entities, IT and cloud is deeply integrated and part of their core business, while others struggle to make sufficient use of IT and cloud services to streamline their business. Additionally, most of the entities respond that they find it hard to manage their cloud costs, don't have a cost management system, and are likely unaware of the environmental impact of their cloud environment. From the analysis of needs, it seems like most entities struggle with cloud cost management, which is consistent with what we see for the global market in the market analysis.

To address varying levels of maturity and needs within our userbase, we will consider negotiating parallel agreements. This ensures that MPS have a portfolio of solutions and that entities can base their choice on what suits their organization and cloud environment best.

5.1.7 Enable efficient license management

From the market analysis it appears that license management (SaaS) is easier to handle for most organizations compared to IaaS and PaaS spend. The reason might be that handling license management in the cloud is similar to how it is handled on-prem. From the market analysis we also see that SaaS constitute the majority (60%) of the global public cloud market. If not to an even higher degree, this is most likely also the case for the Norwegian public sector. To ensure a holistic approach to cloud management it is therefore important that license management in the cloud is covered by upcoming procurement processes.

To address this, upcoming proof of concepts will test tools that includes SaaS license management. We will also consider negotiating parallel agreements to ensure that MPS have a portfolio of tools that can support different cloud environments.

5.1.8 Support existing portfolio on MPS

As mentioned in the introduction, MPS have two other projects that involve procurement of cloud services. CIPS are focused on covering IaaS and PaaS, while CyberX includes tools, guidance, and training to improve cyber security. Since MPS' is currently focused mostly on IaaS and PaaS, the FinOps project should provide tools that support these contracts.

To address this, upcoming proof of concepts will test tools for managing IaaS and PaaS spend.

5.2 Timeline

The figure below is based on the discussion in the previous chapter and describes our plans and milestones going into 2024 and 2025.

