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The state of **multiphysics simulation** in 2025: Challenges, trends and opportunities

Juha Riippi
CEO & co-founder
Quanscient

Jukka Knutinen
Head of Marketing
Quanscient

Housekeeping items

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Before we start

Submit your questions at any time

We'll address them throughout the event.

In addition, we'll have a dedicated Q&A session at the end.

Report given out at the end

We will hand out the full report at the end of the event.

It will become downloadable from the sidebar.

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Introduction to the speakers

Juha Riippi

CEO & co-founder

Quanscient

Jukka Knuutinen

Head of Marketing

Quanscient

Agenda

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Webinar agenda

1

Introduction (5 min)

Jukka Knuutinen
Head of Marketing, Quanscient

- Welcoming words
- Housekeeping items

2

Forewords (5 min)

Juha Riippi
CEO & co-founder, Quanscient

- Motivation for a study like this
- Considerations when analyzing the results
- Overview of the demographics

3

State of multiphysics simulation in 2025 (5 min)

Juha Riippi

- Primary approach to simulation
- Which tools are used?
- Number of simulation tools used

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Webinar agenda

4

Role of simulation in modern R&D (5 min)

Juha Riippi

- For what purpose are simulations used?
- At what stage of R&D are simulations used?
- Is simulation usage perceived as sufficient?
- How valuable is the function of simulation perceived?

5

Challenges faced with existing solutions (10 min)

Juha Riippi

- 4 main challenges identified
- Other challenges
- Further analysis of the challenges and their impact

6

Trends and future expectations (10 min)

Juha Riippi

- Technological advancements in the next 5 years
- Analysis of the 4 key emerging technologies

→ **Report handout**

Agenda

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Webinar agenda

7

Q&A (10 min)

All speakers

- Live discussion and answers to audience questions

8

Conclusion and key takeaways
(5 min)

Jukka Knuutinen

- Summary and key takeaways of the webinar
- Additional resources to learn more

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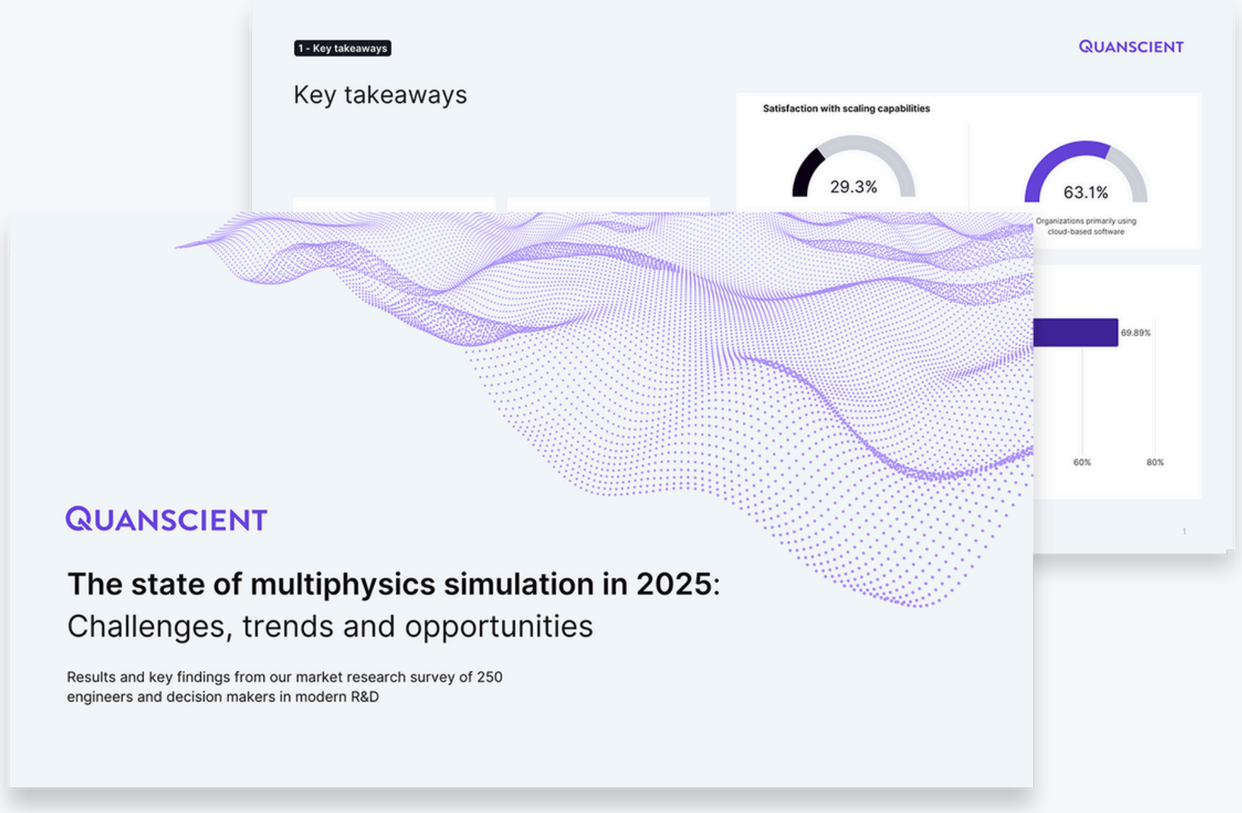
The state of multiphysics simulation in 2025



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Motivation for the study

Simulation is more essential (and more demanding) than ever

- Key tool for product development and engineering decisions
- Needed to model complex, multiphysics interactions
- Increasing system complexity raises the bar for simulation tools

We ran this study to understand how simulation needs are evolving

- Surveyed 250 engineers and decision-makers
- Explored current usage, pain points, and expectations
- Results reveal where simulation tools fall short and what's next

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Considerations when analyzing the results

Results are presented as received from the survey

- Raw response data was cleaned and categorized
- Charts and summaries reflect the actual answers provided
- Open-ended inputs were grouped where needed for clarity

Keep in mind the sample size when viewing segmented data

- Total of 250 responses means some segments are small
- Results by segment have higher uncertainty and are directional, not statistically absolute

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Overview of the demographics

250 respondents in total

Fig 1. What industry do you work in?

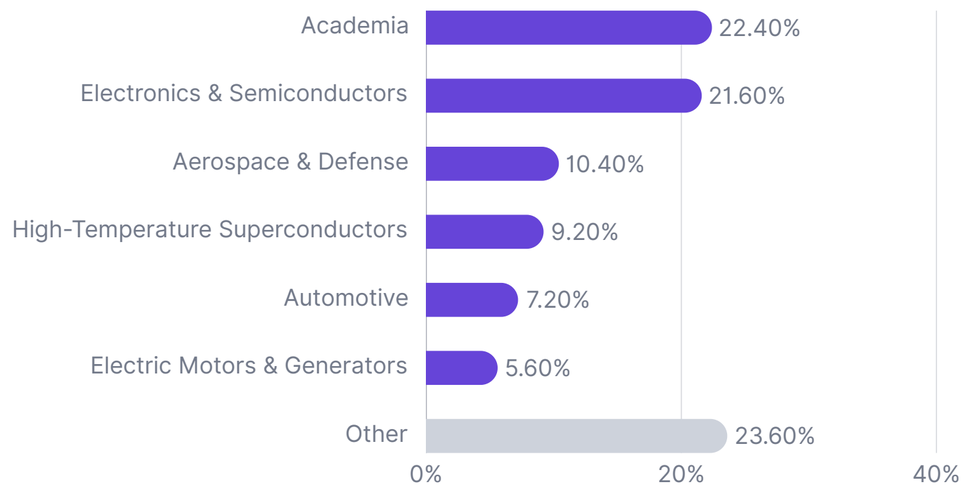
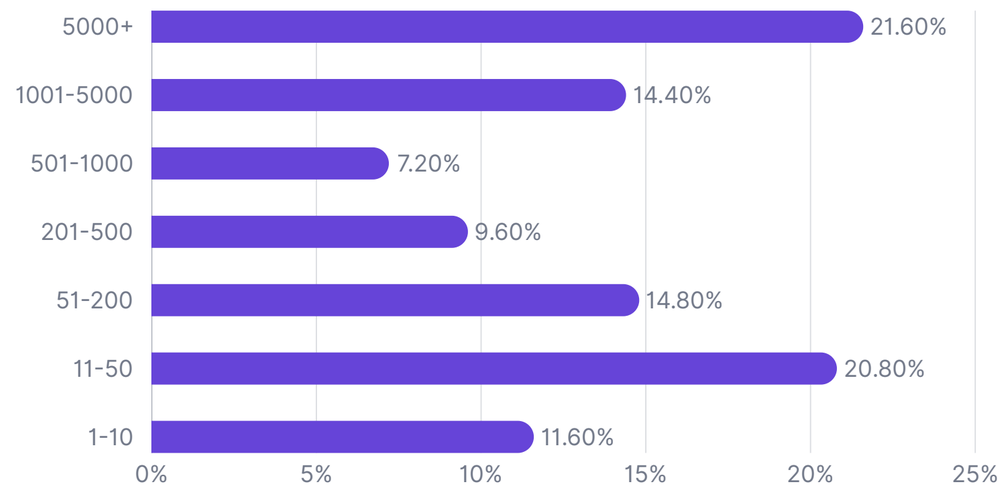


Fig 2. What is the size of your organization? (Number of employees).



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Overview of the demographics

250 respondents in total

Fig 3. Distribution of roles

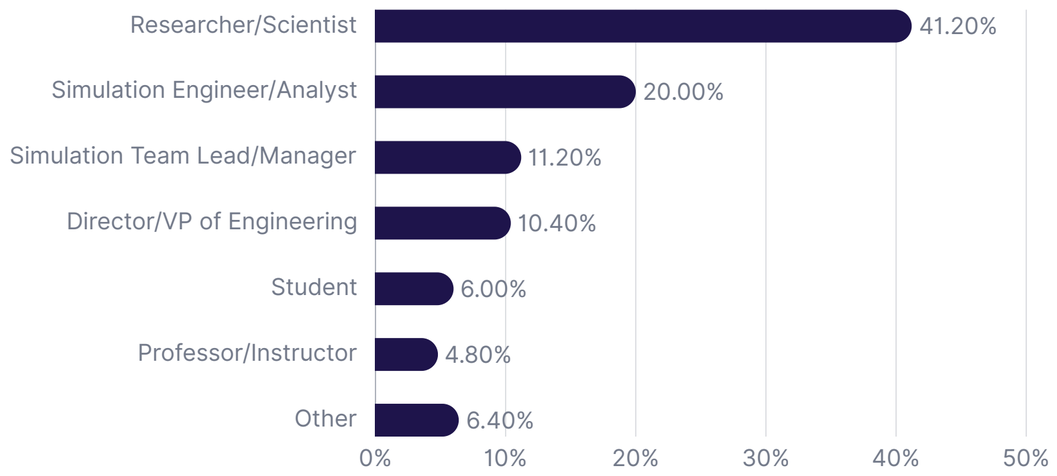
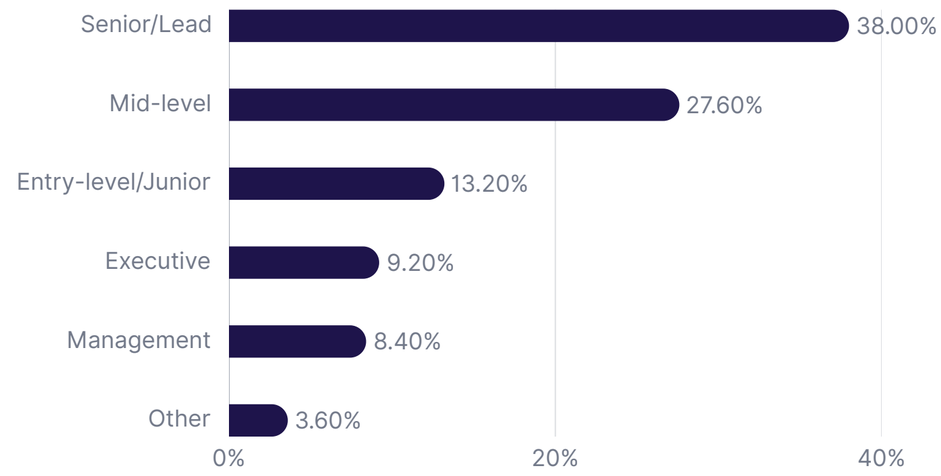


Fig 4. Distribution of seniority



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The current state of multiphysics simulation

Covering how simulation is done today: tools used, methods followed, and how many platforms are in play

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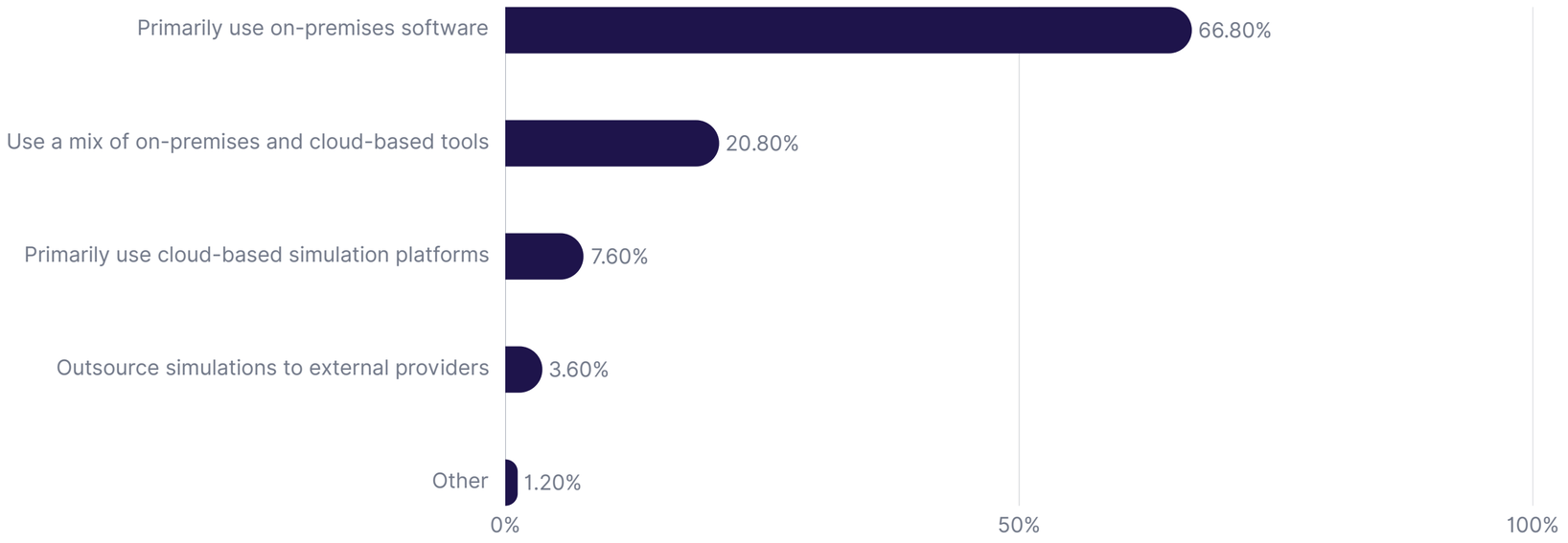
The current state of multiphysics simulation

Fig. 5 Which of the following best describes your primary approach to simulations?



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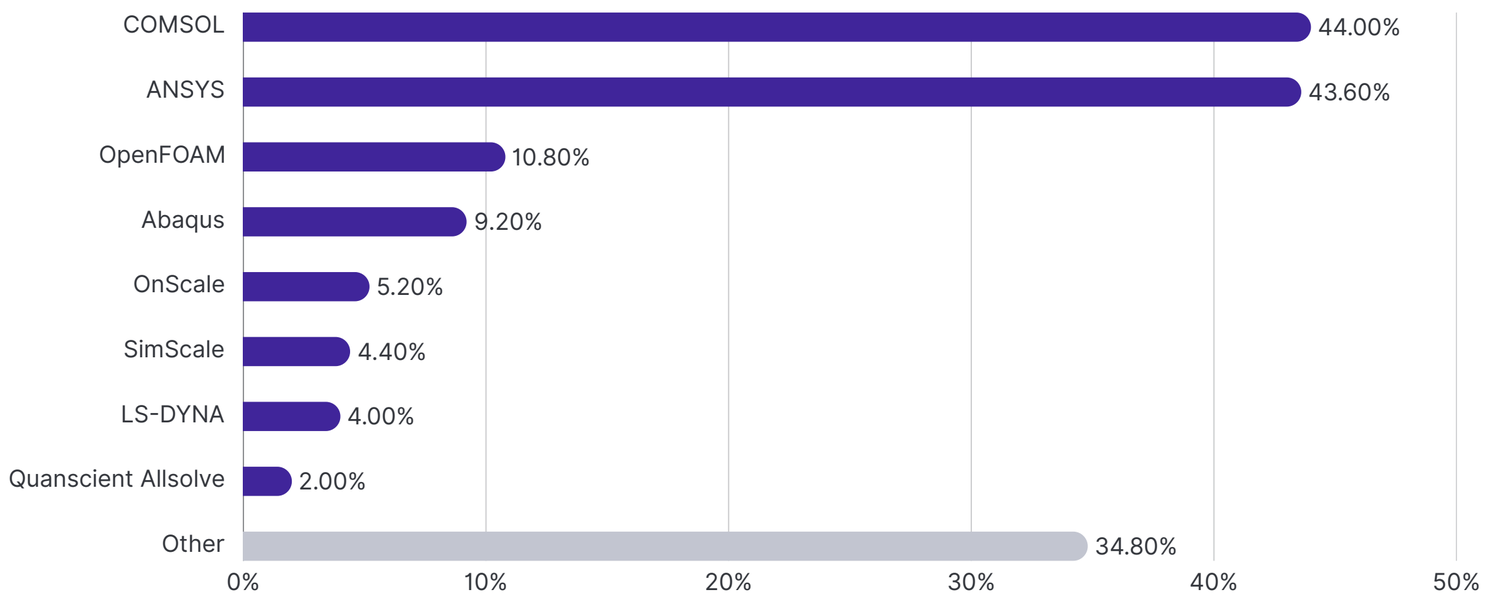
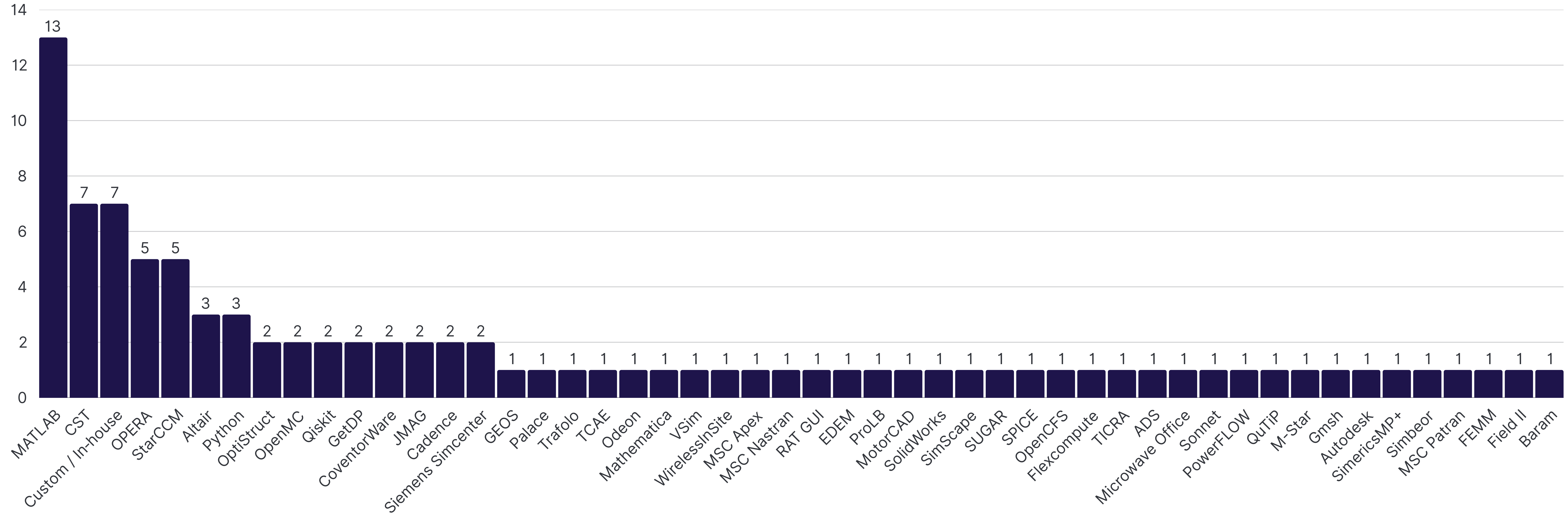
The current state of multiphysics simulation

Fig 6. Primary choice for simulation software (select all that apply)



The current state of multiphysics simulation

Fig. 7 Count of the other simulation tools mentioned



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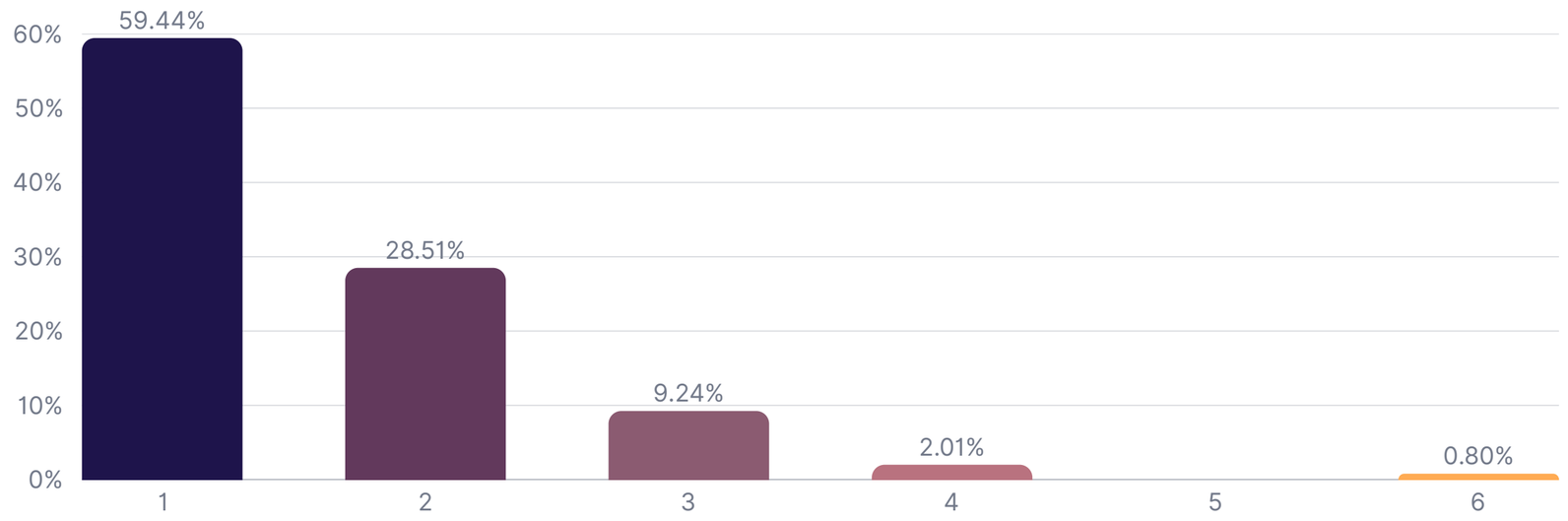
The current state of multiphysics simulation

Fig. 7 How many simulations software a user primarily uses



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The critical role of simulation in R&D

Looking at why simulation is used, when it’s used,
and how it’s valued in modern R&D

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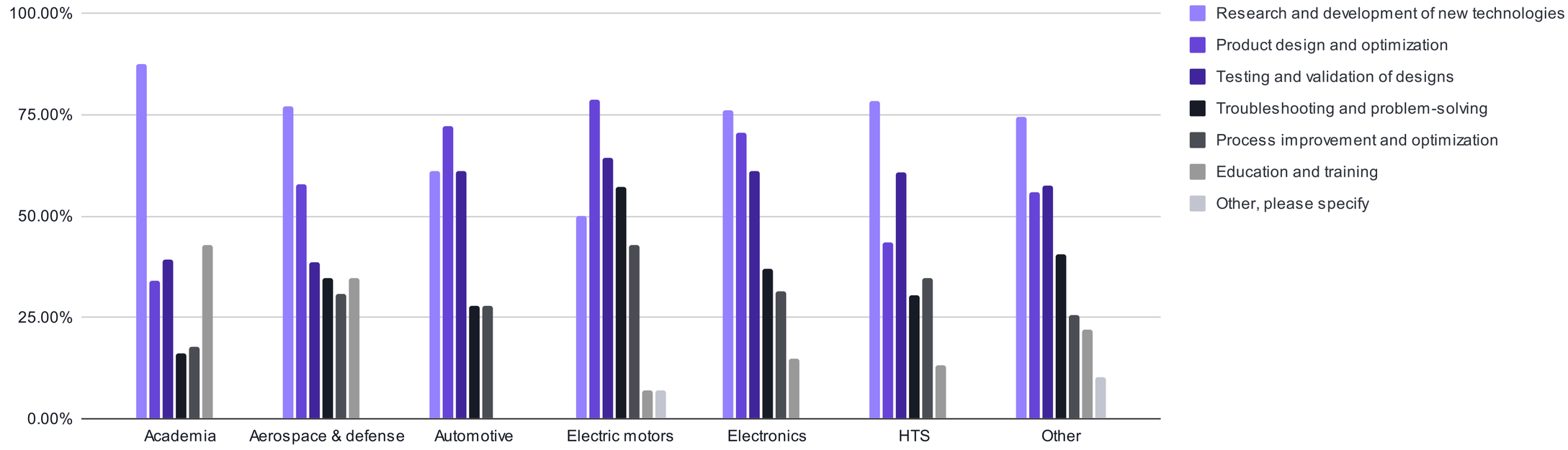
The critical role of simulation in R&D

Fig. 8 How simulations are used by industry



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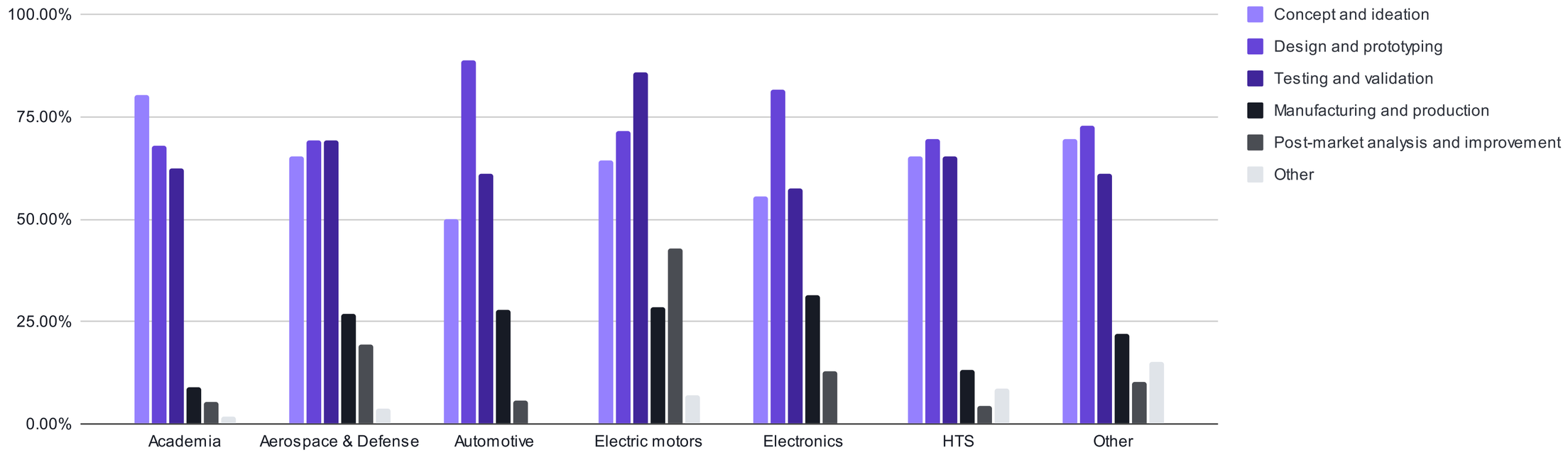
The critical role of simulation in R&D

Fig. 9 Stage simulations are used by industry

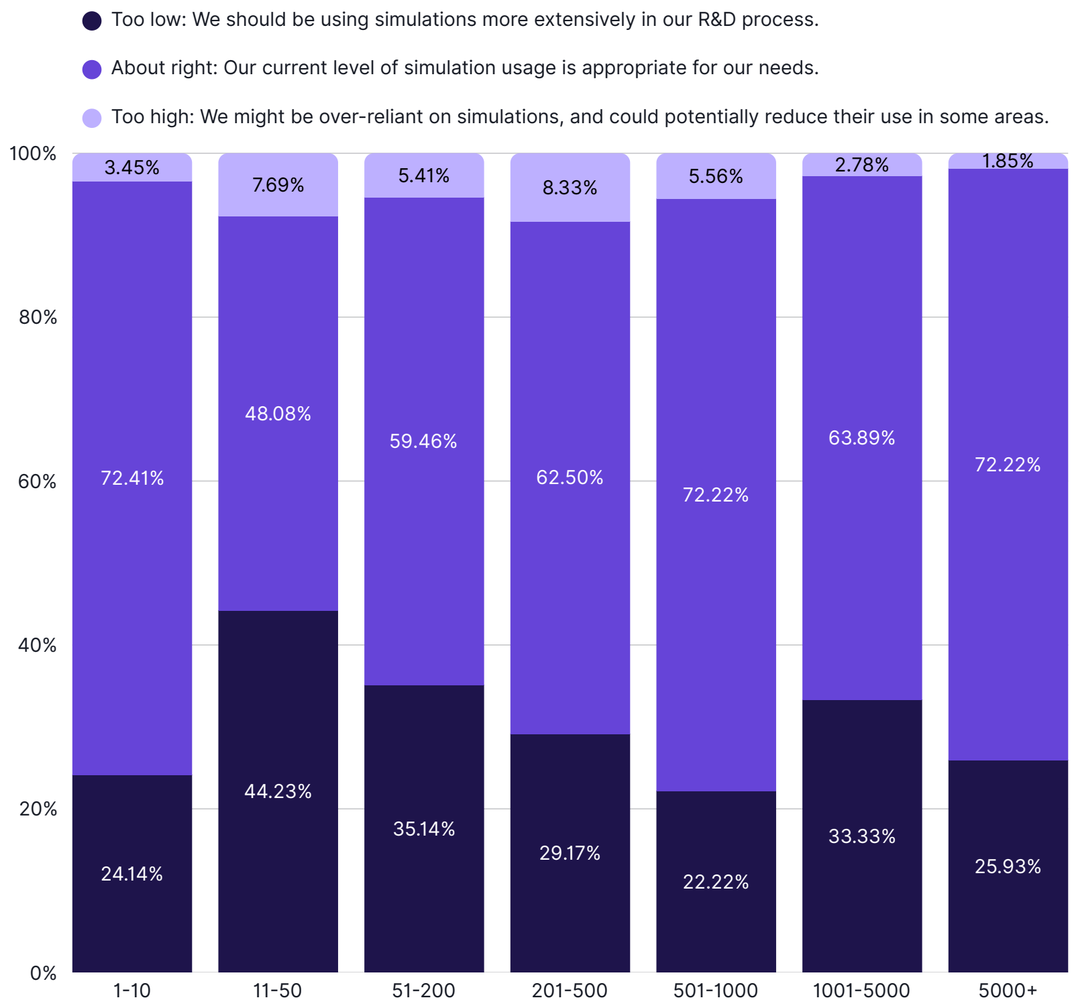


Role of simulation

The critical role of simulation in R&D

44.23% of respondents from organizations with 11-50 employees report underutilizing simulations in their R&D

Fig. 10 Thinking about your organization's R&D process, do you feel the current level of simulation usage is...?



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The critical role of simulation in R&D

"Absolutely critical."

"Simulation is an essential tool to better understand the phenomena we are interested in."

“Ever increasing. End goal is total product virtualization.”

“Important but sometimes overlooked by the general organization.”

"The first step for any new concept."

Simulation is deemed critical in modern R&D

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Challenges with simulation in modern R&D:
4 key challenges identified

An in-depth look at the top challenges simulation users face
and how they vary across industries

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The 4 key challenges

1

Extended wait times for resources and simulation completion

2

Diminished result accuracy from model simplification

3

Limited capacity to efficiently explore design variations

4

Accurate meshing of complex models

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Challenge 1: Waiting for resources and simulations to finish

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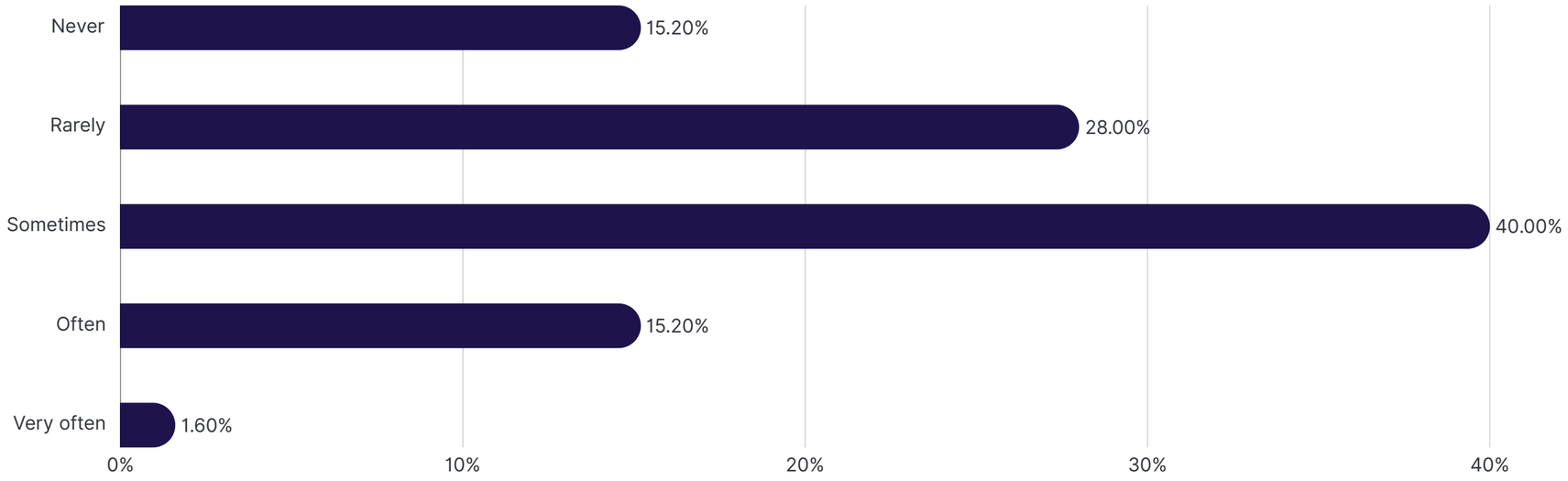
Waiting for resources and simulations to finish

84.8% report experiencing wait times for simulation resources at least rarely

Fig. 11. How often do you have to wait for simulation resources (licenses, hardware, cluster capacity) to become available in order to complete essential studies?



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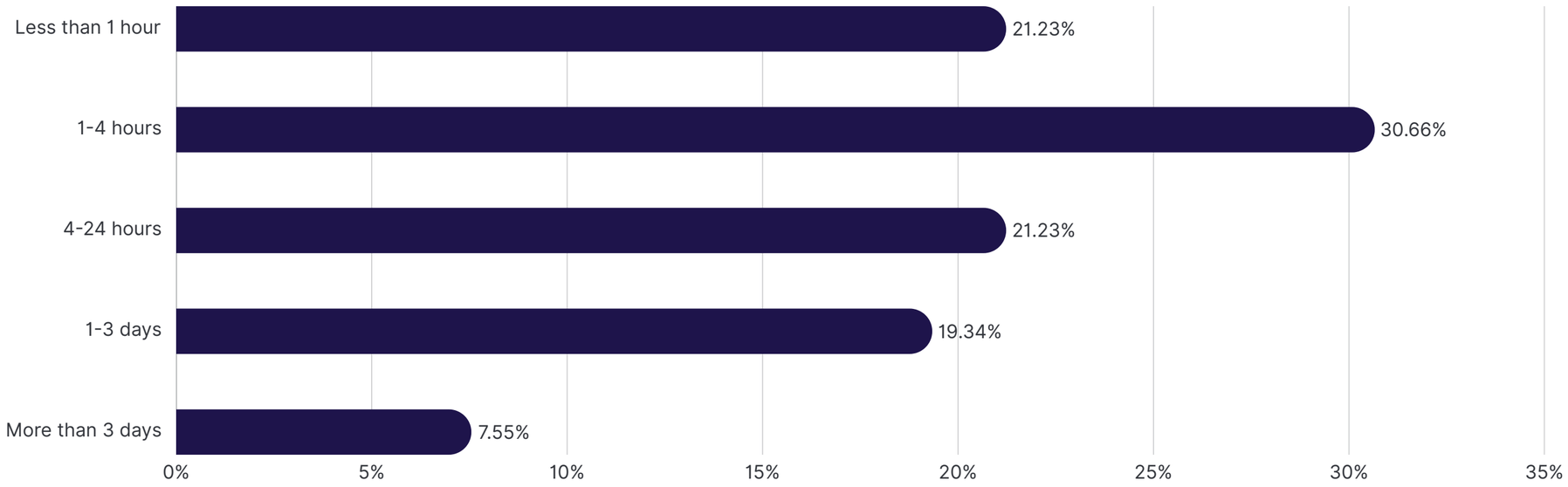
Waiting for resources and simulations to finish

48.12% experience waiting times ranging from 4 hours to more than 3 days

Fig. 13. When you do have to wait for simulation resources, how long is the typical waiting time?



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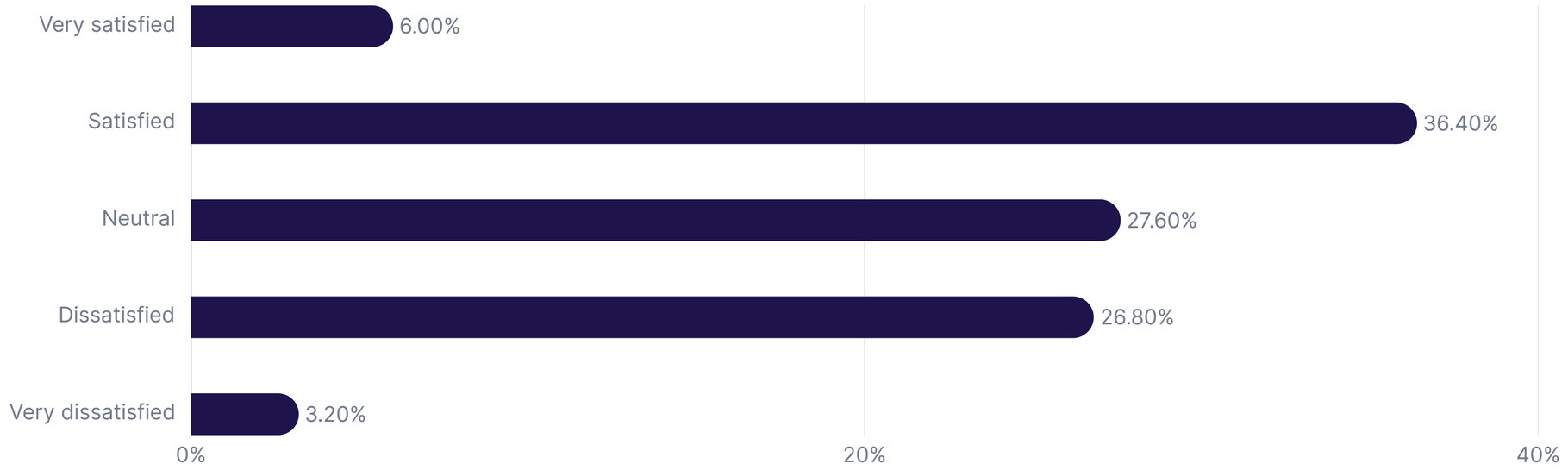
Waiting for resources and simulations to finish

54.4% report not being satisfied with their simulation runtimes

Fig. 15 How satisfied are you with the speed of your current simulation tools and processes?



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Waiting for resources and simulations to finish

! Despite **89.2%** having to simplify their models, only **42.4%** are satisfied with their runtimes

Fig. 16 Having to simplify models by approach to simulation

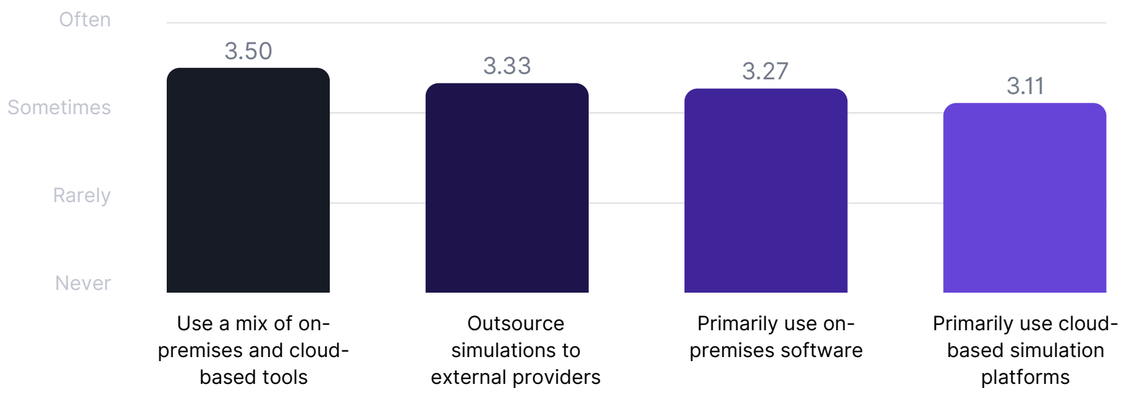
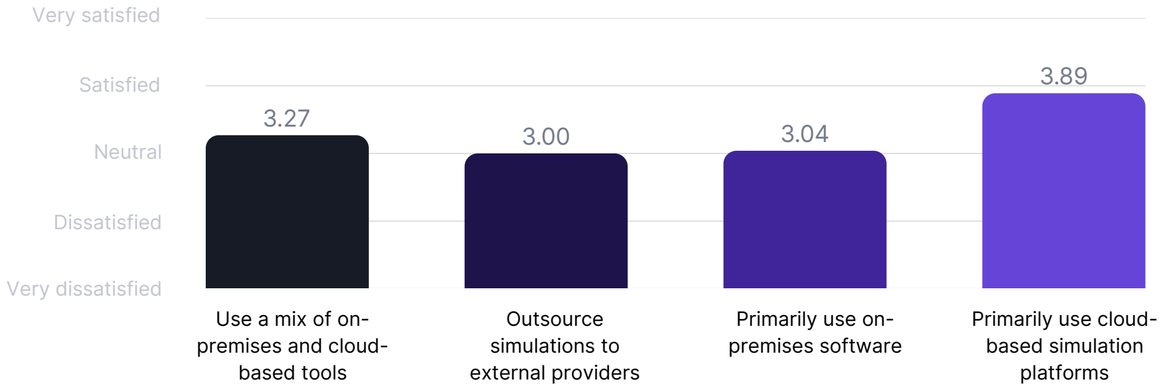


Fig. 17 Satisfaction with simulation speed by approach to simulation



Waiting for resources and simulations to finish

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Q: If you could wave a magic wand and instantly improve one thing about your simulation process, what would it be?

“Supercomputer resources”

“Access to massive parallel computing capabilities”

“Reduce the simulation time to almost zero”

"Infinite resources"

"Reduce time required to run the simulations"

“No restrictions in computing resources”

"Drastically reduce simulation time”

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Challenge 2: Reduced accuracy of results

Reduced accuracy of results due to model simplification

Q: Do you have to simplify your models to reduce your simulation runtime due to operational constraints?

> **!** Simplifying models is a common practice across industries and organization sizes

Fig. 18 Having to simplify models by industry (Never=1, Often=4)

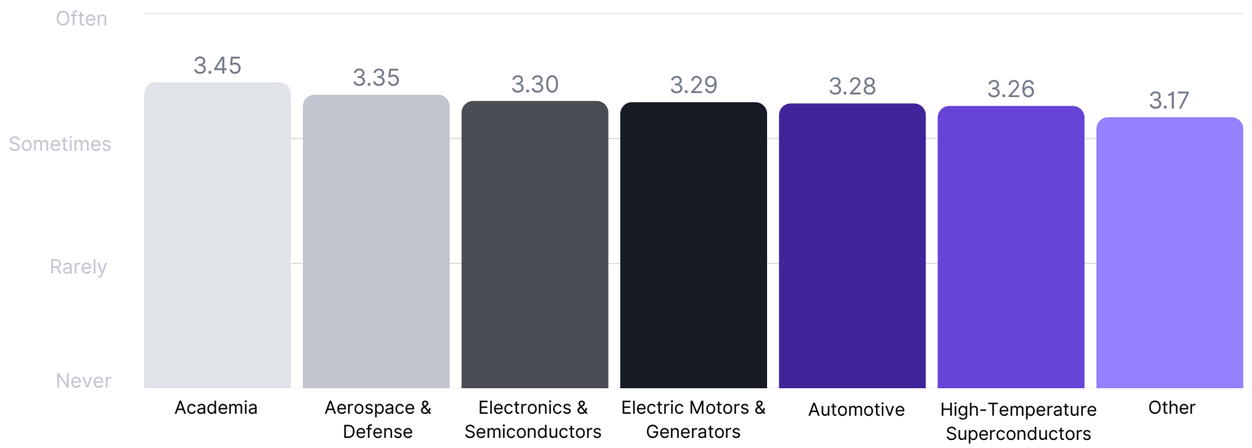
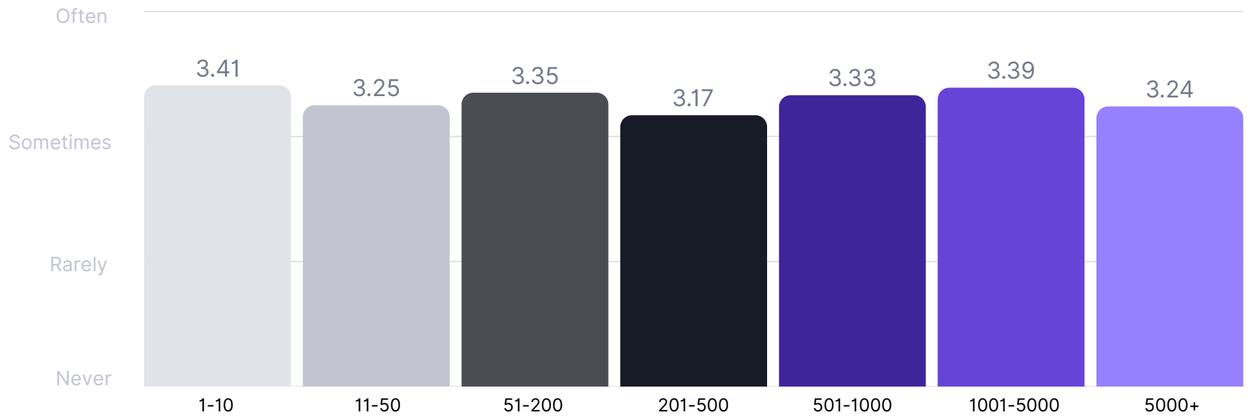


Fig. 19 Having to simplify models by organization size (Never=1, Often=4



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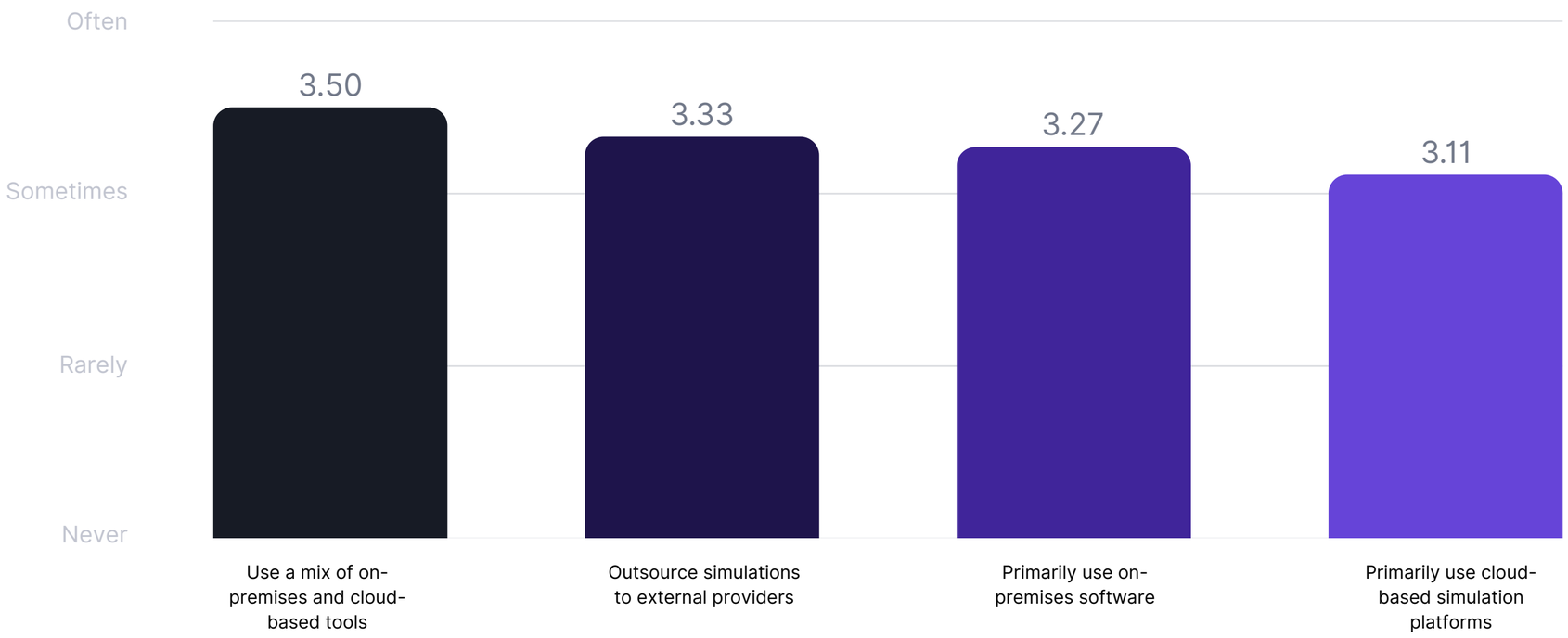
Reduced accuracy of results due to model simplification

Cloud-based respondents report a slightly reduced need to simplify models

Fig. 20 Having to simplify models by primary approach to simulation



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Q: If you could wave a magic wand and instantly improve one thing about your simulation process, what would it be?

"Getting accurate simulations nearly instantly”

"Remove the need to mesh the geometry and still have accurate results and short simulation times with complex geometries and large assemblies”

"More accurate results by considering more physical phenomena”

"Results without having to wait a long time or sacrificing accuracy”

"Make the simulation process faster without compromising accuracy”

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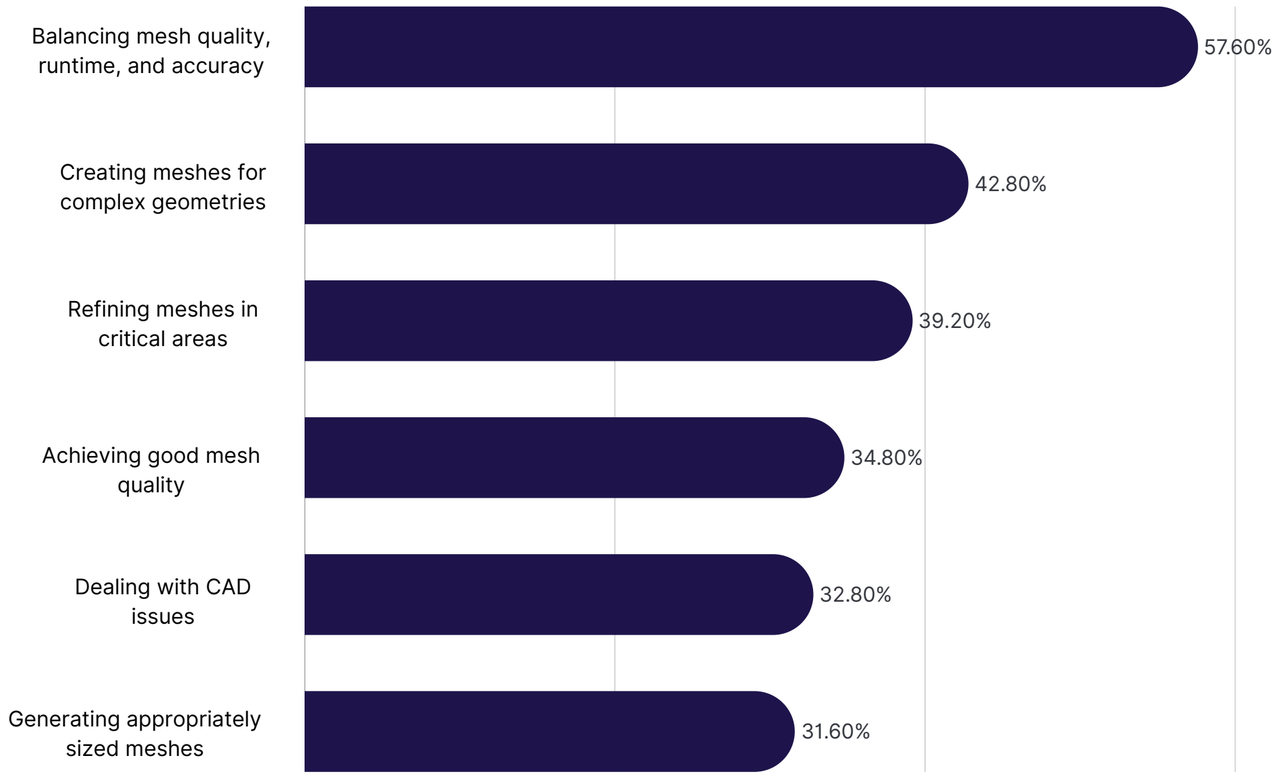
Challenge 3: Accurate meshing of complex geometries

Challenges with meshing

Fig. 24 Which of the following challenges do you face with meshing in your current simulation workflow? (Select all that apply)



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Q: Is there something else that frustrates you in your simulation processes?

"CAD defeaturing, meshing"

“Mostly set-up and meshing, then achieveing convergence”

“Meshing and simulation high loading“

“Lack of robust high-order mesh generators”

“Lack of ability to have intelligence in the mesh fidelity”

“Mesh errors”

“The meshing of complex geometries takes lot of time and gives lot of errors if the geometries are not captured properly with the limited options in the tool.”

“CAD geometry preparation for large and complex models.”

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Q: If you could wave a magic wand and instantly improve one thing about your simulation process, what would it be?

“Meshing complex geometries”

"Mesh and supercomputer resources"

“Meshing”

"Mesh"

“Instant wonderful meshes from an ugly CAD file”

“Mesh generation convergence”

“Less time consuming meshing”

“Easy meshing, accelerate simulation”

“Easier mesh generation”

"Meshing ability"

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Challenge 4: Limited ability to explore design options

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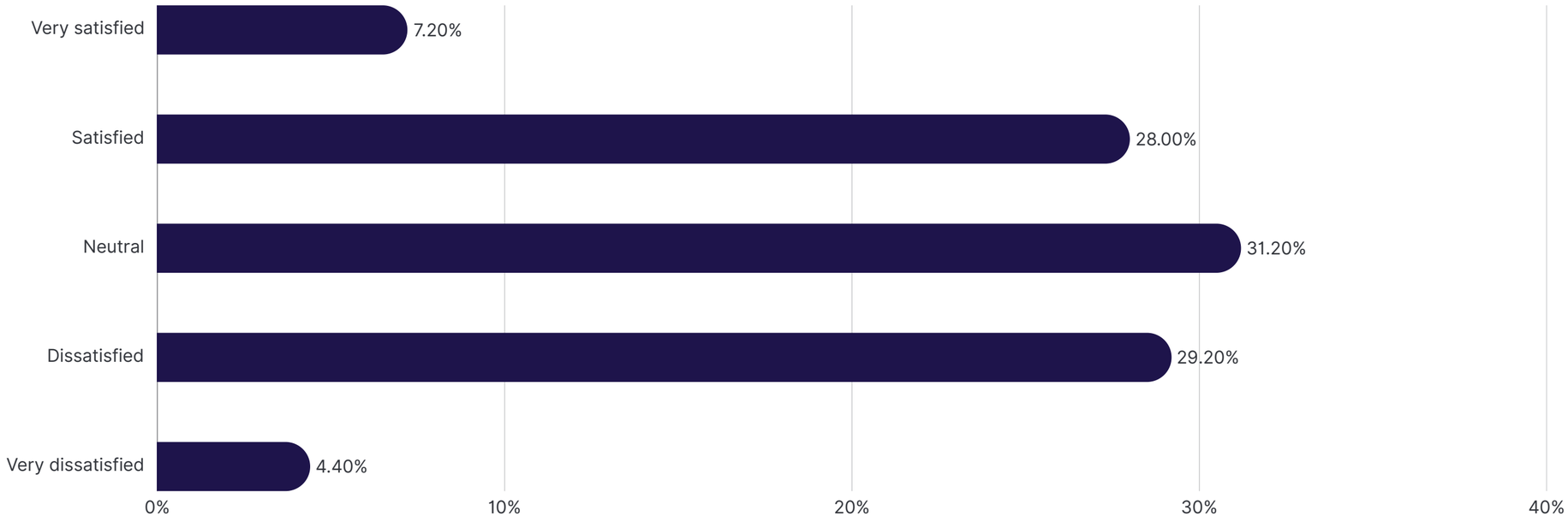
Limited ability to efficiently explore design options

64.8% are not satisfied with their ability to efficiently explore design options.

Fig. 21. How satisfied are you with your current ability to scale your simulations (e.g., run many simulations in parallel, explore a wide range of design parameters)?



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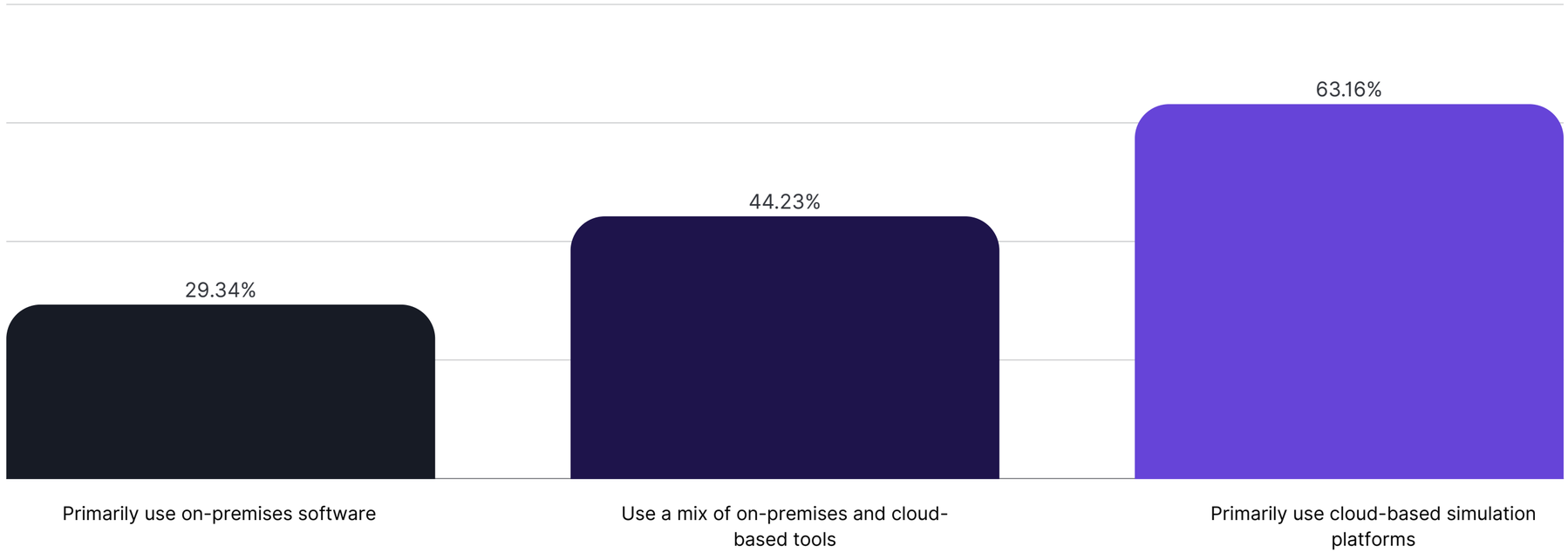
Limited ability to efficiently explore design options

63.16% of cloud-based respondents report being satisfied with their scaling capabilities

Fig. 22 Percentage of respondents S*atisfied* or V*ery satisfied* with scaling capabilities by primary approach to simulation



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Q: If you could wave a magic wand and instantly improve one thing about your simulation process, what would it be?

“Optimization of structures”

“The ability to instantly make several iterations over any variable in our design scripts and plot the results.”

“Better optimization tool, simple parameter sweeps”

“Make large parameter sweeps run in parallel to speed them up”

“Intuitive parametric model builder, automated meshing, integrated fast solver”

“Automatic scaling options considering the computing and memory resources and the goal of the simulation”

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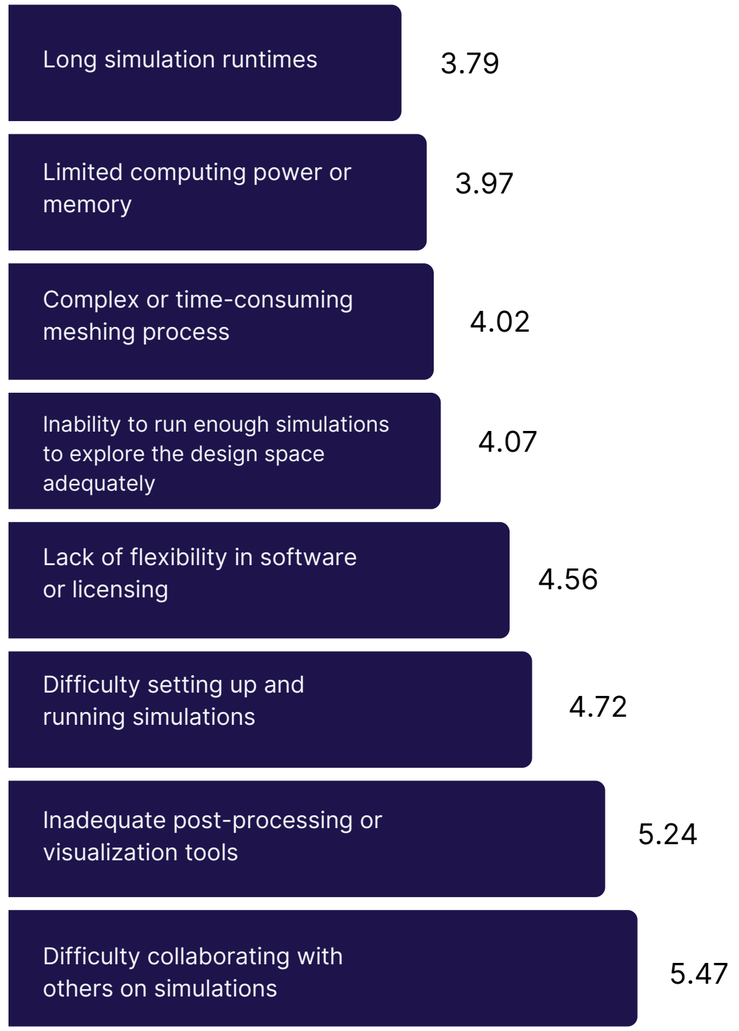
Other challenges faced

Other challenges faced

Frustrations ranked

Simulation speed was ranked as the biggest frustration

Fig. 23 Biggest frustrations in order from most annoying to least annoying (average ranking from 1-8)



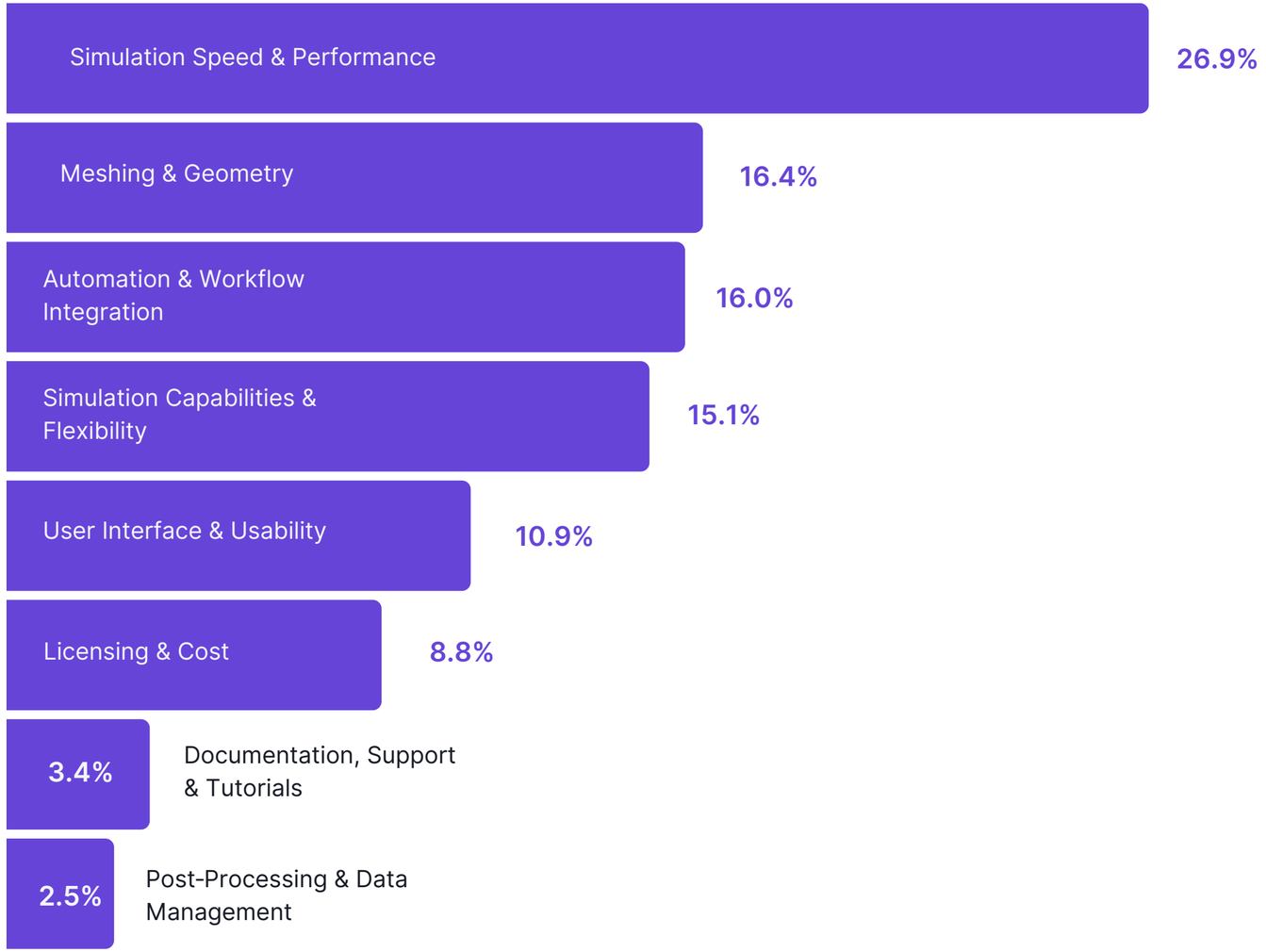
Other challenges faced

Magic wand: Areas of improvement

Q: If you could wave a magic wand and instantly improve one thing about your simulation process, what would it be?

Simulation speed is the number one issue respondents would fix if they had a magic wand

Fig. 25 Areas of improvement in the open-ended magic wand question



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Expectations for the next 5 years: Emerging technologies

Exploring the four technologies expected to shape the future of simulation and what users hope they will solve

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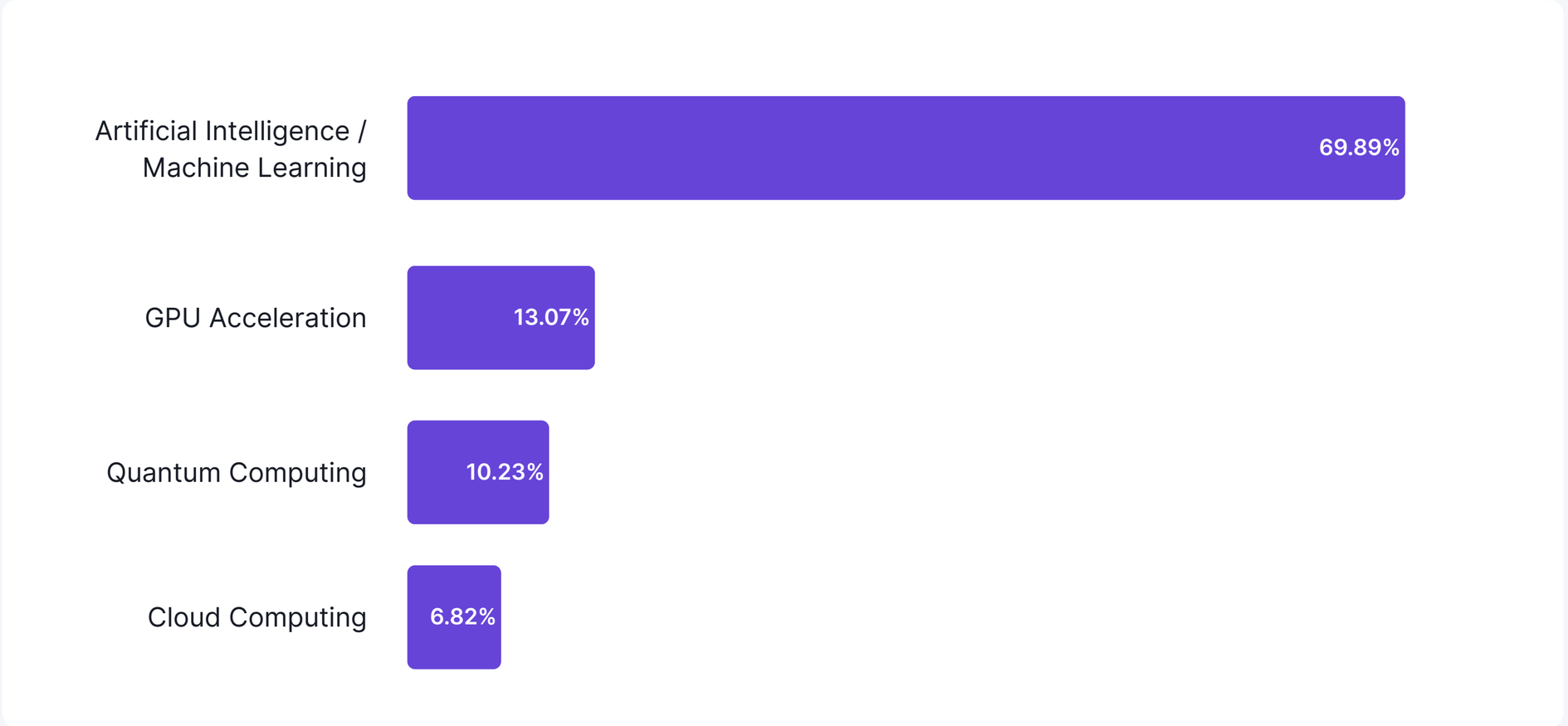
The 4 key technologies



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Artificial Intelligence (AI) / Machine Learning (ML)

AI is expected to make simulation tools significantly smarter, helping automate tasks, deliver intelligent insights, and reduce the reliance on deep expertise

“AI-driven simulations will reduce the flaws in design as legacy data with AI suggestions will help to produce high quality products”

“AI application in simulation so that the optimization process becomes more intelligent and automatic”

“Having an AI copilot that automatically suggests simulation settings and can tune them and help with setup”

“AI might take the simulation technology to the next leap”

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GPU Acceleration

GPU acceleration is expected to deliver major performance gains, enabling faster runtimes and the ability to handle increasingly complex simulations more efficiently

“GPU acceleration for traditionally CPU based FEM”

“Cheaper GPU compute. CFD simulations moving to GPU”

“New solvers that can natively run on GPU”

“Speedup through use of GPUs”

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Quantum computing

While seen as potentially transformative, most users remain skeptical about the near-term impact of quantum computing, expecting meaningful benefits to remain several years away

“Quantum-assisted simulations”

“Quantum-based simulation”

“Quantum simulations to speed up the parallel processing”

“Quantum Computing advancements will allow us to make headway into the future much more quickly”

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Cloud computing

“Cloud, ability to compromise CPU-hours according to development deadline and day-to-day workload”

“Spreading and adoption of cloud based simulation, with virtually unlimited resources”

Users anticipate greater scalability, collaboration, and access to powerful resources via the cloud, but also express concerns around cost, security, and integration

“Software running in the cloud”

“Cloud-based and distributed simulations.”

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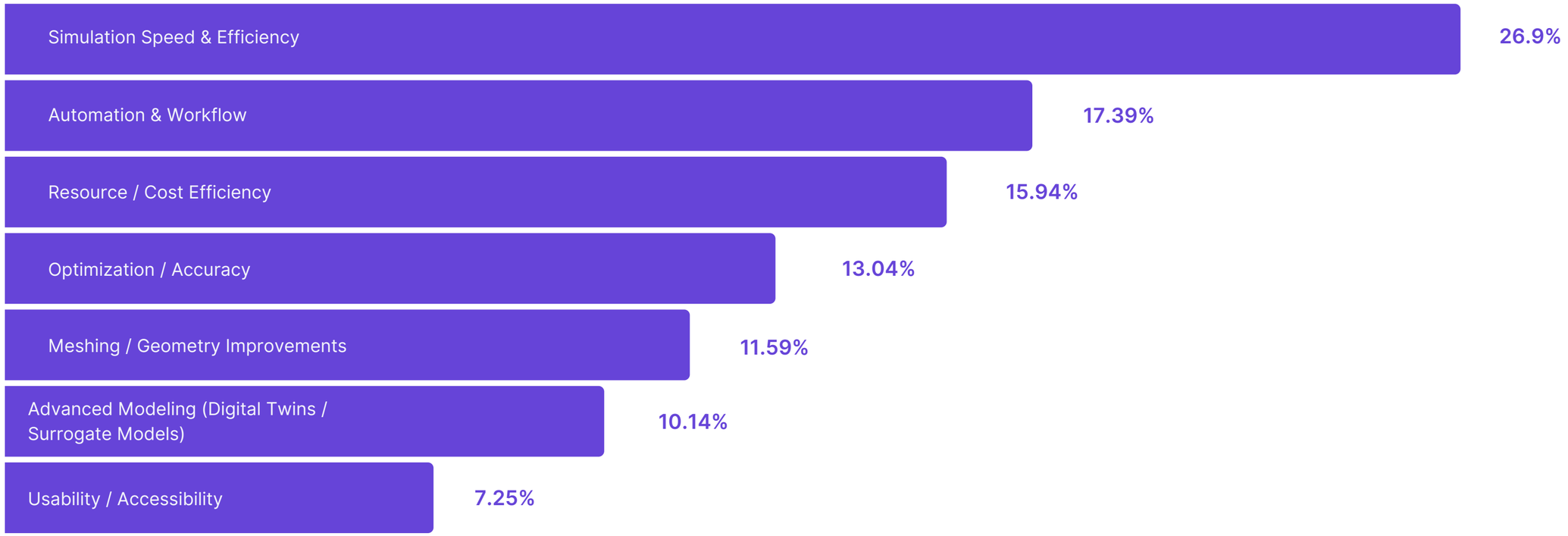
Breakdown of other trends and expectations

Simulation speed is the area that most respondents expect new technologies to improve

Fig. 27 Areas the technological advancement will improve



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Our 5 key takeaways

Highlights that stood out to us and reflect the problems we’re focused on solving

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Our 5 key takeaways

1

Simulation speed remains the top bottleneck

2

Automation isn’t a nice-to-have anymore—it’s expected

3

Accessibility is limited even with enterprises

4

AI/ML is driving interest—but usability is key

5

Cloud computing is still underused

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Our vision

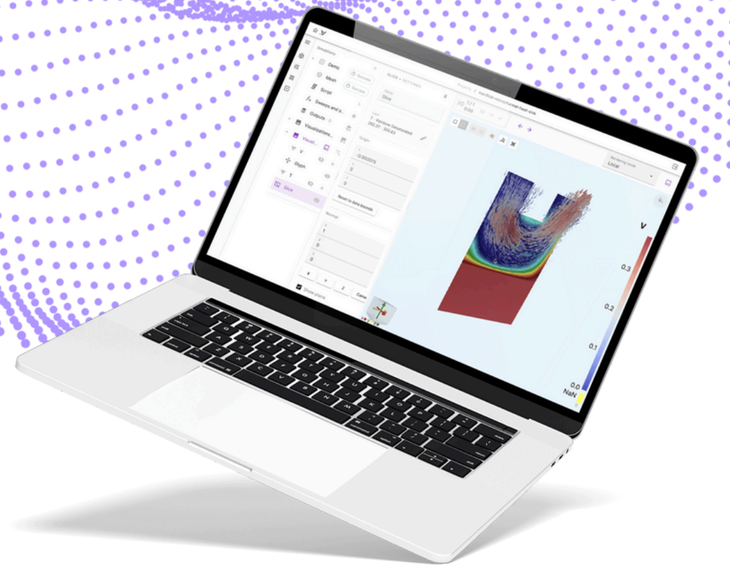
“We enable a future where engineers can rapidly explore and refine thousands of design options for the world's most complex challenges—equipping them to choose the optimal solution with precision and confidence.”

Quanscient Allsolve

Quanscient Allsolve

The powerful and scalable multiphysics simulation platform

Run fast, accurate, and complex multiphysics simulations at a massive scale



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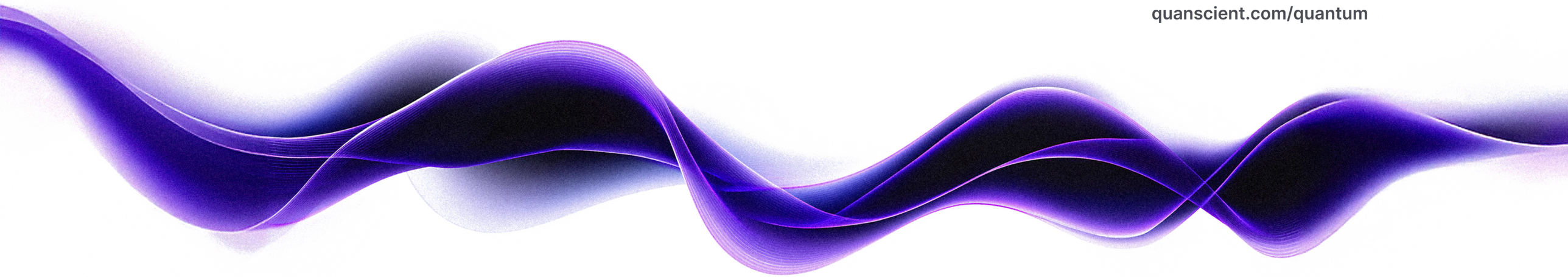

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We have **already proven meaningful CFD simulations** on current quantum computers, driving continuous progress towards more sophisticated and reliable outcomes.

We offer custom algorithm development and licensing options for our pilot customers.

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