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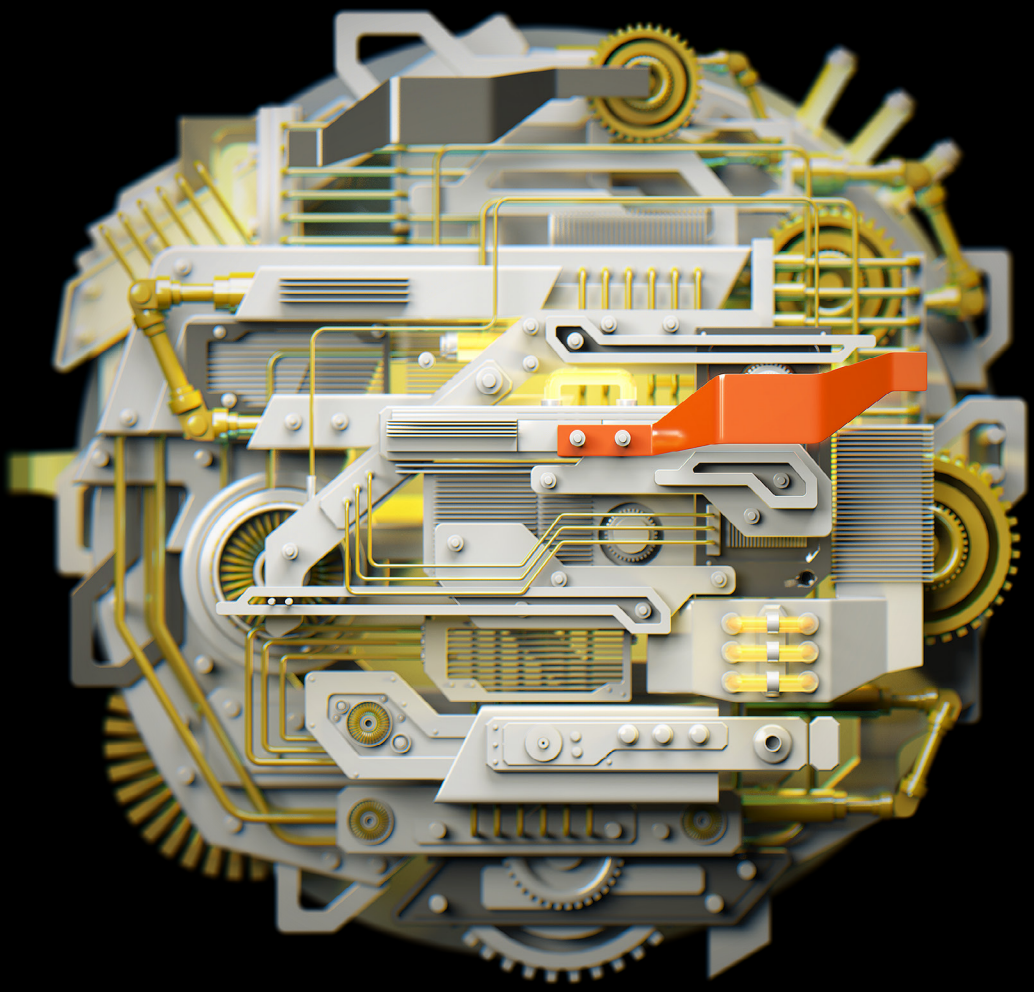

Global Engineering R&D Pulse Survey 2022

Global demand market insights

May 2022

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Foreword

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It would be no exaggeration to state that the past two years were possibly some of the most challenging years for enterprises globally.

As the metaphorical fog clears and the world slowly inches back to normalcy, it appears that most things that were supposed to be stop-gap measures – remote work, diversification of sources of supply, and collaborating for innovation – have become mainstay. This is even true for traditional office-based functions, such as Engineering Research and Development (ER&D), which had to substantially reinvent its ways of working, yet not missing on collaboration and continuous innovation.

ER&D organisations are those market-shapers that have the potential to define the future of an enterprise and its products and services. On one hand, they shape and sense customer behaviour. On the other hand, they play a key role in driving an enterprise's sustainability agenda through their output. Therefore, these are of particular interest when attempting to predict the market's future trends.

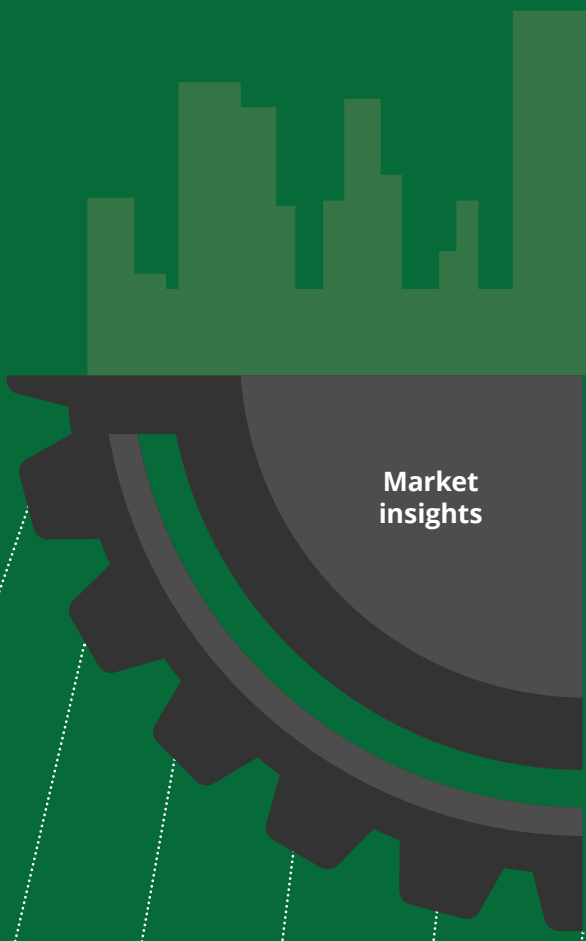
This report aims to provide a comprehensive view of how the ER&D function in enterprises worldwide – covering the North American, EMEA, and APAC regions represented by 19 countries operating in 12 sectors (logically clubbed into 8 for the purpose of this report) – are evolving and prioritising their agenda. It covers a diverse range of topics pertaining to the global market in ER&D ranging from their 2022 priorities and challenges to their medium-term (2024) plans. It also studies the advent of digital engineering in the traditional R&D function, and leaders' take on the role of their in-house globally distributed Global Capability Centers (GCCs) and Engineering Service Providers (ESPs).

In addition, given the global coverage, the report provides an insightful sectoral and regional view to these topics. The data for this report was primarily garnered through a survey of more than 100 R&D leaders (from 96 sector-best organisations) and the findings were then supplemented through a series of primary interviews with senior stakeholders in the ER&D function. The final outcome of this six-month-long process is now being published as the *"ER&D Global Pulse Survey".*

We believe that the report presents a holistic picture of the aspirations of global organisations, issues plaguing the current system, and the future of the ER&D ecosystem. This should serve as a potent tool for leaders within the ER&D function as they chart their roadmap for the next few years. We also aim to explore growth opportunities that ER&D GCCs and ESPs have if they successfully pick up on the pulse of their demand-side partners.

We would like to acknowledge the leaders from around the world who participated in the survey. We hope you find this report insightful.

Executive summary



Coming out of the pandemic, we are witnessing gradual but steady uptick in global Engineering Research and Development (ER&D) spend.

Compared with the 2021 budget, **80 percent** of the surveyed companies expect their global engineering R&D spend to increase this year.

85 percent companies also indicated a continued upward trajectory in budget over the next three years.

Although creating customer-centric, connected products is a top investment priority for ER&D organisations, building a technology ecosystem to better engage with a large set of technology providers is next on the agenda. In addition, adopting Environmental, Social, and Governance (ESG) standards, globalising R&D footprint through new Global Capability Centres (GCCs) or Engineering Service Providers (ESPs) and tapping into a global talent pool are the other top investment priorities.

Supply chain disruptions continue to be the top challenge as companies are still responding to the cascading effects of COVID-19.

Given the rapidly evolving technology and push to shorter innovation cycles and faster time to market, co-creation is emerging as the new innovation model of choice, with **~70 percent** of the respondent companies exploring (or already involved in) co-creation with either start-ups or ESPs.

Similar to other functions, the hybrid work model is here to stay in R&D. However, about **50 percent** of the ER&D workforce globally is predicted to be **based fully out of office** by 2024, with **1 in 3 employees** continuing to operate either in hybrid or fully remote models.

India continues to be the ER&D destination of choice. About **85 percent** of the surveyed organisations already leverage a GCC for their ER&D activities, with **~ 75 percent** of such centres being located in India. More companies are expected to establish or increase their India presence in the next few years owing to increasing comfort levels with decentralised/ remote ER&D teams and proven ER&D ecosystem that India offers.

India perspective

Over **70 percent** of the surveyed companies with GCC/ESP in India plan to increase their ER&D spend in their India GCCs or ESPs this year. This decision is driven by the fact that India is fast becoming the hub for digital engineering skills for most ER&D companies.

About **85 percent** of the surveyed companies with India GCCs state that they are satisfied with the performance of their India GCCs, while **78 percent** with India ESPs are satisfied with the performance of their India ESPs.

Research and Advanced Engineering (R&AE), especially in advanced technologies, such as Artificial Intelligence (AI)/Machine Learning (ML), automation, and big data, is shaping up to be the principal focus area for India GCCs and ESPs, as cited by almost **50 percent** of the surveyed companies. Other areas of interest for India GCCs include driving innovation out of the centre and product/technology strategy. Similarly, software design and engineering and mechanical design and engineering are priority areas for India ESPs.

The headquarters expect India GCCs to drive innovation and ESPs to scale software and product development.

Headquarters' key asks from GCCs are to **inculcate more ownership and nurture future-ready leaders.**

Sectoral insights

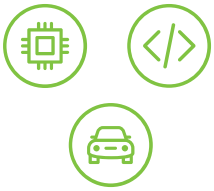
Spend

Sectors are estimated to have increased their ER&D spend in the range of **10-20 percent**, by 2024, compared with their 2021 budget.

Top sectors by innovation acceleration model

Buy new technology

Co-create with start-ups



Co-create with ESPs

Co-create with academia

Co-create with competitors

Envisaged mode of delivery for majority workforce

Through the next three years, select sectors show a strong sentiment towards a particular way of working for the majority of their employees

In-office

Remote

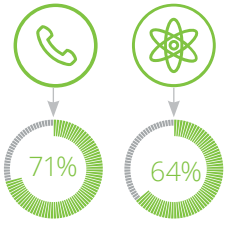
Top challenges of 2021

Inflation / supply chain disruption and its effects on increasing product costs

Speed of technological change

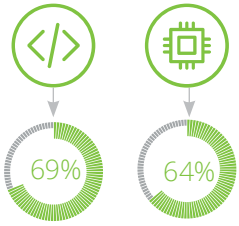
Top priorities of 2022

Industry 4.0 solutions



Building a technology ecosystem

Innovative, connected, and customer-centric products



Sustainability/ circular economy

Modular designs and product platforms

Most commonly used delivery centre

ER&D GCCs

ESPs

Most common activities delivered out of India GCCs

Mechanical design and engineering

Software design and engineering

Top reasons for using GCCs and ESPs

Scalability of ER&D ecosystem

100%

70%

70%

Improving focus on core business and innovation

63%

Most common activities planned to be delivered out of India GCCs and ESPs in the next three years

Global Centre of Excellence (CoEs) in India for emerging technologies

70%

Product/technology strategy

60%

Top areas of long-term investment

Industry 4.0 solutions

79%

71%

63%

Developing innovative, connected, customer-centric products and solutions

70%

70%

Digitalizing their end-to-end product development lifecycle to improve ER&D productivity

65%

Most sought after engineering skills in India GCCs and ESPs

Digital skills

- AI/ML/Deep Learning
- Automation
- Big data/engineering analytics

Core skills

- Software development
- Product management
- Manufacturing engineering

- Medical devices
- Software products
- Industrial
- Telecom
- Energy, oil and gas
- Hardware and electronics
- Automotive and transportation
- Aerospace and defence

Regional insights

	North America	EMEA	APAC
Spend forecast	Most of the surveyed companies across regions plan to increase their ER&D spend in 2024 in the range of **10-20 percent**, compared with the 2021 spend		
Top challenges in 2021	• Supply chain disruption	• Accelerating innovation cycles in product development and shortening their time to market	• Supply chain disruption
Top priorities for 2022	• Products for **sustainability / circular economy** Greening the products / production / and supply chain • Developing innovative / connected / customer centric products and solutions	• Globalizing the R&D footprint through new ER&D GCCs and ESPs. • Driving ER&D productivity and performance by digital infrastructure	• Developing innovative / connected / customer-centric products and solutions • Building a technology ecosystem to reduce time to market of new products / access to new technologies and scarce capabilities at scale
Top activities being delivered by GCCs			
Non-India GCCs	• Research and advanced engineering • Software design and engineering	• Manufacturing and operations • Process standardisation	• Research and advanced engineering • Software design and engineering
India GCCs	• Driving innovation out of the India centre • Software design and engineering	• Driving innovation out of the India centre • Product/technology strategy	• Testing and validation • Product/technology strategy
Top activities being delivered by India ESPs	• Software design and engineering	• Research and advanced engineering	(No evident priority for APAC)
Top engineering skills sought by India GCCs and ESPs	• AI / ML / DL • Big Data/engineering analytics	• AI / ML / DL • Automation	• Internet of Things (IoT) • Automation
Top areas of long term investment	• Industry 4.0 solutions • Developing innovative / connected / customer-centric products and solutions	• Industry 4.0 • Globalising R&D footprint	• Developing key skills and talent • Products for **sustainability/ circular economy**

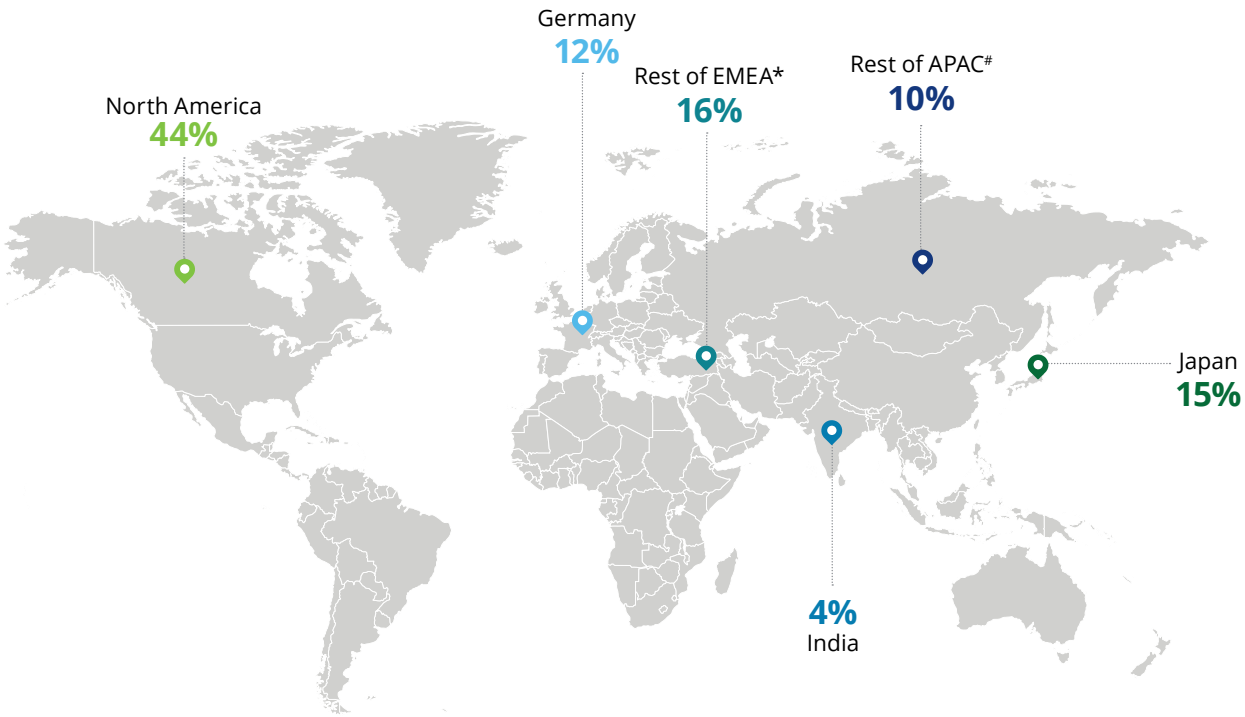
Respondent profile overview

The 2022 survey witnessed record participation – A total of **104 responses** were received from **99 unique companies** across **19 countries**

The 2022 survey has seen a **190 percent** increase in participation compared with the 2020 Pulse Survey.

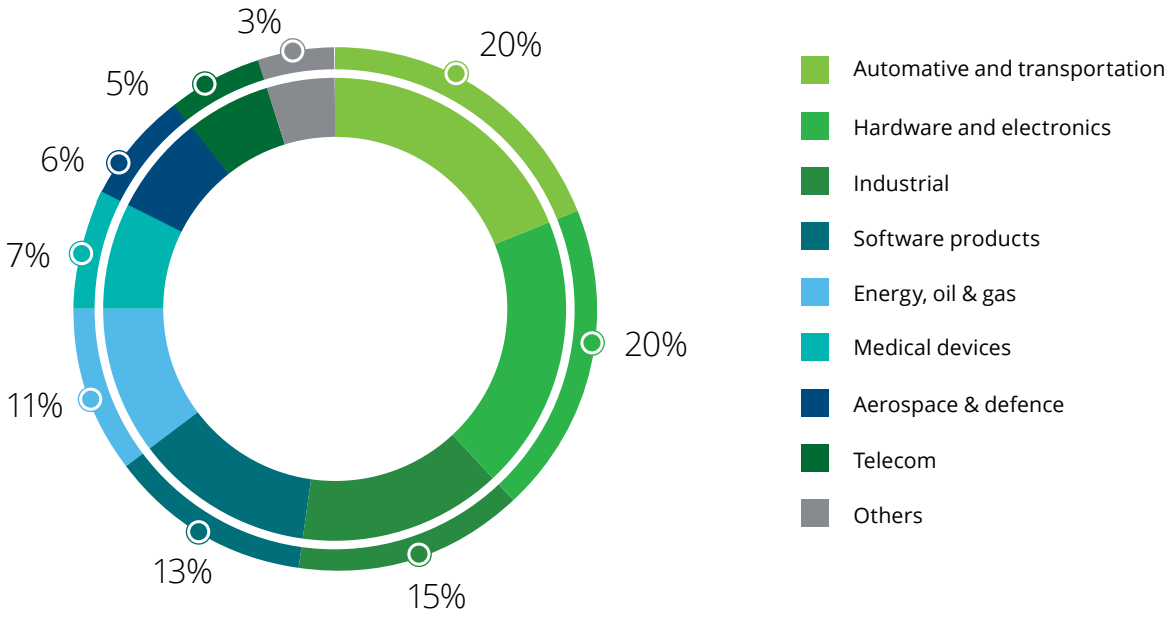
Total **104 responses** include three expert interviews. The data and analysis in the report is based on size of **101 responses.**

Geographic distribution of respondents by company headquarters

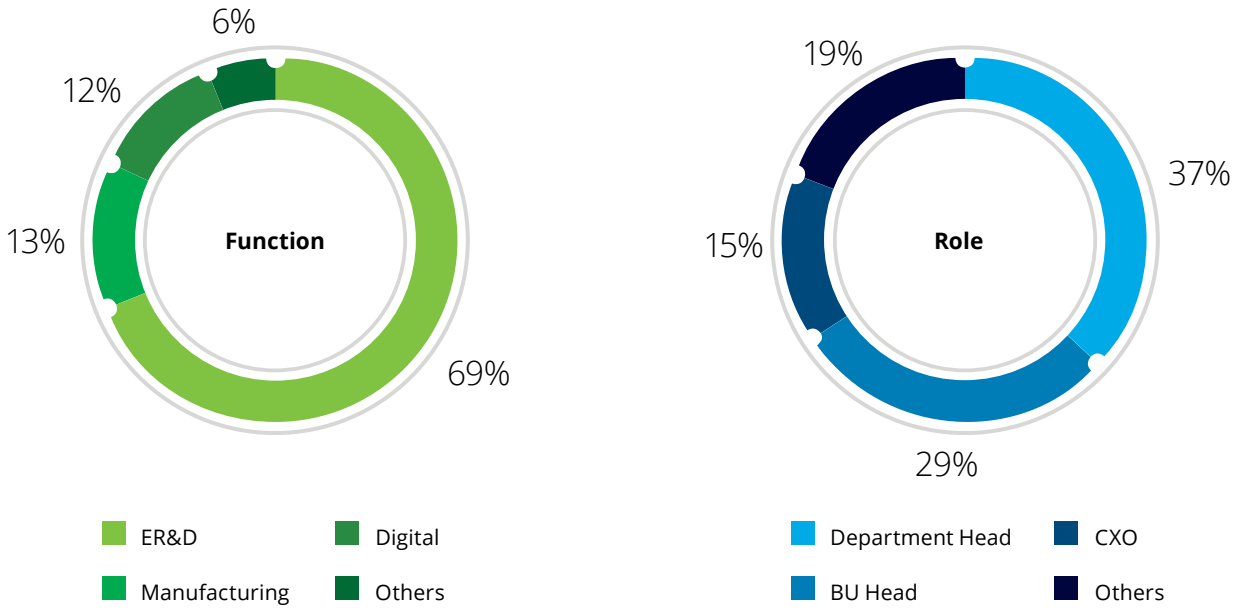


* Rest of EMEA comprises France, the Netherlands, Sweden, the United Kingdom, Italy, Ireland, Denmark, Saudi Arabia, and Israel
# Rest of APAC comprises Taiwan, China, Australia, Singapore, and South Korea

The survey covers **eight major sectors** within engineering R&D. The **automotive and transportation, hardware and electronics, and industrial sectors** have showed leading participation, contributing nearly **55 percent** to responses.



About **80 percent** respondents are senior decision-making leaders in the ER&D vertical of their respective companies.



Notes:
All analyses, graphs, and tables in this report are based on the data collected through the above survey and have an n-size of 101, unless otherwise stated.

The data for the report was gathered through an online survey (Deloitte-NASSCOM ER&D pulse survey 2022) that ran for a period of three months ending early 2022.

Global ER&D strategy

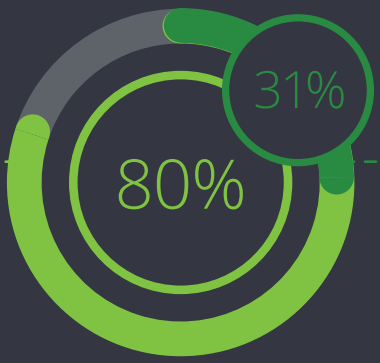
Market insights

Current ER&D spend has been on an upswing after a noticeable slide as **70 percent** of the surveyed companies have already surpassed their pre-COVID levels of ER&D spend.

R&D leaders globally are positive on the growth prospects, with increasing investments being witnessed across sectors.

Current year (2022 vs 2021)

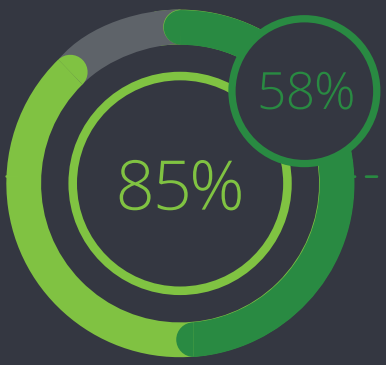
Companies are planning to increase their Engineering R&D spend in 2022



Companies of the 80% that plan to increase their ER&D spend in 2022 will increase their spend by more than **10%.**

2024 vs 2021

Companies indicated an upward trajectory in budget over the next three years.



Companies of the 85% that plan to increase their ER&D spend by 2024 will increase their spend by more than **10%.**

A majority of the companies understandably decreased their ER&D spend in 2020. As the uncertainty from the pandemic subsided with increased vaccine coverage, ER&D budgets also recovered to their traditional levels; almost **70 percent** companies are expected to **surpass their pre-COVID levels of spending** in 2022.

R&D spend in organisations is expected to increase in absolute terms. This increase is largely driven by the rise in organisations' overall budget rather than an increase in R&D spend as a percentage of overall revenue. This is consistent with the **10-20 percent** increase in the ER&D budget by 2024, indicated by a majority of the respondents (implying a CAGR in the range of **3-6 percent** over the next three years).

- About **12 percent** of the respondents predicted that their ER&D budget will increase in the range of 20-50 percent by 2024; this suggests an increase in the R&D budget: revenue ratio.

The major driver for investments is the need to **digitalise products and solutions** across regions and sectors. Companies are investing heavily in Industry 4.0 solutions and other technologies, such as cloud, AI, and big data, to keep pace with the changing competition, and shareholder and consumer expectations.

Sectoral variations in ER&D spend (benchmarked against 2021 spend)

2022

1. **The energy, oil and gas, and aerospace and defence** sectors are expected to see an increase in global R&D spend in the range of **10-20 percent.**

- The energy, oil and gas sectors are investing in the research of (or already investing on) **cleaner sources of energy;** and hence, have the highest band of investments amongst all sectors. Investment is directed towards areas such as renewable sources of diesel from certain crops, solar and wind energy to produce electricity, and electric charging stations for automobiles.
- The increase in spend in the aerospace and defence sector is a **cyclical response** to the strong negative impact of the pandemic on ER&D investments in the past two years.

2. The remaining sectors are projected to increase their global R&D spend in the range of **5-10 percent.**

2024

1. Most companies are expected to increase their global ER&D spend in the range of **10-20 percent.**

Regional variations in ER&D spend (benchmarked against 2021 spend)

2022

1. While companies in North America and APAC, on an average, expect spend to increase by **5-10 percent,** EMEA companies are behind, and predict spend to go **up by 5 percent,** on an average.

2024

1. Most companies across regions are expected to increase their ER&D spend in the range of **10-20 percent.**

There is a strong push to shorten innovation cycles and get faster to market. While traditionally R&D organisations have preferred the organic route, co-creation is emerging as a strong alternative to address these challenges.

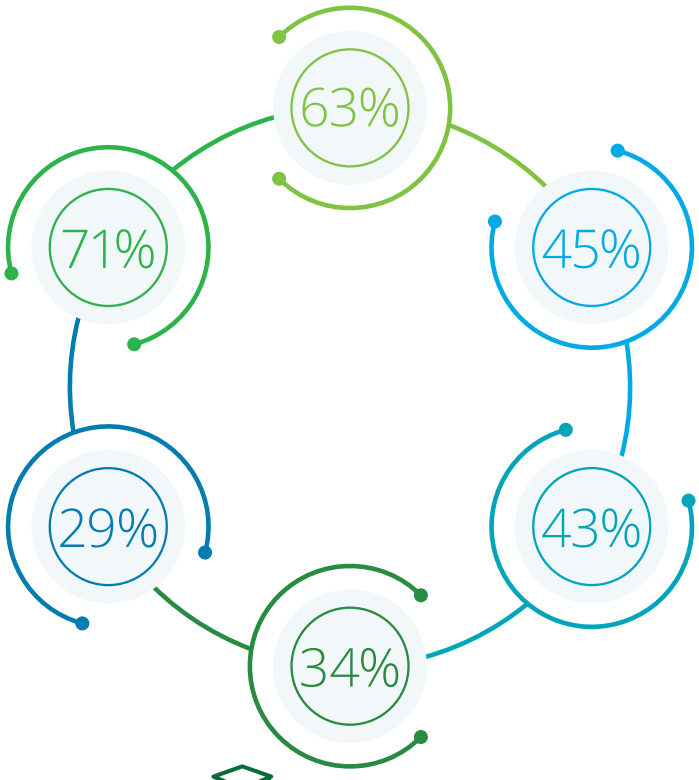
Buy new technology

Companies opt to buy new technologies to accelerate their R&D cycle. It helps companies shorten innovation cycles.

This approach is seen to be highly preferred by companies in the **medical devices and energy, oil and gas sectors.**

Build in-house

Companies still prefer to retain control over their ER&D and hence, in-house development continues to be the most popular choice across **sectors.**



Co-create with start-ups

With an increase in the velocity of technological changes, companies are partnering with start-ups for their expertise in deep tech such as AI/ML, cloud computing, and big data.

This approach is also highly preferred by the **software products, hardware and electronics, and automotive and transportation sectors.**

Co-create with competitors

Nascent companies are looking to co-create with competitors and other value chain players to derive synergies and solve sector-level issues. We see emergence of sector consortiums and innovation super cluster types of initiatives where companies come together and solve industry problems.

This approach is highly preferred by companies in the **industrial and telecom sectors.**

Co-create with ESPs

As the range of products and solutions offered by ESPs become broader, companies look to partner with service providers to fulfill their needs.

This approach is highly preferred by companies in the **aerospace and defense and industrial sectors.**

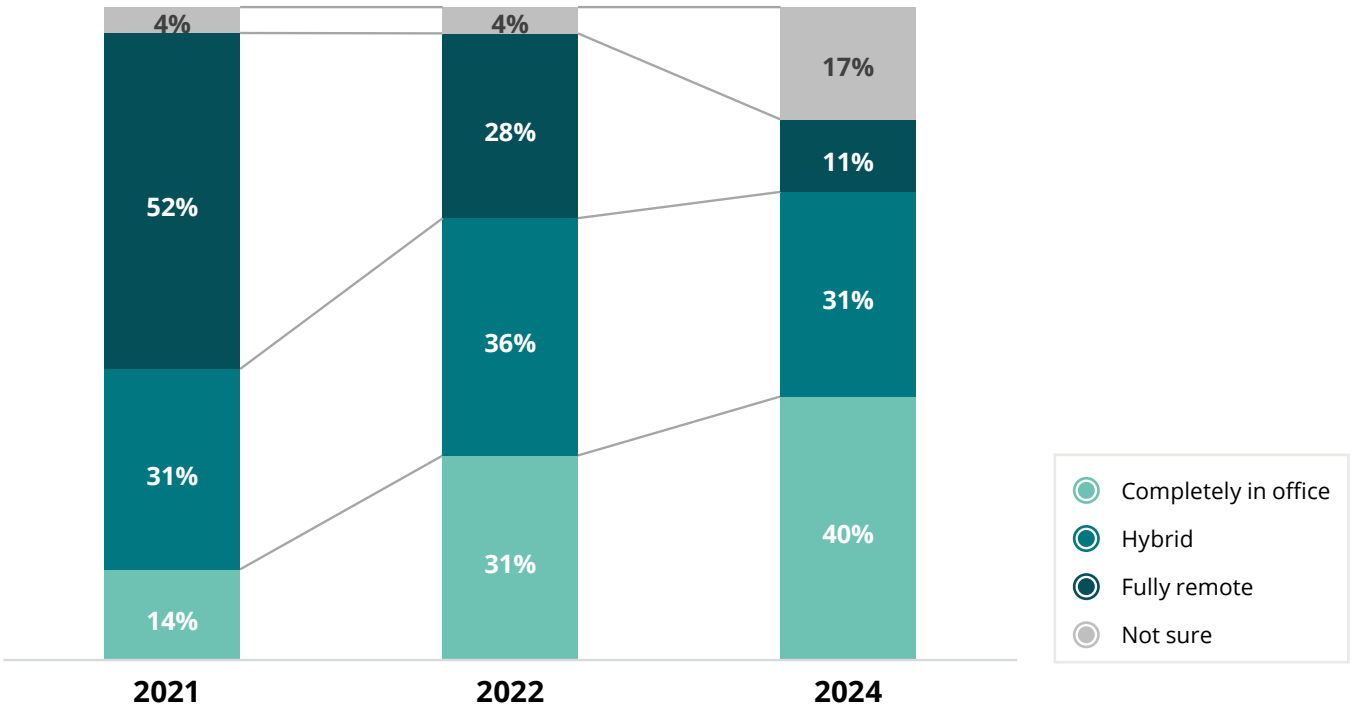
Co-create with academia

Universities are an alternate avenue for developing domain expertise in emerging technologies and advanced engineering due to the strong culture of research within these educational institutions.

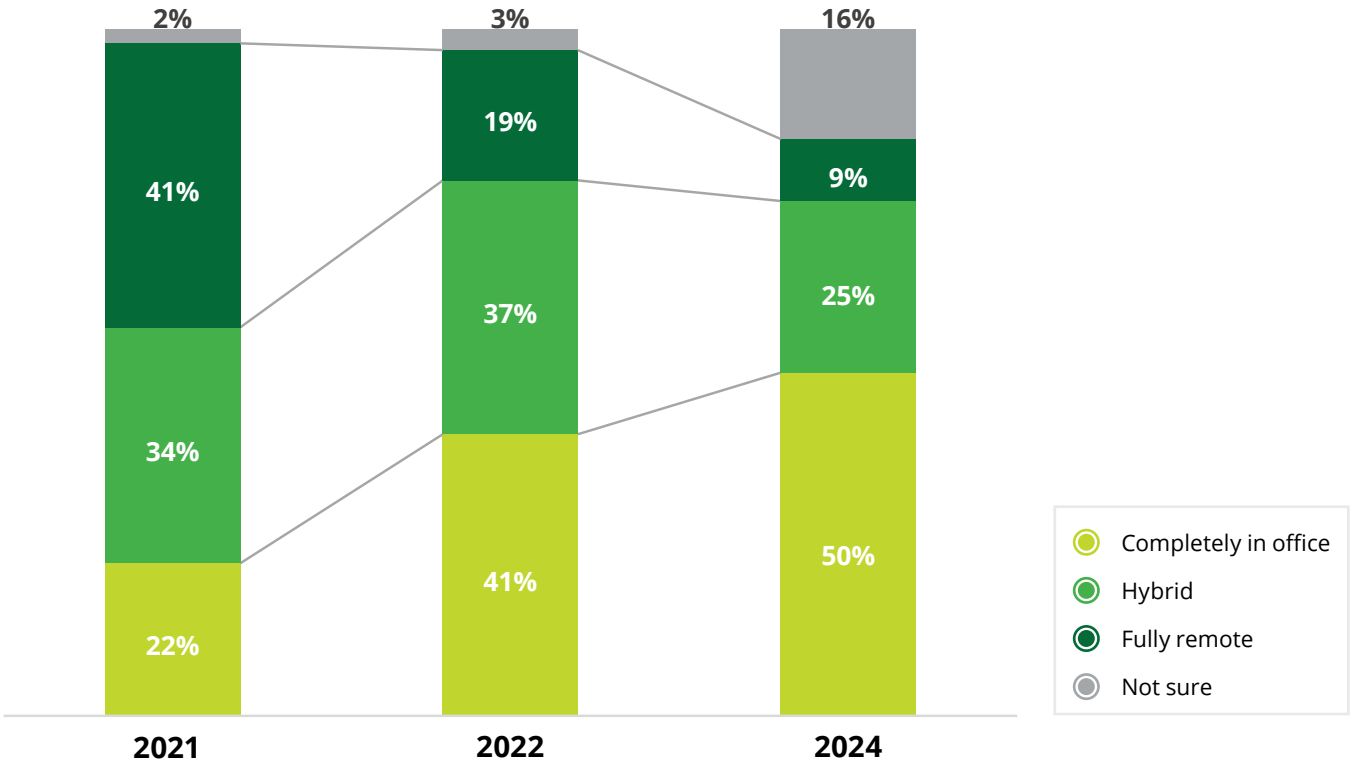
This approach is highly preferred by companies in the **industrial and energy, oil and gas sectors.**

While **37 percent** of the surveyed organisations continue to show a higher propensity for the hybrid work model compared with pre-COVID-19 days, the engineering workforce is expected to witness a significantly greater movement of the employees back into office.

Overall organisation workforce



Engineering R&D workforce



- Some engineering R&D **activities**, such as product design, modeling, embedded process, and testing, are difficult to deliver remotely, and require physical presence in labs and plants for effective execution.
  - Additionally, many companies prefer their teams working onsite as the in-office workforce model enables effective collaboration between cross-functional teams. The survey predicts that **about 50 percent** of the workforce in the ER&D domain will be **back in office** by 2024.
  - That said, a significant portion of ER&D is moving towards digital engineering (**50 percent** respondents) that renders itself well to the remote and hybrid working model irrespective of the sector.
- As products are becoming more connected and digitalised, traditional sectors (such as industrial and hardware) can also sustain a considerable portion of their workforce in hybrid/remote models in the near future.
  - Companies plan to keep nearly **30 percent** of their workforce in the **hybrid model by 2024** to provide more flexibility to employees.
  - The emergence of hybrid/remote working models creates new opportunities for globalising the R&D footprint. This helps leverage the synergies of multiple functions and expertise being housed in various geographical locations or time zones.

Sector-level analysis

Companies in the **industrial and energy, oil and gas** sectors have a higher preference for the '**in-office**' working model.

- Research facilities for branches of engineering (such as industrial, energy, oil and gas) involve complex machinery set-up, resulting in a higher preference for the in-office model.

Companies in the **software products** sector have a considerable workforce in the **remote** model and plan to continue doing so due to the limited need for physical R&D infrastructure.

Region-level analysis

In the long run, companies with their headquarters in the US are expected to embrace the new normal more proactively and sustain a majority of their workforce through the hybrid model.

- This is mainly driven by the presence of major global companies in the software and medical devices sectors.

Companies with their headquarters in Germany and Japan will steadily shift a significant portion of the workforce to the traditional in-office working models.

- This is mainly driven by the presence of major global companies in the automotive and industrial and energy sectors in these regions.

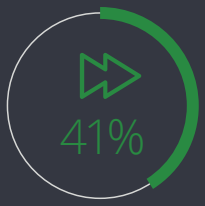
Top challenges facing R&D organisations in 2021

Supply chain disruption continues to be the key challenge as 50 percent of the surveyed companies stated that they are still responding to the effects of COVID-19. However, most companies have managed their liquidity crunch, which was the top challenge highlighted in the last pulse survey.

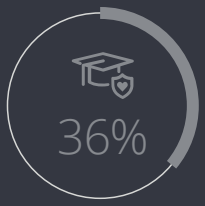
Top challenges in 2021

Inflation/supply-chain disruptions and their effects on increasing product costs

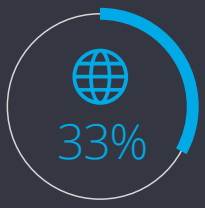
Accelerated innovation cycles/product development and faster time to market



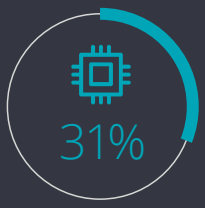
Speed of technological change



Availability of key skills



Globalising R&D footprint



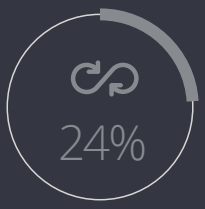
Building a technology ecosystem (closed innovation to open ecosystems)

Scaling-up Industry 4.0 solutions

Agility in the ER&D/ digitally enabled ER&D productivity

Rapidly changing consumer behaviour

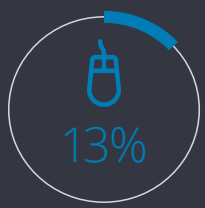
Radical Innovations or capability for developing products for sustainability/ circular economy



Changing regulatory environment

ER&D budget adherence

Lack of a well-defined sourcing strategy



Lack of digital R&D infrastructure for product testing

Lack of strong IP protection framework

Multiple choice question: percentage represents the share of companies that selected this as one of their top challenges

- Co-creation is gaining traction in the ER&D industry. **80 percent** of the surveyed companies considering this approach are looking to cope with challenges of accelerated innovation cycles, speed of technology change and availability of key skills.
- The traditional challenges of lack of digital R&D infrastructure for product testing and lack of strong IP protection framework are no longer the most pressing challenges for global R&D leaders. It thus appears that organisations have matured in the R&D domain and managed these challenges effectively.

Top challenges by sector

The table on the next page, depicts variations in challenges faced by organisations across sectors.

- Some sectors have stepped up sourcing in anticipation of additional disruptions to the supply chain in the near future. About **68 percent** of the surveyed companies in the **hardware and electronics** sector are concerned about **inflation/supply chain disruptions and their effects on increasing product costs** (due to shortfalls caused by semiconductor crisis, thereby limiting production and product redesign).
- **About 67 percent of the surveyed organisations in the medical devices** sector continue to battle **inflation/supply chain disruptions and their effects on increasing product costs**. With many component suppliers closing as a reaction to the onset of COVID-19, components for vital medical devices became challenging to source.
- **Speed of technological change** is a challenge highlighted by **63 percent of the surveyed companies in the software sector**. After the pandemic, companies have accelerated adoption of digital solutions. However, new technologies continue to emerge and evolve. Therefore, software companies continue to find it challenging to assess which ones to address and prioritise.

Top challenges by region

Companies with headquarters in **APAC and North America** continue to address their **supply chain disruptions** on account of the pandemic.

Most companies headquartered in **EMEA** focus on addressing **accelerated innovation cycles/ product development and faster time to market**.

- With the increased focus on product **sustainability** and disruptive technologies of the automotive and industrial sectors (EMEA having global players of these sectors), faster product development is turning out to be a major challenge for countries in EMEA.

Sectoral heat map for top challenges

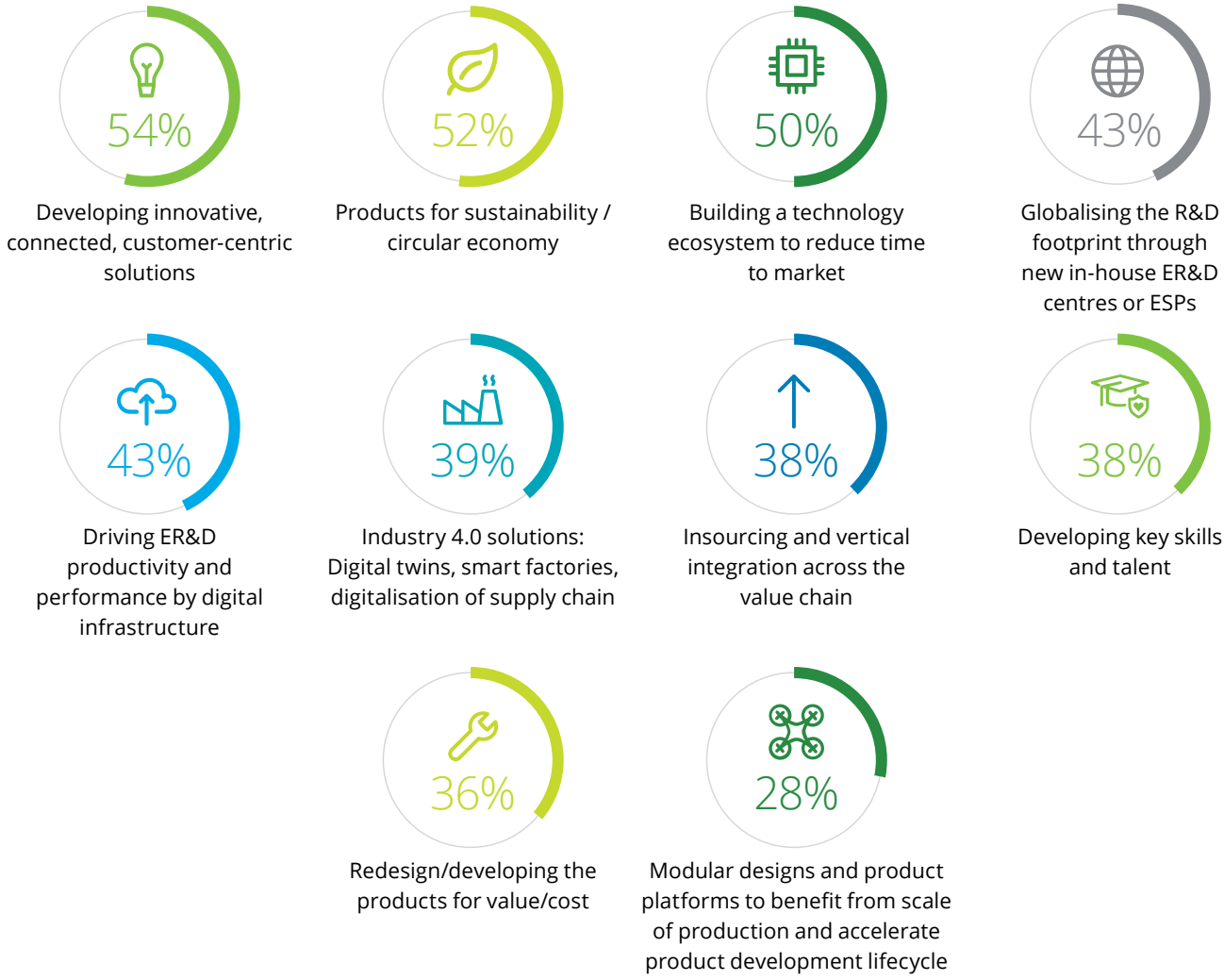
Top challenges	Automotive and transportation	Hardware and electronics	Industrial	Energy, oil and gas	Software products	Medical devices	Aerospace and defense	Telecom
Inflation/supply chain disruptions and their effects on increasing product costs	<40%	>60%	40-60%	<40%	<40%	>60%	<40%	40-60%
Speed of technological change	<40%	40-60%	<40%	<40%	>60%	<40%	<40%	40-60%
Accelerated innovation cycles/product development and faster time to market	40-60%	<40%	<40%	<40%	40-60%	<40%	<40%	40-60%
Availability of key skills	<40%	<40%	<40%	40-60%	40-60%	40-60%	<40%	<40%
Globalising R&D footprint	40-60%	<40%	<40%	<40%	<40%	40-60%	<40%	<40%
Scaling-up Industry 4.0 solutions	<40%	<40%	40-60%	40-60%	<40%	<40%	<40%	40-60%
Building a technology ecosystem (closed innovation to open ecosystems)	40-60%	<40%	<40%	<40%	<40%	<40%	40-60%	<40%
Agility in the ER&D/digitally enabled ER&D productivity	<40%	<40%	<40%	<40%	<40%	<40%	40-60%	<40%

Key: (Percentage of respondents who chose this option within the sector) >60% 40-60% <40%

Top priorities and investment avenues for R&D organisations in 2022

Short-term priorities, such as employee safety, focus on core business, and cost optimisation that companies were devoting their attention to in 2020 have now been replaced with holistic goals, such as customer centricity and sustainability.

Top priorities and investment avenues for 2022



Multiple choice question: percentage represents the share of companies that selected this as one of their top priorities

The top two priorities/investment avenues for 2022 (as seen in the chart above) are market-facing, while the rest are internal to the company.

- For traditional sectors, such as automotive and transportation and hardware and electronics, developing **innovative, connected, customer-centric products and solutions** continues to be the foremost priority. These sectors are shifting towards more software-dependent products. Hence, there is a growing momentum to create connected devices.
- For almost **50 percent** of the surveyed companies, **sustainability** is expected to be amongst their key considerations as they chart their product development roadmap. A notable insight here is that these R&D organisations do not foresee concerns in managing radical innovations and capabilities to develop sustainable products .

- **Industry 4.0 solutions, such as digital twins, smart factories, and digitalisation of supply chain** are a leading priority for the **energy, oil and gas, automotive and transportation and industrial sectors**. A majority of the companies in these sectors aim to improve their productivity, and overall performance by imbibing Industry 4.0 into their strategies.
- The companies prioritising globalising the R&D footprint through new GCCs/ESPs, developing key skills and talent, and Industry 4.0 solutions are expected to increase their global ER&D spend by at least **10 percent**. These priorities understandably require companies to increase their overall R&D spend significantly than other business priorities.

Top priorities by sector

The table depicts variations in priorities that organisations across sectors face:

64%

of the surveyed companies in the **hardware and electronics** sector and

69%

in the software products sector classify **developing innovative, connected, customer-centric products and solutions** as their topmost priority.

- Strong focus on development of digital solutions (such as online platforms and applications) based on a customer's point of view is expected to be a priority.

69%

of the surveyed companies in **the software** sector focus on **'building a technology ecosystem'**.

- The technology ecosystem model is built around a larger set of key providers, each focusing on a specific domain or product. They work in a collaborated manner, giving the business access to a greater range of capabilities and plug-and-play flexibility.

64%

of the surveyed companies in the e**nergy, oil, and gas** sector have highlighted **'Industry 4.0'** as a principal priority. The state-of-the-art technologies of Industry 4.0 offer increased ability to deploy renewable energy in manufacturing, reduced carbon emissions, optimised energy use, heightened productivity, and cost savings at an unprecedented scale.

64%

of the surveyed companies in the **energy, oil, and gas** sector prioritise **'products for sustainability/circular economy'** as Governments and companies worldwide pledge to achieve net-zero emissions of greenhouse gases.

- A transition to net-zero emissions would nonetheless entail a transformation that would affect many countries and sectors of the economy, either directly or indirectly, resulting in changes in demand, capital spending, costs, jobs, etc.

71%

of the surveyed companies in the **telecom sector** also prioritise **'Industry 4.0'**. Many advancements have been made because of telecom research to continually improve communication with faster speed and greater connectivity.

63%

of the surveyed companies in the **'aerospace and defense sector'** focus on **'modular designs and product platforms to benefit from the scale of production'** to allow for quick integration, unlocking greater production efficiency for manufacturers and higher flexibility in design.

Top priorities by region

APAC - The proliferation of changing technologies is enfolding in Asia at an unprecedented pace and scale. Companies with headquarters in APAC focus on **building a technology ecosystem to reduce time to market**.

- To succeed in a borderless world and work with partners in an agile way to deliver viable products and integrate functionality, enterprises in Asia Pacific are cashing in on the power of technology.
- The speed and agility of this method stand in marked contrast to the traditional approach of developing new products, services, or solutions in a dedicated environment alongside the existing provider and system landscape.

EMEA – About **60 percent** companies with headquarters in EMEA plan to **globalise their R&D footprint through new ER&D GCCs or ESPs**. The increasing need for multidisciplinary competencies and the rising innovation costs have led companies in EMEA to leverage GCCs and ESPs.

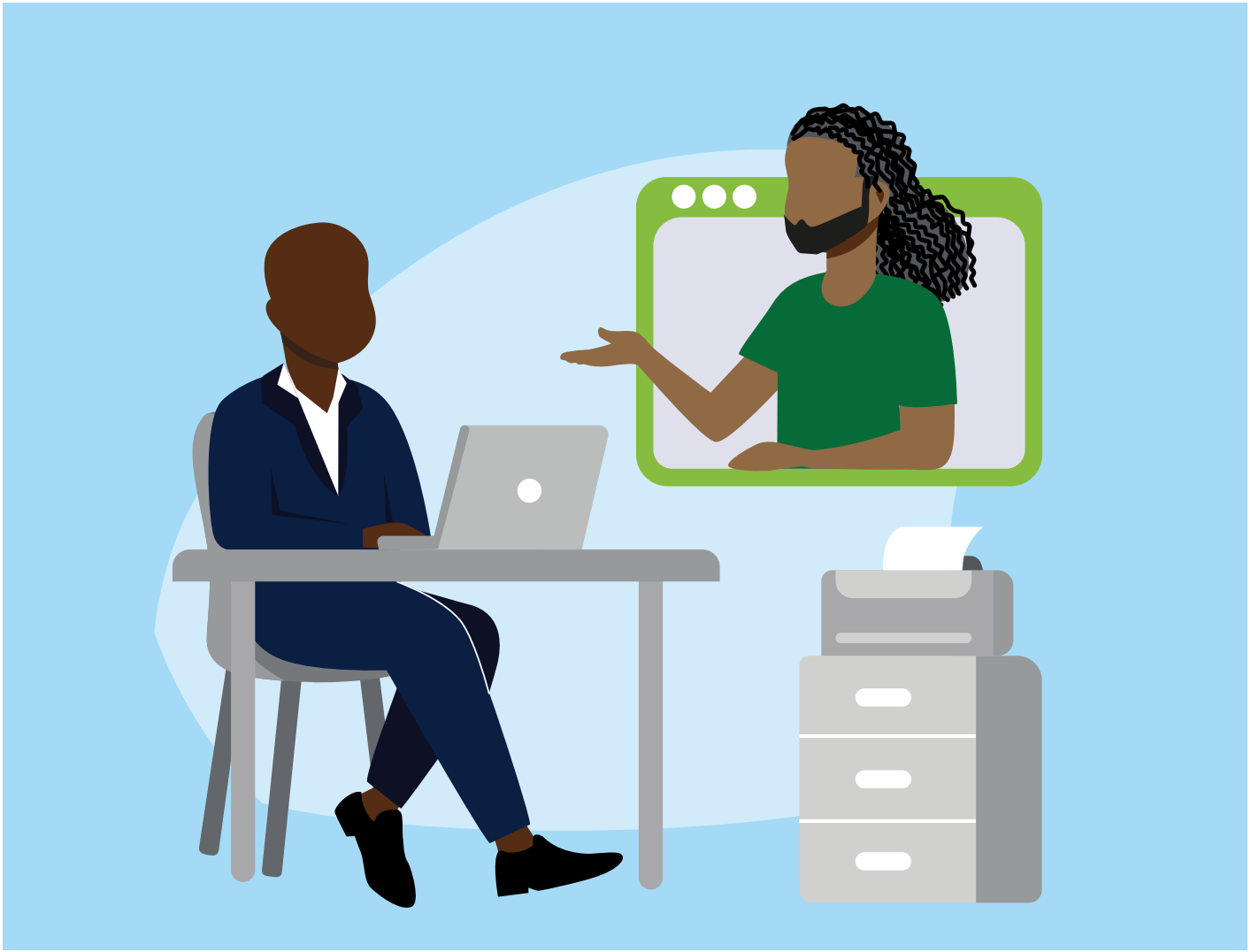
- **Driving ER&D productivity and performance by digital infrastructure** is another focus area for companies in EMEA (specifically in Germany). This significantly reduces costs and accelerates cycle times. The future of R&D is expected to be driven by AI/ML and advanced analytics mining large datasets, enabling companies to understand and visualise interaction with targets, and predict likelihood of success.

North America - Companies in the US have already globalised their R&D footprint at a higher scale compared with those based in EMEA.

Sectoral heat map for top priorities

Top priorities	Automotive and transportation	Hardware and electronics	Industrial	Energy, oil and gas	Software products	Medical devices	Aerospace and defense	Telecom
Developing innovative, connected, customer-centric products and solutions	40-60%	>60%	40-60%	<40%	>60%	40-60%	<40%	40-60%
Building a technology ecosystem	<40%	40-60%	40-60%	<40%	>60%	<40%	<40%	40-60%
Products for sustainability/ circular economy	40-60%	40-60%	40-60%	>60%	<40%	40-60%	<40%	40-60%
Globalising the R&D footprint	40-60%	40-60%	40-60%	<40%	<40%	40-60%	40-60%	40-60%
Driving ER&D productivity and performance by digital infrastructure	40-60%	<40%	40-60%	<40%	<40%	<40%	40-60%	40-60%
Insourcing and vertical integration across the value chain	<40%	40-60%	<40%	40-60%	<40%	<40%	<40%	<40%
Industry 4.0 solutions: digital twins, smart factories, digitalisation of supply chain, etc.	40-60%	40-60%	40-60%	>60%	<40%	40-60%	40-60%	>60%
Modular designs and product platforms to benefit from scale of production	<40%	<40%	<40%	<40%	<40%	40-60%	>60%	<40%
Developing key skills and talent	<40%	<40%	<40%	40-60%	>60%	<40%	<40%	40-60%

Key: (Percentage of respondents who chose this option within the sector) >60% 40-60% <40%



Evolving service delivery models

Engineering R&D GCCs

ER&D GCCs are highly preferred by sectors such as **automotive and transportation, hardware and electronics, and telecom.**

85%

of the surveyed companies already use a GCC for their ER&D activities.

Engineering service providers

ESPs are highly preferred by sectors such as **aerospace and defense, and medical devices.**

47%

of the surveyed companies already outsource ER&D activities to an ESP.

Nearly 40 percent of the surveyed companies planning to co-create with ESPs in the future do not have an established partnership with an ESP. Thus, **ESPs have a huge potential for 'growing the pie'** in terms of new demand from companies in ER&D.

The expansion of the engineering R&D footprint is no longer primarily based on cost arbitrage. Companies expect their GCCs and ESPs to take ownership of **end-to-end product management lifecycle**, effectively moving them up the value chain.

Location Assessment

Of the preferred locations for setting up GCCs or outsourcing to an ESP, **India and China** have emerged as the most popular destinations. Both these countries provide a business-conducive ER&D ecosystem, including expertise in right skills, eminent universities to source talent from, cutting-edge start-up culture, and favourable government incentives. Companies are looking to diversify their footprint by migrating some ER&D activities (especially some niche skillsets or those that are not dependent on a critical mass) to newer geographies. Beyond India and China, they want to test the waters in some traditional R&D strongholds, such as Israel and Germany, or to regions with significant cost arbitrage, such as Southeast Asia, or in a few cases, to nearshore locations in the same time zone as headquarters.

Regional summary

- **Companies with headquarters in North America** - Organisations headquartered in North America often opt their ESPs to be in nearshore locations. The need to be close to the US geography, with real-time support from teams in the same time zone and access to local supplier base (Mexico) is making service providers present in the US well positioned to deliver ER&D needs for companies with headquarters in North America.

- **Companies with headquarters in APAC** – At present, a larger percentage of the ER&D work that is delivered outside the headquarters is taken up by organisations' GCCs. This arrangement potentially opens new avenues for ESPs that might be able to carry out these activities with a reasonable cost advantage (as there is no new set-up and hiring spend), and already specialise in specific activities

Top reasons for using ER&D GCCs and ESPs

55 percent respondents have stated 'improving focus on core business' and 47 percent respondents have cited that 'easy availability of the ER&D ecosystem' as the key reasons for companies to use GCCs and ESPs for ER&D activities.

GCCs

Improve focus on core business and innovation

Scale of R&D ecosystem availability (academia/peer presence/start-ups)

Output of in-house ER&D can be shared across product lines

Consolidation and standardisation of processes

Better availability of some key emerging technologies

Gain access to better skills/ expertise

Reduce and control cost of operation

n=88

ESPs

Improve focus on core business and innovation

Reduce and control cost of operation

Scale of R&D ecosystem availability (academia/peer presence/start-ups)

Investment for strategic advantage

Gain access to better skills/ expertise

Better availability of some key emerging technologies

Output of In-house ER&D can be shared across product lines

n=53

Generated from a multiple choice and open text question; ranked in the decreasing order of the number of respondents who selected the option

'Consolidation and standardisation of processes' and 'easy shareability of output across multiple product lines' are key drivers for companies to leverage GCCs.

'Gaining access to better skills and expertise' or 'looking for a partnership to gain competitive advantage' are key drivers for companies to use ESPs.

Sectoral summary for reasons to use ER&D GCCs

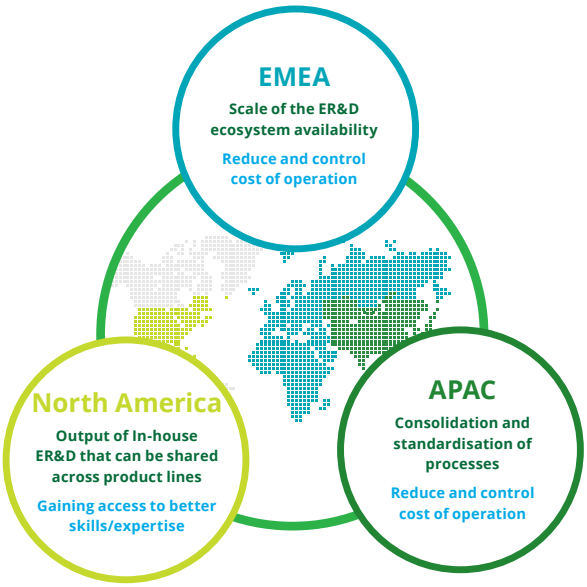
GCCs have been redefining the way businesses use a diverse talent pool and skillsets distributed across geographies. While GCCs were initially set up with an objective of accessing new talent pools with a cost advantage, over the years they have brought in other value-added benefits.

The table below depicts the variation in reasons to leverage GCCs by organisations across sectors.

- With the advent of digitalisation, the scope of GCCs has matured from a delivery centre for business processes to a strategic hub for engineering R&D services.
- Companies employ GCCs for their **'scale of ER&D ecosystem availability'** and adopt a focused and streamlined global approach to improve productivity and efficiency. This highly relies on offshore strategic partnerships to establish networks of scientific expertise, which is cited by about **100%** **of the surveyed companies in the software sector and** **70 percent** of the surveyed companies in the **industrial and medical devices sectors.**
- **71 percent** of the surveyed companies in the **medical devices sector** employ GCCs to also **'share output of in-house ER&D across products'** through significant discoveries and development of new therapies. These GCCs also provide complementary insight about the efficacy and adverse effects of medical interventions that could affect the results of the studies across other drugs, vaccines, medical devices, and diagnostics.

Regional summary for reasons to use ER&D GCCs

- Although improving focus on core business area is stated as a common reason across regions, companies with headquarters in different regions use their GCCs/ESPs for unique reasons:



ER&D GCCs

Engineering service providers

Sectoral heat map for top reasons to leverage GCCs

Top reasons to leverage GCCs	Automotive and transportation	Hardware and electronics	Industrial	Energy, oil and gas	Software products	Medical devices
Improve focus on core business and innovation	40-60%	40-60%	40-60%	40-60%	40-60%	40-60%
Scale of ER&D ecosystem availability	40-60%	<40%	>60%	40-60%	>60%	>60%
Output of in-house ER&D can be shared across product lines	>60%	<40%	40-60%	>60%	40-60%	>60%
Better availability of some key emerging technologies	40-60%	40-60%	40-60%	40-60%	40-60%	<40%
Consolidation and standardisation of processes	<40%	40-60%	40-60%	40-60%	40-60%	40-60%

Key: (Percentage of respondents who chose this option within the sector) >60% 40-60% <40%

Sectoral summary for reasons to leverage ESPs

Companies have several reasons, including 'reducing and controlling cost of operations', 'improving the company's focus,' and 'liberating inner sources for new products', to outsource to ESPs.

The table below depicts the variations in reasons to use ESPs by organisations across sectors:

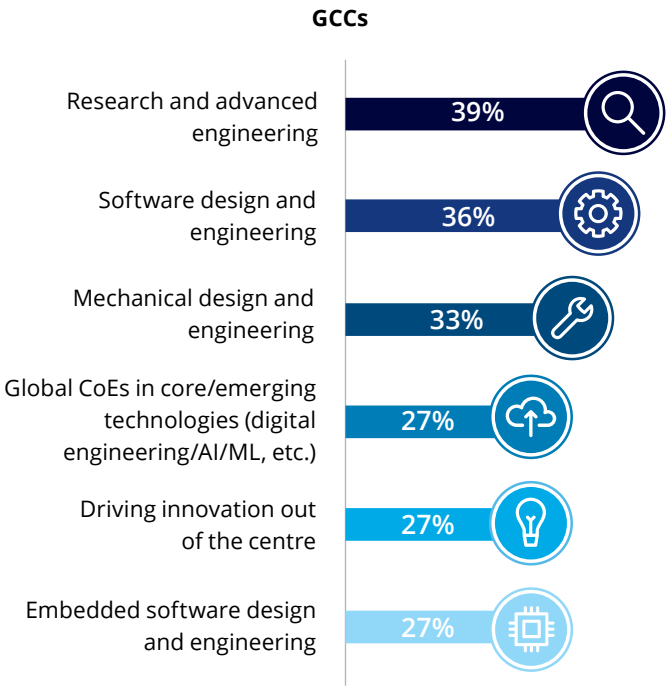
- Of the surveyed companies, **83 percent** of the companies in the **software sector** and **63 percent** of the companies in the **energy, oil and gas sector** state that **'improving focus on core business and innovation'** is the core reason to leverage global ESPs.
  - Given the expenses and time constraints of hiring and training internal developers and elevating infrastructure, looping in an outside team of experts for the relevant work is convenient and fiscally viable.

Sectoral heat map for top reasons to leverage ESPs

Top reasons to leverage GCCs	Automotive and transportation	Hardware and electronics	Industrial	Energy, oil and gas	Software products
Improve focus on core business and innovation					
Reduce and control cost of operation					
Investment for strategic advantage					
Scale of ER&D ecosystem availability					
Better availability of some key emerging technologies					

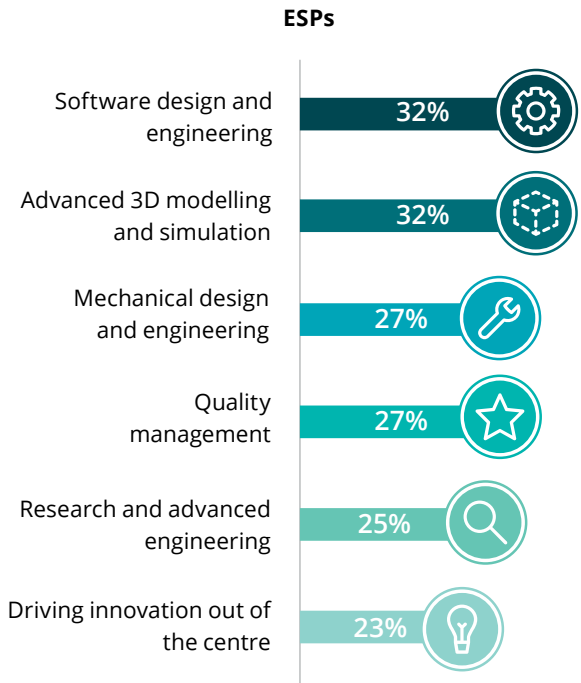
Key: (Percentage of respondents who chose this option within the sector) >60% 40-60% <40%

Top activities to be migrated to GCCs



n=65

Top activities to be migrated to ESPs



n=41

Multiple choice question: Percentage represents the share of respondents that selected this as one of their top activities

Organisations have always had their GCCs focus on development, testing, and integration. However, through the survey, we witness the maturity of this operating model, with organisations also looking at activities such as R&AE, driving innovation, CoEs for digital engineering, and emerging tech to be based out of such centres.

- Additionally, with GCCs focusing on developing the talent and skillset of their workforce, activities requiring specialised skills, such as 'embedded software design and engineering' and 'mechanical design and engineering' are being increasingly moved to global GCCs.

ESPs are gaining the trust of their base companies and clients with IP sharing and shift of new core activities to ESPs.

- With ESPs focusing on moving beyond traditional activities and becoming strategic end-to-end partners to their clients, activities such as 'quality management 'and 'advanced 3D modelling' are fast gaining traction with ESPs.
- Companies use ESPs for their expertise in specialised skills, which in essence provides a competitive advantage to companies.

Regional summary

The top activities to be migrated to GCCs vary across organisations headquartered in different regions.

Companies with headquarters in EMEA focus on migrating activities such as 'manufacturing and operations' and 'process standardisation'.

- The countries in EMEA (especially Germany and France) are home to some of the major global companies in the automotive, aerospace, industrial, and energy sectors. Hence, non-India GCCs (presumably in nearshore locations) receive core manufacturing activities.

Companies with headquarters in APAC and North America are seen to be prioritising the delivery of 'research and advanced engineering' and 'software design and engineering' from their global centres. This is because of the presence of some major global companies in the software products and hardware and electronics sector in those geographies.

Digital and core engineering skills sought after in GCCs and ESPs

ER&D companies are investing in upskilling and reskilling their workforce in both digital and core engineering skills to make them industry ready. As universities are shaping to be key stakeholders in ensuring the quality of talent, industry consortiums and associations are partnering with engineering and management colleges to create the next generation of ER&D workforce.

Most sought-after digital engineering skills

60%
Artificial intelligence/machine/ deep learning

48%
Big data/engineering analytics

48%
IoT

45%
Automation

37%
Cloud computing

Most sought-after core engineering skills

49%
Software development

40%
Systems integration/systems architecture

39%
Mechanical design and engineering

37%
Manufacturing engineering

36%
Product management

n=74

Multiple choice question: percentage represents the share of companies that selected this as one of their top skills

- Due to the increasing complexity of data centres and workforce required to maintain them, companies now focus on building their business models on cloud. Moreover, the world witnessed an exponential increase in cyber-attacks in 2021 compared with previous years. These business imperatives thus make **'cyber security' and 'cloud computing'** the principal skills for the **software product** sector.
- 5G is rated as a critical digital engineering skill for the **hardware and electronics** sector understandably, since the companies operating in this sector are deeply involved in the development and deployment of various applications of 5Gs.
- The focus of the **automotive and industrial** sectors is material performance that directly affects customer experience. Hence, the need for accurate, comprehensive **mechanical analysis and testing** of these materials continues to be critical for R&D of new products.
- **Embedded medical system** skills are crucial for the **medical devices** sector for frequent monitoring and management of patients' health. Use of sensors to extract data on aspects of a patient's health, such as their heart rate, and sending this data to physicians wirelessly for analysis is one such example of these technologies.

Perspective on India

ER&D GCCs

ER&D GCCs in India have met the expectations of their parent organisations. Companies plan to significantly increase their budget for India in the immediate future.

85%

Companies have provided positive feedback on the performance of India GCCs.

Performance of India GCCs has improved -

the satisfaction level has improved from **82 percent** seen in the last survey.

All analyses, graphs, and tables relating to India ER&D GCCs have an n-size of 64

Engineering R&D spend for India GCCs

72%

Of the surveyed companies with GCC in India plan to increase their spend in 2022. Of these, **50%** plan to increase their spend by more than **10% percentage**, which is much higher than the global R&D budget increase.

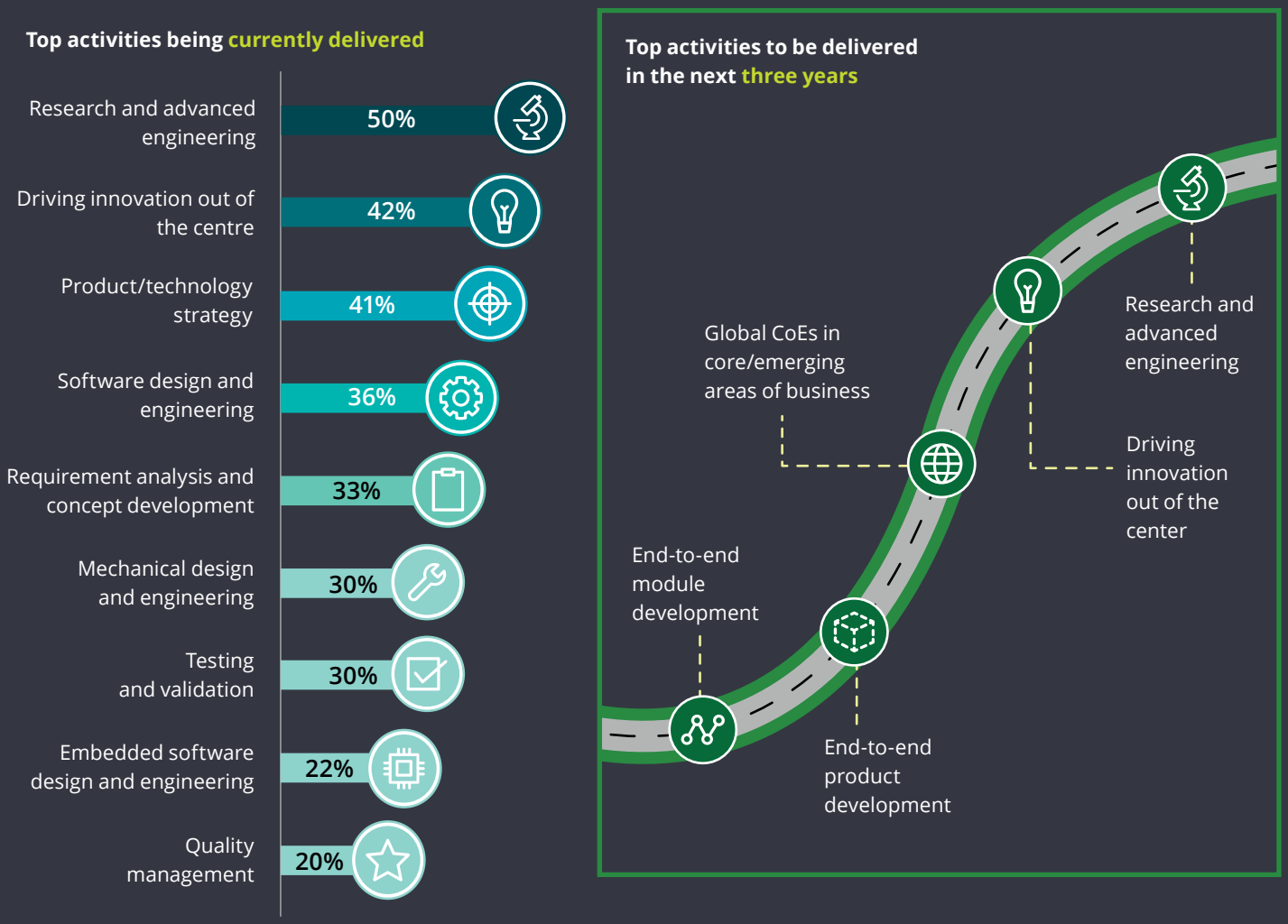
- **More than 90 percent** of the surveyed organisations plan to ramp-up or maintain their spend on their India GCCs, a sentiment similar to the one seen last year.
- **India, a key destination -** Companies across geographies are looking to leverage their India GCCs to deliver more activities due to the availability of key skills and talent at scale.
  - As India is also better positioned to deliver on emerging technologies (AI/ML/IoT/ cloud, etc.), companies are opening to the possibility of even shifting many of their core activities to their India GCCs.
- Sector level analysis - Companies in the '**industrial and software products**' sectors are predicted to contribute the highest to the increase in ER&D spend in India GCCs, driven by increasing focus on providing value-added services and growth of key emerging technologies.

Observed correlations from surveyed data between ER&D spend and challenges

- Companies with challenges such as changing regulatory environment, **globalising R&D footprint**, and **lack of digital R&D infrastructure** for product testing, plan to increase their ER&D spend in their India GCCs by **10-25 percent**.
  - Changes in regulatory environment include new environmental regulations for production of more sustainable products and solutions (for example, standardisation of EV battery/charging infrastructure). Companies planning to increase their R&D footprint are also investing to increase resource strength in their India GCCs.

- Companies with challenges such as **speed of technological change**, **radical innovations**, or **capability** for developing products for **sustainability/circular** economy, and **scaling-up Industry 4.0 solutions** plan to increase their ER&D spend in the range of **0-10 percent**.
  - Preparing for these challenges is a part of the long-term strategy of companies. Hence, these companies are expected to increase their ER&D spend only moderately.

Top engineering R&D activities delivered from India GCCs



Multiple choice question: percentage represents the share of companies that selected this as one of their top activities

- **'Research and advanced engineering'** is increasingly seen as the key activity being migrated to India GCCs, while **'driving innovation out of the centre'** has emerged as another principal activity replacing 'ensuring business continuity' and 'ability to drive scale' that were rated high in the last pulse survey.
  - While highly specialised activities, such as 'research and advanced engineering' and 'driving innovation out of the centre' appear on top as activities currently being delivered by the largest share of surveyed companies, the volume of work being executed is relatively low now. The magnitude of the same is expected to significantly pick up in the next three years.
- With the availability of enhanced skills and domain expertise (in software development, product management, and manufacturing engineering), and employee adaptability to key emerging technologies (such as AI/ML/DL, automation, and big data/engineering analytics), activities such as **'requirement analysis and concept development', 'product/technology strategy', 'driving innovation out of the centre,' and 'research and advanced engineering'** are making strong inroads into India GCCs. This signals a highly positive trend for their growth in India.
  - Further, GCCs are preferred for building and retaining specific domain expertise within the resource pool as these activities require close coordination with multiple teams and departments.
- In the next three years, because of the readily available talent and considerable management control, GCCs are expected to take up activities such as setting up of **'global CoEs in core/emerging areas of business'** and ensuring **'end-to-end module development'**. ER&D GCCs are increasing in value by nature of work and the level of influence they have in the value chain. By virtue of that, we see them play the role of influencers and in some cases sponsors of certain initiatives. The dynamics are panning out in a way that ER&D GCCs are becoming sponsors and building the relationship with service partners with co-location accelerating the process.

Sectoral demand areas for activities currently being delivered by GCCs

The top set of activities delivered by India GCCs are common across most sectors. However, specific sectors propose to carry out the following services as the leading activities from their India GCCs.

- **'Mechanical design and engineering'** is the top activity migrated for companies in the industrial, energy, oil and gas and the automotive sectors as the products in these sectors are largely machine-based.
- **Software design and engineering'** is the top priority for companies in the software products sector as companies in this sector provide software solutions requiring a large pool of software engineers.

Regional demand areas for activities currently being delivered by GCCs

While 'research and advanced engineering' is a top demand area for India GCCs with firms across regions, there are specific variations in the activities expected to be shifted based on the region of the firm.

- **Companies with headquarters in APAC** are mainly migrating regular activities, such as 'testing and validation,' as their India GCCs are still evolving.
- **Companies with headquarters in EMEA** and **North America** are looking to migrate more complex activities around 'driving innovation out of the centre', 'product/technology strategy', and 'software design and engineering'. As these companies have more matured India GCCs, it is only logical that they now plan to shift more complex activities.

Observed correlations from surveyed data between ER&D spend and activities

The long-term strategy of companies is a major factor driving their overall ER&D budget to India GCCs and ESPs. Companies planning to deliver more complex ER&D activities tend to have a higher increase in their ER&D budget towards India centres.

- Companies with mature GCCs plan to **drive their innovation cycle** and **core product/technology strategy** through their India centres. This requires companies to increase their ER&D spend towards India GCC/ESP by **10-25 percent** in the next three years.
- However, companies with less mature global R&D footprint tend to migrate/outsource basic activities, such as **process standardisation/ automation, services (such as CAD, SW, HW, and testing), and telemetry** into India centres. Hence, these companies tend to increase their budget at a relatively modest rate of about **10%** (when adjusted for expected inflation over the years).

Sectoral variation of activities to be delivered by India GCCs by 2024

While most sectors hope to run 'end-to-end product development' from their India centres, the other ER&D activities planned to be delivered from India GCCs vary across sectors as the overall ER&D strategy depends on the sectors and level to which the Indian ecosystem is prepared for certain activities. The table below depicts the variation in the activities planned to be delivered by India GCCs at a sector level.

- About **60 percent** of the surveyed enterprises in the **industrial sector** plan to deliver their product/technology strategy from their India centres. While already delivering a large portion of the ER&D initiatives for companies, they have the vision to deliver the core product strategy.
- About **70 percent** of the surveyed enterprises in the **energy, oil and gas sector** plan to build global CoEs in India for emerging technologies, such as AI/ML, big data, and IoT and for software development as a core engineering skill.

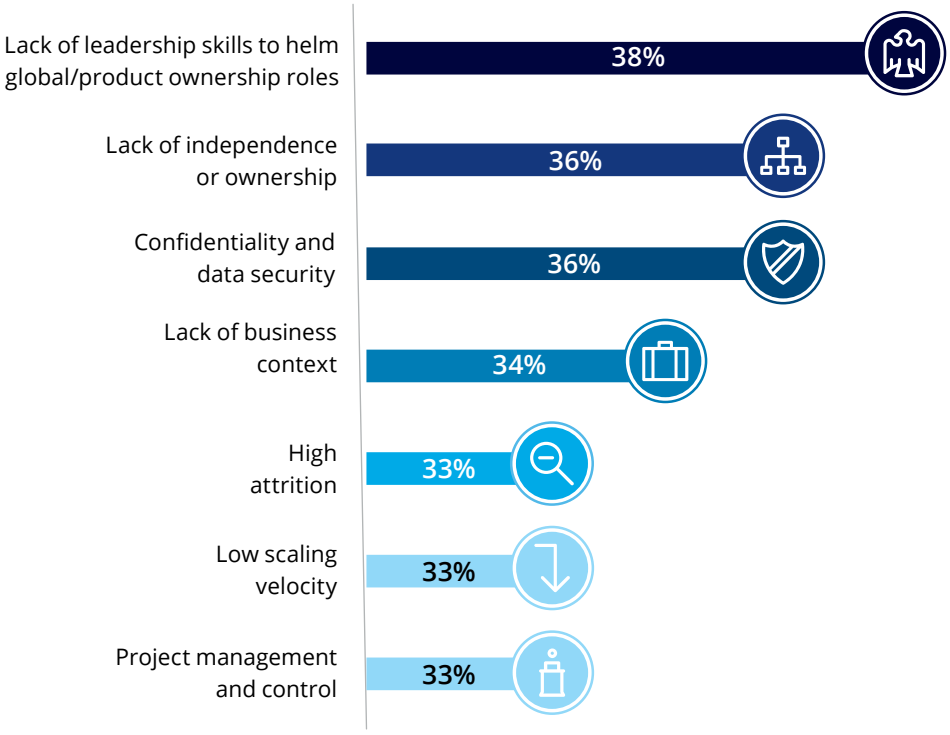
Sectoral heat map for top activities to be migrated to India GCCs by 2024

Top activities to be migrated to India GCCs	Automotive and transportation	Hardware and electronics	Industrial	Energy, oil and gas	Software products
Driving innovation out of the centre	<40%	<40%	40-60%	<40%	40-60%
End-to-end product development	40-60%	<40%	40-60%	40-60%	<40%
End-to-end module development	<40%	<40%	<40%	40-60%	40-60%
Global CoEs in core/emerging areas of business	<40%	40-60%	<40%	>60%	<40%
Research and advanced engineering	<40%	<40%	40-60%	40-60%	<40%
Product/ technology strategy	<40%	<40%	>60%	<40%	<40%

Key: (Percentage of respondents who chose this option within the sector) >60% 40-60% <40%

Top improvement areas for India GCCs

Leadership and independence/ownership have been highlighted as the top improvement areas for India GCCs



Multiple choice question: Percentage represents the share of respondents that selected this as one of their top activities

- As India GCCs transition to providing activities such as 'research and advanced engineering' and its likes that are core to organisations, they are becoming product innovation centres that take responsibility of end-to-end product development, warranting the central theme to transition the leadership from expert engineers and service delivery leaders to business leaders. Accordingly, there is need to augment the Indian talent base with senior product engineering leaders. However, while domain expertise of the middle management is important to both digital and core skills, the gap in availability of 'holistic, future-aware managers' to fill the **senior management roles** is a major challenge with most GCCs in India and needs to be addressed on priority.
- Burgeoning with exciting new start-ups, rapidly growing technology companies, and traditional companies reinventing themselves, the Indian market sees companies offering competitive salaries and aggressively hiring from within the same talent pool. The resulting issue of **high attrition** plagues sectors and is a major challenge for knowledge retention within the ER&D departments of companies. Furthermore, "The Great Resignation" happening due to radical changes in employee priorities during the pandemic has driven the attrition rate to an all-time high over the past two years.
- With the evolving de-centralised delivery models, companies are particularly concerned about and trying to foresee risks associated with employees relying on their home networks and sometimes their own devices with minimal organisational oversight on data access. The security systems in place were initially intended for an in-office working model. As organisations prepare for what life looks like in a post-pandemic world, one of the many issues they'll have to address are **'confidentiality and data security'** risks of remote working.

Top challenges by sector

- **The automotive and transportation sectors** are going through a major technology disruption and focusing on creating connected, autonomous, and EV-based automobiles. Hence, India GCCs are expected to **ramp-up their digital engineering skills** to deliver effectively to these industry trends.
- Companies in traditional sectors, such **as hardware and electronics, industrial, and energy, oil and gas** need their India GCCs to efficiently manage R&D projects. These industries are still in the initial stages of product digitalisation. Hence, efficient project management and control is necessary to develop new products and solutions.
- Companies in the **software products** sector have seen maximum growth in demand during the pandemic as companies across sectors are **digitalising** their products. Given the sudden growth in this sector, there is need for experienced senior leaders to **helm global/ product ownership roles** in India GCCs.

Top challenges by region

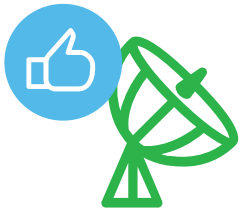
- As India GCCs face management complexity and language barrier with respect to other **APAC nations** (especially Japan), 53% companies with headquarters in APAC have raised issues related to '**project management and control**'.
- **Companies with headquarters in EMEA** (especially Germany) plan to shift core activities to their India GCCs and hence, are concerned about '**limited/non-availability of digital engineering skills.**'
- **Companies with headquarters in North America** expect India GCCs to provide greater **scaling velocity**, which would mean they are open to migrate more activities to their India GCCs. Hence, there is need for expanding the availability of quality talent in India and the presence of a strong ER&D ecosystem.

Perspective on India

Engineering service providers

Engineering service providers in India have exceeded their earlier performance and India can expect to see a substantial increase on ER&D spend towards ESPs

All analyses, graphs, and tables relating to India ER&D ESPs have an n-size of 23



78%

Companies have provided positive feedback on the performance of their India ESPs.

Performance of India ESPs has improved from the last year - the satisfaction level has improved from **68 percent** seen in the last survey'

Engineering R&D spend for India ESPs

52%

Of the surveyed companies plan to increase their spend in 2022.
Of these, 50% plan to increase their spend in the range of **10-25%**.

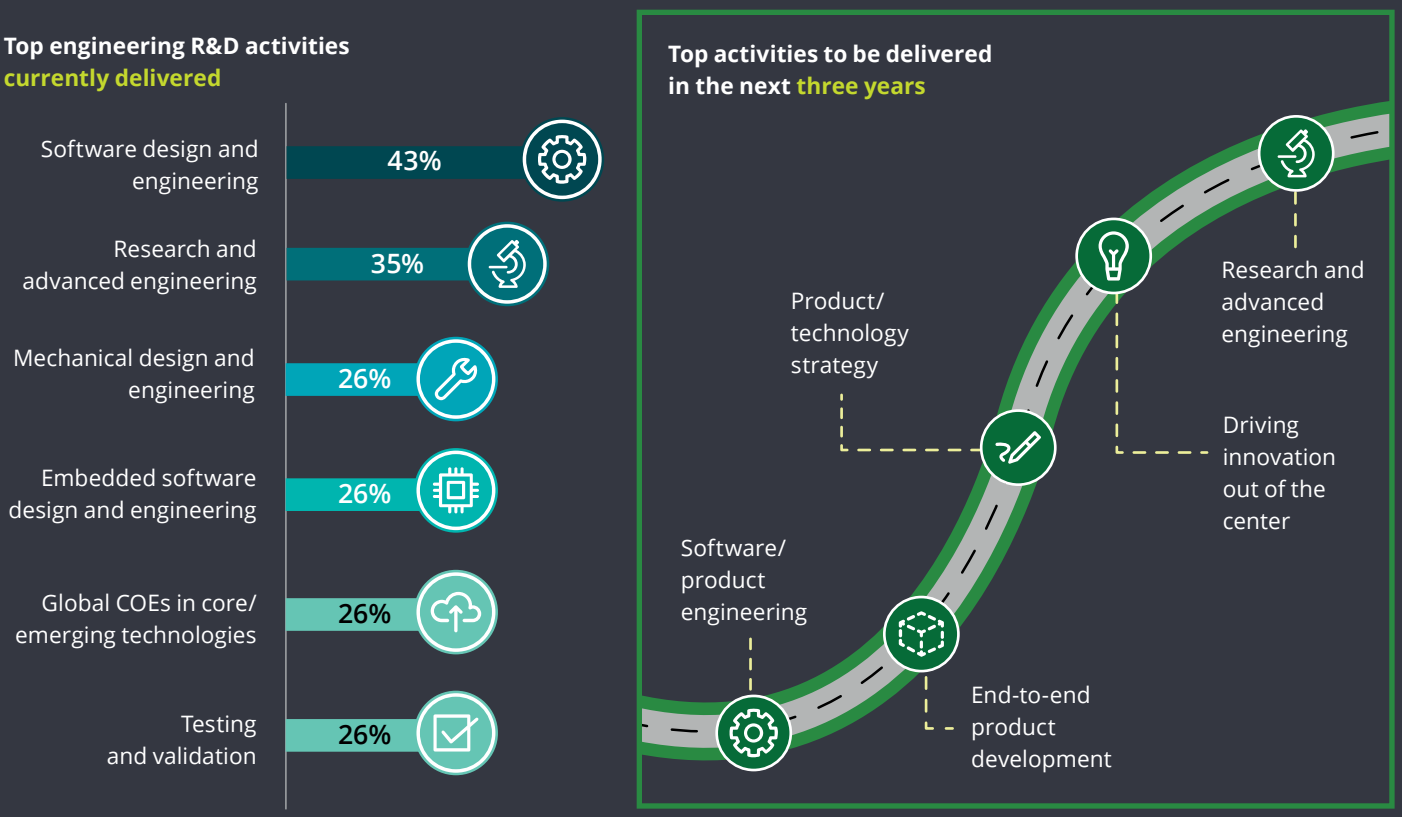
- Compared with the last survey, we see a positive outlook from surveyed enterprises towards their India ESP as **nearly 80 percent** of them are planning to ramp-up or maintain their ER&D budget allocated to ESPs
- Companies across regions and sectors are looking to leverage India ESPs to improve their focus on core business and innovation
  - Companies prefer India ESPs due to the availability of scale in the ecosystem (academia, peer presence, start-ups)

Observed correlations from surveyed data between ER&D spend and challenges

- Companies planning to increase their ER&D spend in their India ESPs in the range of **10-25 percent** are coping with challenges such as availability of key skills, and agility in the digitally enabled ER&D productivity
- Companies planning to increase their ER&D spend in the range of **0-10 percent** are addressing challenges such as speed of technological change, accelerated innovation cycles, and scaling-up Industry 4.0 solutions.

Top engineering R&D activities delivered from India ESPs

Software design and engineering and research and advanced engineering are the top activities being delivered by India ESPs.

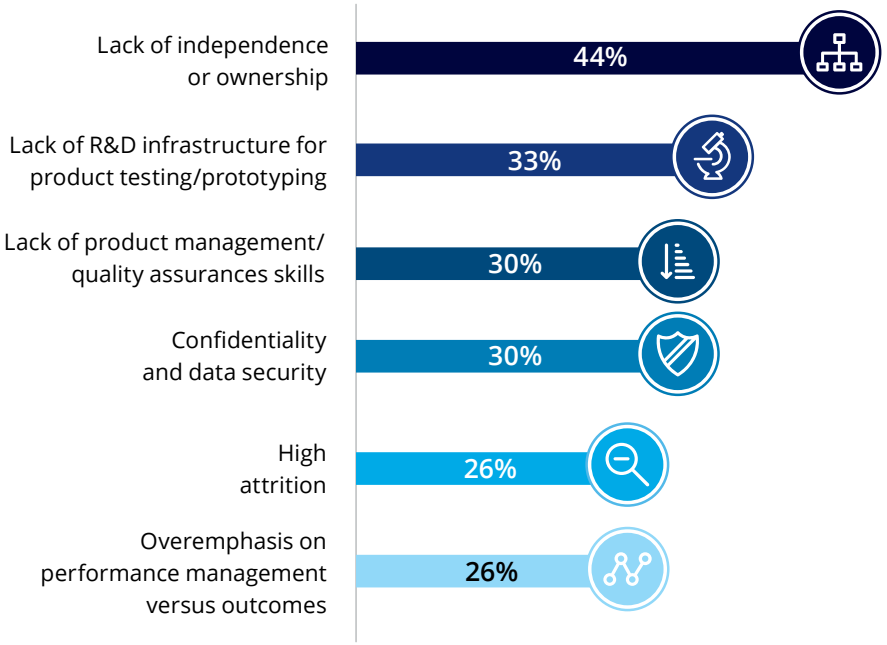


Multiple choice question: percentage represents the share of companies that selected this as one of their top activities for India ESPs

- Given that India ESPs have traditionally been strong in **software development, product management, and mechanical analysis**, coupled with the presence of factors such as a robust start-up ecosystem, an enormous talent pool, cost competitiveness, globally the second highest English-speaking population and state-of-the-art technologies, companies prefer activities such as 'Software design and engineering' to be delivered by India ESPs.
- With expertise in digital engineering skills of **AI/ML/ DL, automation**, **and cyber security**, India is a top destination for outsourcing activities such as software design, and engineering and testing, and validation.
- While the forte of the ESP base in India has conventionally been 'software design engineering', ESPs are progressively being used for additional activities that require scale, velocity, and flexibility. Apart from these players, the ecosystem is growing richer due to the deep tech start-up base in India and academia participation. In the next three years, companies plan to drive a significant portion of even their core initiatives, such as 'research and advanced engineering', 'driving innovation out of the centre,' and 'product/technology strategy' through their India ESPs.

Top improvement areas for India ESPs

Complete independence and ownership is by far the biggest improvement area for India ESPs.



Multiple choice question: percentage represents the share of companies that selected this as one of their top challenges for India ESPs

- Companies expect India ESPs to **increase their ownership to efficiently own and deliver products and solutions** outsourced to them as they are usually leveraged to deliver a specific portion of the envisioned product and may not be involved across the entire value chain of the product.
- With the increased demand for outsourcing activities to India ESPs, there is need to **ramp up the present R&D infrastructure for product testing/prototyping.**
- Further, **high attrition** across sectors in the Indian market is another major **challenge** for knowledge retention within India ESPs. On the bright side, it is seen that ESPs are addressing this issue now through various partnerships and skilling initiatives.

Additional perspectives

Skills and geographical preferences

Companies are investing heavily in building their digital engineering skills in India GCCs and ESPs

All analyses relating to digital and core engineering skills in this section (Additional perspectives) have an n-size of 68

- Most companies invest significantly in training initiatives for their workforce to continue to tackle the concerns arising from high attrition, and availability of key skills/talent. These companies could further their cause by adopting co-creation models, such as working with academia to revamp and redesign the college curriculum to make graduates and postgraduates more prepared and 'updated' when they enter the workforce.
- Many industry partnerships for upskilling the workforce on future technologies are now prevalent and gaining a stronger foothold to enhance employability. Efforts such as these would stand to gain with more such collaborative ventures by India GCCs and ESPs.
- In terms of common focus areas for GCCs and ESPs, the respondent sentiment indicates that the development of **'automation' and 'AI'** skills will be crucial. On another front, it would be pertinent to build expertise in areas such as **'additive manufacturing'** that are essential to accelerate prototyping, for inventory stock reduction and combining manufacturing and assembly into a single process.
- With organisations battling cyber-attacks regularly, **'cyber security'** too is further becoming a critical area for the **software sector** to ensure secure IT ecosystems. This domain could benefit from joint efforts between GCCs and ESPs to tackle risks such as zero-day vulnerabilities.

Regional variation in digital skills expected of India GCCs/ESPs

The regional variations in digital engineering skills required to be developed in India GCCs/ESPs are directly linked with the kind of activities being prioritised to be delivered from each region.

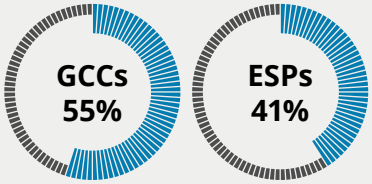
- The companies with headquarters in **APAC** prioritise **IoT and automation** skills to be developed in their India GCCs for delivering the activities pertaining to research and advanced engineering, and driving innovation out of the centre. These skills are critical to automotive and transportation, and hardware and electronics companies of Japan having their ER&D delivered from India GCCs.
- The companies with headquarters in **EMEA** prioritise **automation and AI** skills to be focused on in their India GCCs/ESPs for driving innovation out of the centre. This is especially true for companies in the automotive and industrial sector in Germany that are shifting/outsourcing their R&D activities to India GCCs/ESPs.
- The companies with headquarters in **North America** prioritise **AI/ML/DL** skills to be honed in their India GCCs/ESPs to deliver the activities around research and advanced engineering, and software design and engineering.

Companies are expected to continue investing heavily to build their **core engineering skills** in India GCCs and ESPs

Software development

Software development continues to be the most important core engineering skill for India GCCs and ESPs.

% of surveyed companies preferring the skill in their India centers

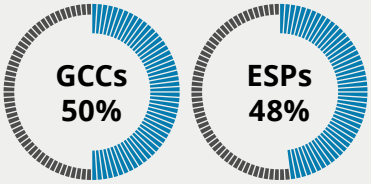


Dominant sectors
- Software products
- Energy, oil, and gas

Product management

Companies focus on product management essentially to gauge customer needs and build a successful product.

% of surveyed companies preferring the skill in their India centers

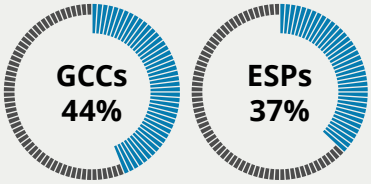


Dominant sectors
- Software products
- Industrial

Manufacturing engineering

As products are becoming more integrated and connected, companies across various sectors are advancing their manufacturing capabilities.

% of surveyed companies preferring the skill in their India centers



Dominant sectors
- Industrial
- Automotive and transportation

As the ER&D industry is embracing digital skills, organisations with headquarters across regions prioritise skills such as **'software development' and 'product management'** in addition to **'mechanical design and engineering' and 'embedded hardware'.**

Sectoral variations in core skills required from India GCCs

Apart from the top three core engineering skills, there are variations in its demand across sectors:

- **'Embedded software'** is a critical skill for **hardware and electronic**s because the increasing number of products in this sector (which include computing systems and consumer electronics) requires a software programme in a device.
- **System integration/architecture** is crucial for companies in the **energy, oil and gas, and industrial** sectors. The products in these sectors are becoming more complex as they shift from purely mechanical parts to being a software-driven technology, making system integration a critical aspect for success.
- **'Mechanical design and engineering'** is an essential skill for the manufacturing-oriented sectors, such as **'automotive and transportation' and 'industrial'** to ensure designs function safely, efficiently, and reliably, and at a competitive cost.

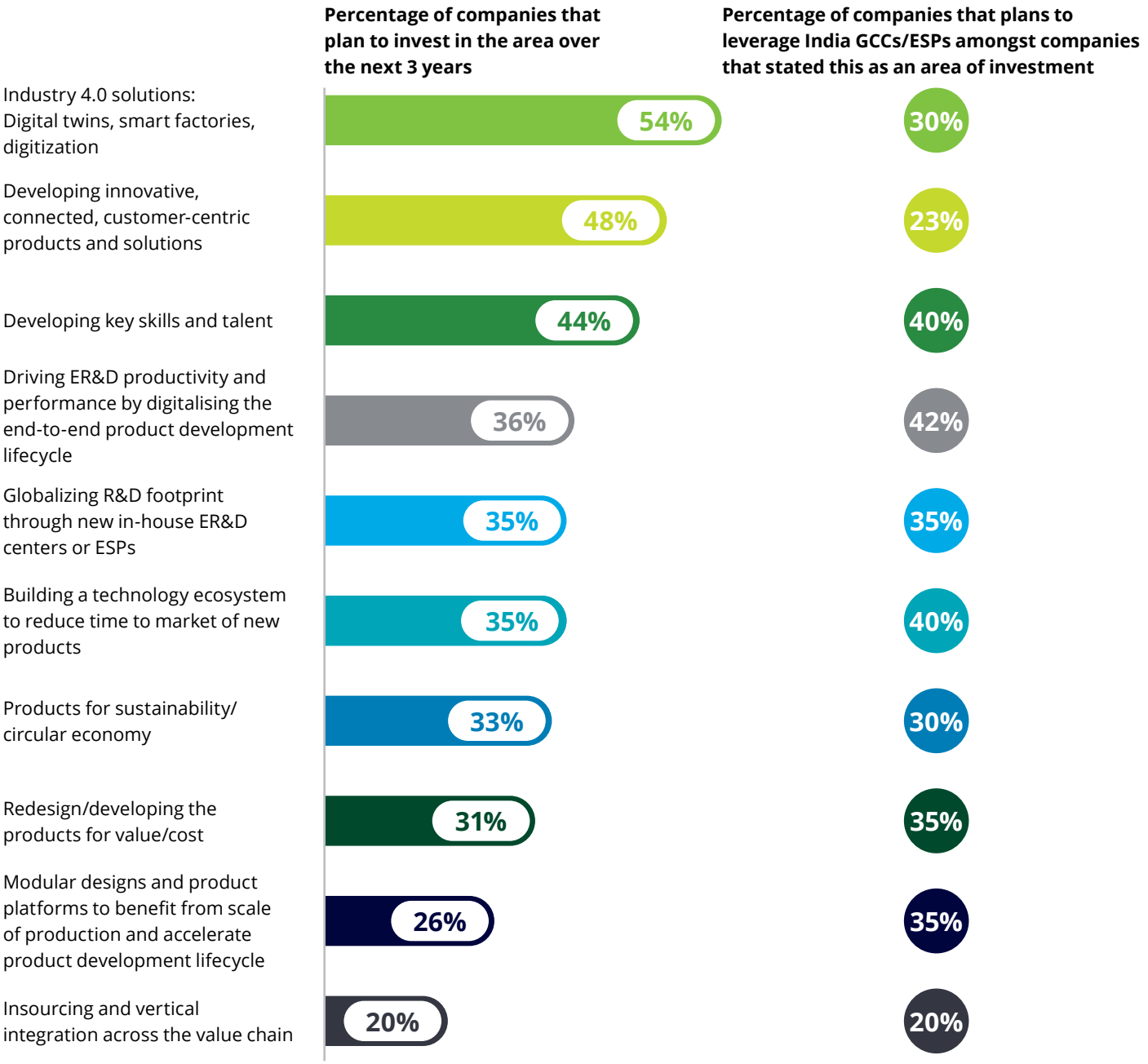
Observed trends between companies with only India presence and those with no India presence

	Companies with only India presence (29 percent of the surveyed companies)	Companies with only non-India presence (21 percent of the surveyed companies)
Reasons to migrate activities	**The top reasons for shifting activities to India are:** • Better availability of key emerging technologies, such as AI/ML, IoT, automation, 5G, and cloud computing • Investment for strategic advantage, and reducing and controlling cost of operation	**The top reasons for nearshoring actives are:** • Proximity to similar time zones and access to the local supplier base
Activities being delivered	• Software design and engineering • Product/technology strategy	• Mechanical design and engineering • Manufacturing and operations
Skills critical to be developed	• Digital engineering skills - 5G and edge computing • Core engineering skills - Manufacturing engineering and embedded software	• Digital engineering skills - IoT and cloud computing • Core engineering skills - Mechanical design and engineering, and mechanical analysis

Outlook

Industry 4.0 solutions and developing innovative and customer-centric products are projected to be two pivotal areas of investment in the next three years.

A significant percentage of companies are planning to have their India GCCs/ESPs focus on their high priority areas of investment



Multiple choice question: percentage represents the share of companies that selected this as one of their top priorities

Among the organisations that are prioritising the above areas of investment, the India centers will play a key role in driving digitalising end-to-end product lifecycle (42%), building a technology ecosystem (40%) and developing key skills and talent (40%).

- Companies globally are aiming to invest in **'Industry 4.0 solutions**: Digital twins/smart factories/digitalisation of supply chain, etc.,' to leverage vertical integration of smart production systems, horizontal integration and through-engineering across value chains, and the impact of exponential technologies. With respect to other key investment areas, there are variations across regions.
- **Companies with headquarters in APAC and North America** foresee investments to **develop key skills and talent**. Corporates in these regions are investing to step up the learning and development of their employees as they seek to build a workforce with the right skills and knowledge to stay relevant in this fast-changing business environment.

- With some of today's most coveted tech companies having successfully created an ecosystem of products that delivers an engaging end-to-end unified experience with the evolution of intelligent and connected devices, more companies face an 'adapt or perish' situation. This is radically reshaping companies and rules of competition within these sectors, and is only expected to get more challenging in the future. Accordingly, companies with headquarters **in North America and APAC are** directing most of their investments on **developing innovative, connected, and human-centric solutions and services.**
- Further, companies with headquarters in **APAC** focus on building **sustainable products**. The industry urgently needs a radical shift to more sustainable growth and consumption patterns to avoid catastrophic and irreversible damages.

With the right enabling conditions, the circular economy and greener products could provide new opportunities for economic diversification, value-creation, and skills development in these countries.

- The next wave of ER&D footprint **globalisation** (through new GCCs and ESPs) will come from companies **headquartered in EMEA**. These companies hope to offshore/outsource to augment a base location's ER&D capabilities and secure new technological competencies distributed globally. In addition to the cost arbitrage of offshoring/outsourcing, the challenging economic environment and increased competition faced by companies headquartered in EMEA are making many enterprises reconsider their business models to enhance their performance and gain a competitive advantage.

Observed correlations from surveyed data between ER&D spend and areas of investment

Companies planning to increase their ER&D spend by more than 20 percent by 2024 prioritise the below two areas of investment:

- Driving ER&D productivity and performance by digitalising the end-to-end product development lifecycle and R&D infrastructure
- Globalising R&D footprint through new in-house ER&D centres or ESPs

Companies planning to increase their ER&D spend below 20 percent by 2024 prioritise the below two areas of investment:

- Industry 4.0 solutions: Digital twins, smart factories, and digitalisation
- Developing innovative, connected, customer-centric products, and solutions

Sectoral variations in areas of investment

Engineering R&D investments vary across sectors as the overall R&D strategy depends on sectoral trends and priorities. The table below depicts variations in the engineering R&D areas of investment at a sectoral level:

- **Industry 4.0 solutions**, such as digital twins, smart factories, and digitalisation of supply chain will be a priority investment for almost all sectors. This shift in technologies will result in increased productivity, less waste, and more efficient products and customer service.
- About **70 percent** of the surveyed companies in the **software products and medical devices** sectors plan to develop innovative, connected, customer-centric products and solutions. COVID-19 ushered in a new era for telehealth and remote monitoring, and today, major advances in wireless technology, miniaturisation, and computing power drive further innovations in MedTech. This is leading to the development of an increasing number of connected medical devices that can generate, collect, analyse, and transmit data.
- About **65 percent** of the surveyed companies in the **aerospace and defence sector** plan to digitalise their end-to-end product development lifecycle to improve ER&D productivity. The defence industry sees an increase in the adoption of big data/analytics, automation (especially RPA), and cloud computing to develop connected devices and unmanned systems.

Sectoral heat map for top areas of investment in the next three years

Top areas of investment	Automotive and transportation	Hardware and electronics	Industrial	Energy, oil and gas	Software products	Medical devices	Aerospace and defense	Telecom
Industry 4.0 solutions: Digital twins, smart factories, digitalisation of supply chain, etc.	>60%	40-60%	>60%	>60%	40-60%	>60%	>60%	>60%
Developing innovative, connected, customer-centric products and solutions	<40%	40-60%	40-60%	40-60%	>60%	>60%	40-60%	40-60%
Developing key skills and talent	40-60%	40-60%	<40%	<40%	40-60%	>60%	<40%	40-60%
Globalising R&D footprint through new ER&D GCCs or ESPs	40-60%	<40%	<40%	<40%	<40%	<40%	40-60%	40-60%
Building a technology ecosystem to reduce time to market of new products	40-60%	<40%	<40%	<40%	<40%	<40%	<40%	<40%
Driving ER&D productivity and performance by digitalising the end-to-end product development lifecycle	40-60%	<40%	<40%	<40%	>60%	<40%	40-60%	<40%
Insourcing and vertical integration across the value chain	<40%	<40%	<40%	<40%	<40%	40-60%	<40%	<40%
Products for sustainability/ circular economy: Greening the products, production, and supply chain	<40%	<40%	40-60%	<40%	<40%	<40%	<40%	40-60%

Key: (Percentage of respondents who chose this option within the sector) >60% 40-60% <40%

Building a technology ecosystem, expanding the ER&D footprint, and developing key skills are predicted to be crucial areas of investment for India GCCs/ESPs in the next three years.

41%
Building a technology ecosystem to reduce time to market of new products

33%
Globalising R&D footprint through new in-house ER&D centres or ESPs

33%
Developing key skills and talent

31%
Redesign/developing the products for value/cost

31%
Driving ER&D productivity and performance by digitalising the end-to-end product development lifecycle and R&D infrastructure

29%
Developing innovative, connected, customer-centric products and solutions

28%
Industry 4.0 solutions: Digital twins/smart factories/ digitalisation, etc.

n=76

Multiple choice question: percentage represents the share of companies that selected this as one of their top areas of investment for India GCCs and ESPs

With efforts from engineering R&D ecosystem stakeholders, India is well poised to address the future engineering R&D imperatives of global enterprises.

- Companies prioritise **'building a technology ecosystem'** to strengthen their partnerships with start-ups and universities for faster and effective outcome for their R&D initiatives.
- As India centres witness a continued evolution from cost-to-thought leadership, global companies leverage India as a top location for carrying out activities to improve quality, decrease time to market, and stay ahead of competition.
- As the Industry 4.0 model gains ground across the manufacturing and services industries, the future of work is set to be transformed. The skillsets that were in demand until a few years ago are now becoming obsolete, requiring organisations to invest heavily in **developing key skills and talent** to build Industry 4.0 capabilities in India.

Sectoral variation of areas of investment for India GCCs

Building a technology ecosystem continues to be a principal investment area across most sectors. However, there is a variation of investment strategy across sectors:

- Companies in the **industrial sector** prioritise production of sustainable products, and thus reducing their overall carbon footprint.
- Companies in **energy, oil and gas** plan to increase their investment in India GCCs and ESPs to develop Industry 4.0 solutions, such as digital twins, smart factories, or digitalisation of supply chain.
- Two of the three companies in the **software products** sector will focus on improving their talent pool in India. These companies are highly dependent on their India GCCs/ESPs for expertise in software design and engineering.
- Companies in the **hardware and electronics** sector plan to improve ER&D productivity and performance by digitalising the end-to-end product development lifecycle and R&D infrastructure.
- Companies in the **automotive and transportation** sector are redesigning their products to cope with the major technology disruptions in the industry. India GCCs and ESPs are helping in the creation of connected, autonomous, and electric vehicles at an economic value/cost.

Afterword

Although COVID-19 had a major setback on the R&D growth trend in 2020, **70 percent** companies have already surpassed their pre-COVID levels of R&D spend (going by their 2022 spend estimates). This survey also highlights that majority of the companies will increase their ER&D budget by ~10 percent in 2022 and up to **20 percent** by 2024 compared with their 2021 spend.

Almost **85 percent** of the survey responses were captured before the ongoing situation in North-Eastern Europe commenced. Hence, the report does not capture the evolving dynamics and the associated uncertainties that could have an impact on the global economy. Such Black Swan events have the potential to affect the expected growth trajectory of the ER&D industry as seen in the past.

Specifically, the current geopolitical crisis has had a strong impact on fuel and commodity prices across the globe. It is expected to further worsen the inflationary challenge mentioned by organisations in the survey. However, with higher fuel prices, companies will focus their investments on developing cleaner and sustainable energy sources, which is the top second priority for the surveyed organisations in 2022. As Russia and Ukraine are the major suppliers of critical raw material, such as palladium and neon, any extension of the war could put additional pressure on the supply chain and result in further disruptions (that would especially be felt by the semiconductors and automotive sectors).

The sights of the India ER&D ecosystem are back to the future

During the 2020 Pulse Survey, India GCCs were focusing on 'ensuring business continuity' and 'ability to drive scale'. However, the 2022 survey made it clear that the attention has now shifted to 'driving innovation out of the centre'. More than **80 percent** of the surveyed ER&D leaders are satisfied with the performance of India GCCs and ESPs and are confident that they will be able to deliver on the required skills and activities.

India as a destination for ER&D activities is poised to attract the maximum share of R&D budget from companies globally. It is often predicted that India as a destination for ER&D activities is poised to attract the maximum share of ER&D budgets globally. This growth story has been well reinforced by the findings of the pulse survey.

More than **70 percent** of organisations with India ER&D presence are looking to increase their spend towards India GCCs and ESPs. Reinforcing the global prediction of ER&D organisations driving the next wave of offshoring in the country, the survey predicts that about **35 percent** of organisations with India presence will increase their ER&D spend by more than **10 percent** in the country.

This greater share of spend into India GCCs and ESPs can be attributed to the following reasons:

Globalising the R&D footprint in India GCCs and ESPs **(growing broader and deeper within the Indian ecosystem)** by ramping up activities over the next few years

India is leading the shift from hardware to software across sectors due to relatively abundant availability of skills in emerging technologies and the presence of a large ER&D ecosystem. This is expected to result in **a higher share of digital engineering spend** towards India within the ER&D industry.

India GCCs and ESPs are poised to support **co-creation (especially with start-ups, ESPs, and academia)** and such partnerships have the potential to deliver better ROIs in the face of accelerated innovation cycles and fierce competition.

India GCCs and ESPs will be a crucial stakeholder for the global **areas of investments,** such as building a technology ecosystem, developing key skills and talent, and improving the ER&D productivity and performance by digitalising the end-to-end product development lifecycle.

Amongst the surveyed organisations, **~85 percent** are already leveraging ER&D GCCs, with **~75 percent** of such centres are in India. More companies are expected to establish or increase their existing India presence in the next few years due to increasing comfort levels with decentralised/remote ER&D teams and a proven ER&D ecosystem that India has to offer.

However, global R&D leaders have also reiterated their desire to see India GCCs and ESPs **inculcating more ownership and nurturing future-ready leaders**. The future of the engineering R&D sector looks promising right now. India is poised to be at the forefront of this revolution, playing a key role in shaping the overall R&D strategy of global companies.

Appendix

Sectoral summary

Automotive and transportation

(Insights are based on 27 global enterprises in this sector)

Increase in ER&D spend

2022 vs 2021 0-5%

2024 vs 2021 10-20%

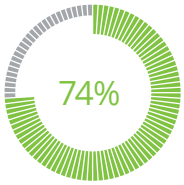
Top challenges

- Accelerated innovation cycles/product development and faster time to market
- Globalising R&D footprint

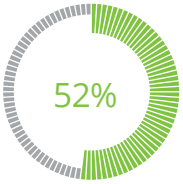
Top areas of investment

- Industry 4.0 solutions: Digital twins, smart factories, digitalisation of supply chain
- Developing key skills and talent

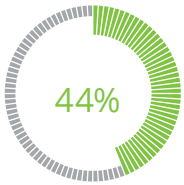
Approaches for R&D initiatives



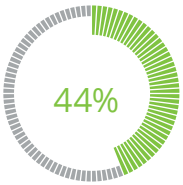
Build in-house



Buy Technology



Co-create with start-ups



Co-create with ESPs

Top priorities

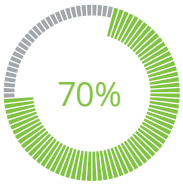
- Developing innovative, connected, customer-centric products and solutions
- Products for sustainability/circular economy

Organisations plan to shift about 40 percent of their workforce to in-office model steadily by 2024, while still maintaining a considerable workforce (~30 percent) in the hybrid model.

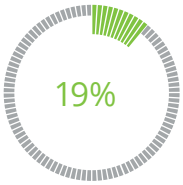
Reasons to migrate

- **GCC:** Output of in-house ER&D can be shared across product lines.
- **Engineering service provider:** Investment for strategic advantag

Perspective on India



of the surveyed companies have a GCC in India



of the surveyed companies have an engineering service provider in India.

Increase in ER&D spend

10-25%

GCCs

Top Challenges

- Project budget overruns
- Limited/non-availability of readily accessible digital engineering skills

Activities to be migrated by 2024

- End-to-end product development
- Research and advanced engineering
- End-to-end module development
- Product/technology strategy

Skills critical for India

Digital engineering skills

- AI/ML/DL
- Automation

Core engineering skills

- Manufacturing engineering
- Mechanical design and engineering
- Software development

Hardware and electronics

(Insights are based on 25 global enterprises in this sector)

Increase in ER&D spend

2022 vs 2021 5-10%

2024 vs 2021 10-20%

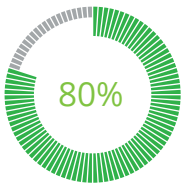
Top challenges

- Inflation/supply-chain disruptions and their effects on increasing product costs
- Speed of technological change

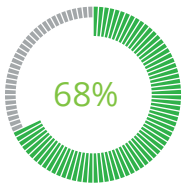
Top areas of investment

- Industry 4.0 solutions: Digital twins, smart factories, digitalisation of supply chain
- Developing innovative, connected, customer-centric products and solutions
- Developing key skills and talent

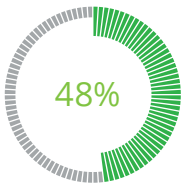
Approaches for R&D initiatives



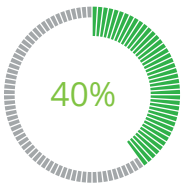
Build in-house



Buy Technology



Co-create with start-ups



Co-create with ESPs

Top priorities

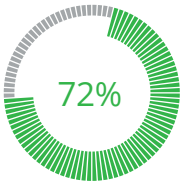
- Developing innovative, connected, customer-centric products and solutions
- Products for **sustainability/circular economy**

Organisations plan to shift about 40 percent of their workforce to in-office model steadily by 2024, while still maintaining a considerable workforce (~30%) in the hybrid model.

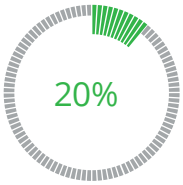
Reasons to migrate

- **GCC:** Consolidation and standardisation of processes
- **Engineering service provider:** Better availability of some key emerging technologies

Perspective on India



of the surveyed companies have a GCC in India



of the surveyed companies have an engineering service provider in India.

Increase in ER&D spend

0-10%

GCCs

Top challenges faced by India GCCs

- Low scaling velocity
- Limited/non-availability of readily accessible digital engineering skills
- Project management and control

Activities to be migrated by 2024

- Global CoEs in core/emerging areas of business
- End-to-end product development
- Process standardisation

Skills critical for India

Digital engineering skills

- AI/ML/DL
- Automation

Core engineering skills

- Embedded software
- Software development

Industrial

(Insights are based on 19 global enterprises in this sector)

Increase in ER&D spend

2022 vs 2021 5-10%

2024 vs 2021 10-20%

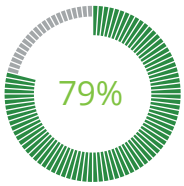
Top challenges

- Inflation/supply-chain disruptions and their effects on increasing product costs
- Scaling-up Industry 4.0 solutions

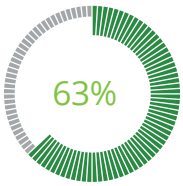
Top areas of investment

- Developing innovative, connected, customer-centric products and solutions
- Industry 4.0 solutions: Digital twins, smart factories, digitalisation of supply chain

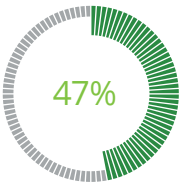
Approaches for R&D initiatives



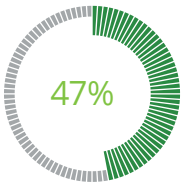
Build in-house



Buy Technology



Co-create with academia



Co-create with ESPs

Top priorities

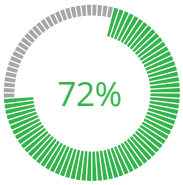
- Industry 4.0 solutions: Digital twins, smart factories, digitalisation of supply chain
- Building a technology ecosystem to reduce time to market of new products / access to new technologies and scarce capabilities at scale

Organisations plan to shift about 46 percent of their workforce to in-office model steadily by 2024, while still maintaining a considerable workforce (26 percent) in the hybrid model.

Reasons to migrate

- **GCC:** Scale of the ER&D ecosystem availability (academia/peer presence/start-ups)
- **Engineering service provider:** Investment for strategic advantage

Perspective on India



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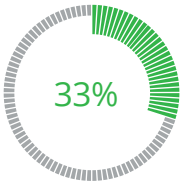


of the surveyed companies have an engineering service provider in India.

Increase in ER&D spend

10-25%

GCCs

Top Challenges

- Project management and control
- Confidentiality and data security

Activities to be migrated by 2024

- Product/technology strategy
- Research and advanced engineering
- Driving innovation out of the centre

Skills critical for India

Digital engineering skills

- AI/ML/DL
- Cyber security
- Automation

Core engineering skills

- Manufacturing engineering
- Product management, Systems integration/ systems architecture

Software products

(Insights are based on 16 global enterprises in this sector)

Increase in ER&D spend

2022 vs 2021 5-10%

2024 vs 2021 10-20%

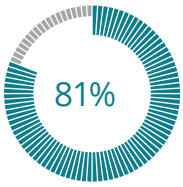
Top challenges

- Availability of key skills
- Speed of technological change
- Accelerated innovation cycles/product development and faster time to market

Top areas of investment

- Developing innovative, connected, customer-centric products and solutions
- Developing key skills and talent

Approaches for R&D initiatives



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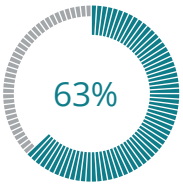

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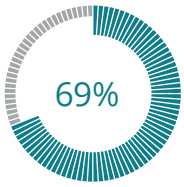
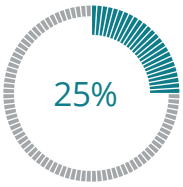


Co-create with start-ups



Co-create with academia

Top priorities

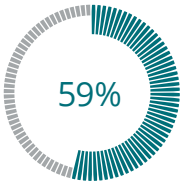
- Developing innovative, connected, customer-centric products and solutions
- Products for sustainability/circular economy: Greening the products / production / and supply chain

Organisations plan to shift about 20 percent of their workforce to the in-office model steadily by 2024, while still maintaining a considerable workforce (~25 percent) in the hybrid model.

Reasons to migrate

- **GCC:** Scale of ER&D ecosystem availability (academia/peer presence/start-ups)
- **Engineering service provider:** Improve focus on core business and innovation **engineering service**

Perspective on India



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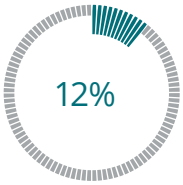


of the surveyed companies have an engineering service provider in India.

Increase in ER&D spend

0-10%

GCCs

Top Challenges

- Lack of leadership skills to helm global product ownership roles
- High attrition
- Lack of business context

Activities to be migrated by 2024

- Driving innovation out of the centre
- End-to-end module development

Skills critical for India

Digital engineering skills

- AI/ML/DL
- Cloud computing

Core engineering skills

- Software development
- Product management

Energy, oil and gas

(Insights are based on 14 global enterprises in this sector)

Increase in ER&D spend

2022 vs 2021 10-20%

2024 vs 2021 10-20%

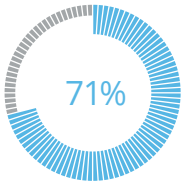
Top challenges

- Availability of key skills
- Scaling-up Industry 4.0 solutions

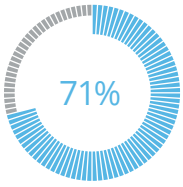
Top areas of investment

- Industry 4.0 solutions: Digital twins, smart factories, digitalisation of supply chain
- Developing innovative, connected, customer-centric products and solutions

Approaches for R&D initiatives



Build in-house



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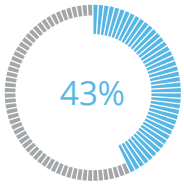
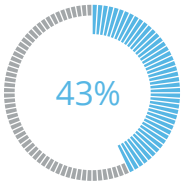


Co-create with ESPs



Co-create with academia

Top priorities

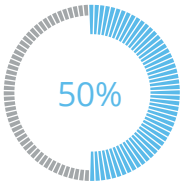
- Industry 4.0 solutions: Digital twins, smart factories, digitalisation of supply chain
- Products for **sustainability/circular economy**

Organisations plan to shift about 60 percent of their workforce to in-office model steadily by 2024, while still maintaining a considerable workforce (~20%) in the hybrid model.

Reasons to migrate

- **GCC:** Output of in-house ER&D can be shared across product lines.
- **Engineering service provider:** Improve focus on core business and innovation.

Perspective on India



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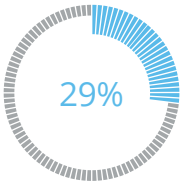


of the surveyed companies have an engineering service provider in India.

Increase in ER&D spend

0-10%

GCCs

Top Challenges

- Project management and control
- Lack of shared digital/R&D infrastructure for product testing/prototyping

Activities to be migrated by 2024

- Global CoEs in core/emerging areas of business
- End-to-end product development
- End-to-end module development
- Research and advanced engineering

Skills critical for India

Digital engineering skills

- AI/ML/DL
- Automation
- Big data/engineering analytics
- IoT

Core engineering skills

- Systems integration
- Software development

Regional summary

North America

(Insights are based on 44 global enterprises in this sector)

Increase in ER&D spend

2022 vs 2021 5-10%

2024 vs 2021 10-20%

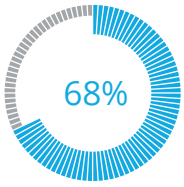
Top challenges

- Inflation/supply-chain disruptions and their effects on increasing product costs
- Speed of technological change

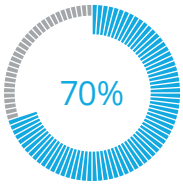
Top areas of investment

- Industry 4.0 solutions: Digital twins, smart factories, digitalisation of supply chain
- Developing innovative, connected, customer-centric products and solutions
- Developing key skills and talent

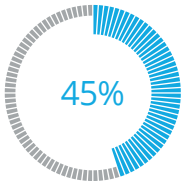
Approaches for R&D initiatives



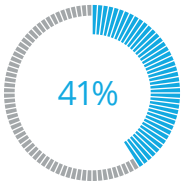
Build in-house



Buy Technology



Co-create with start-ups



Co-create with ESPs

Top priorities

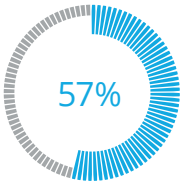
- Products for **sustainability/circular economy**
- Developing innovative, connected, customer-centric products

Organisations plan to shift about ~40 percent of their workforce to the in-office model steadily by 2024, while still maintaining a considerable workforce (~40 percent) in the hybrid model.

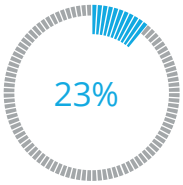
Reasons to migrate

- **GCC:** Improve focus on core business and innovation
- **Engineering service provider:** Gain access to better skills

Perspective on India



of the surveyed companies have a GCC in India



of the surveyed companies have an engineering service provider in India.

Increase in ER&D spend

0-10%

GCCs

Top Challenges

- Low scaling velocity
- Lack of leadership skills to helm global product ownership roles

Activities to be migrated by 2024

- Global CoEs in core/emerging areas of business
- End-to-end product development
- End-to-end module development
- Driving innovation out of the centre
- Process standardisation/automation

Skills critical for India

Digital engineering skills

- AI/ML/DL
- Big data/engineering analytics

Core engineering skills

- Software development
- Product management

EMEA

(Insights are based on 28 global enterprises in this sector)

Increase in ER&D spend

2022 vs 2021 0-5%

2024 vs 2021 10-20%

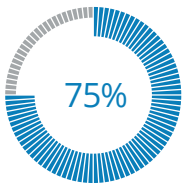
Top challenges

- Accelerated innovation cycles/product development and faster time to market
- Building a technology ecosystem

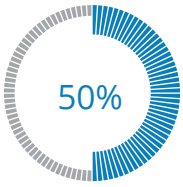
Top areas of investment

- Industry 4.0 solutions: Digital twins, smart factories, digitalisation of supply chain
- Globalising R&D footprint through new ER&D GCCs or ESPs

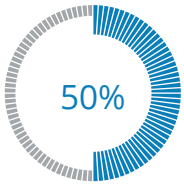
Approaches for R&D initiatives



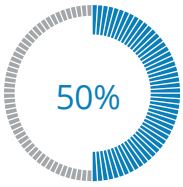
Build in-house



Buy Technology



Co-create with start-ups



Co-create with academia

Top priorities

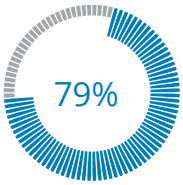
- Globalising the R&D footprint through new GCCs/ESPs
- Driving ER&D productivity and performance by digital infrastructure

Organisations plan to shift about 44 percent of their workforce to the in-office model steadily by 2024, while still maintaining a considerable workforce (~26 percent) in the hybrid model.

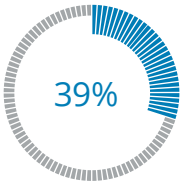
Reasons to migrate

- **GCC:** Improve focus on core business and innovation
- **Engineering service provider:** Reduce and control cost of operation

Perspective on India



of the surveyed companies have a GCC in India



of the surveyed companies have an engineering service provider in India.

Increase in ER&D spend

10-25%

GCCs

Top Challenges

- Limited/non-availability of readily accessible digital engineering skills
- Lack of independence or ownership

Activities to be migrated by 2024

- Global CoEs in core/emerging areas of business
- End-to-end product development

Skills critical for India

Digital engineering skills

- AI/ML/DL
- Automation

Core engineering skills

- Software development
- Product management

APAC

(Insights are based on 29 global enterprises in this sector)

Increase in ER&D spend

2022 vs 2021 5-10%

2024 vs 2021 10-20%

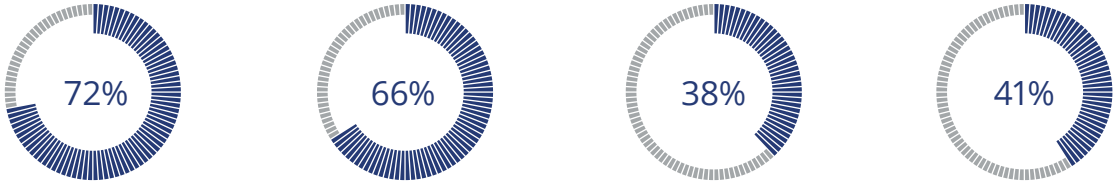
Top challenges

- Inflation/supply-chain disruptions and their effects on increasing product costs
- Availability of key skills

Top areas of investment

- Developing key skills and talent
- Products for **sustainability/circular economy:** Greening the products/production/and supply chain

Approaches for R&D initiatives



Build in-house | **Buy Technology** | **Co-create with ESPs** | **Co-create with start-ups**

Top priorities

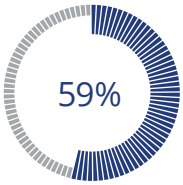
- Developing innovative/connected/customer-centric products and solutions
- Building a technology ecosystem to reduce time to market of new products/access to new technologies and scarce capabilities at scale

Organisations plan to shift about 45 percent of their workforce to the in-office model steadily by 2024, while still maintaining a considerable workforce (~23 percent) in the hybrid model.

Reasons to migrate

- **GCC:** Improve focus on core business and innovation
- **Engineering service provider:** Reduce and control cost of operation

Perspective on India



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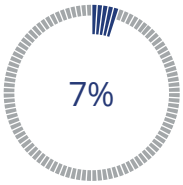

of the surveyed companies have an engineering service provider in India.

Increase in ER&D spend

0-10%

GCCs

Top Challenges

- Project management and control
- High attrition
- Lack of leadership skills to helm global product ownership roles

Activities to be migrated by 2024

- Global CoEs in core/emerging areas of business
- End-to-end product development

Skills critical for India

Digital engineering skills

- Automation
- IoT

Core engineering skills

- Manufacturing engineering
- Embedded software

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Deloitte Globally has grown in scale and diversity—more than 312,000 people in 150 countries, providing multidisciplinary services yet our shared culture remains the same.

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NASSCOM is the industry association for the IT-BPM sector in India. A not-for-profit organisation funded by the industry, its objective is to build a growth-led and sustainable technology and business services sector in the country with over 3200 members. NASSCOM Insights is the in-house research and analytics arm of NASSCOM, generating insights and driving thought leadership for today's business leaders and entrepreneurs to strengthen India's position as a hub for digital technologies and innovation.

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