



# Engineering research and development – Global location analysis

March 2022

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# Foreword

The 'Engineering Research and Development' (ER&D) services sector is one of the fastest-growing technology driven sectors in India. India's ER&D industry is expected to be in excess of USD63 billion in 2025, up from USD31 billion in FY2021.

In 2020, the COVID-19 pandemic affected all sectors of the economy and disrupted the supply chain across the world. There have been drastic shifts in strategic priorities of companies. In its aftermath, companies accelerated their digital transformation processes, optimised various costs, and enhanced product innovation to prepare for any future disruptions. Global companies are also constantly looking for suitable locations, which can act as ER&D powerhouses to fuel future innovation and optimisation.

With the announcement in this year's union budget regarding replacement of the Special Economic Zones Act with new legislation, states have the ability now to become partners in 'Development of Enterprise and Service

Hubs'. This in turn is expected to provide the necessary impetus to the growth of ER&D centres in India.

The NASSCOM-KPMG in India Engineering research and development - Global location analysis study assesses 18 countries across the globe through various parameters to identify the current and future ER&D hotspots. In addition, a detailed global and India city-wise framework has also been developed to assess top ER&D locations with respect to various sectors as well.

As organisations articulate a sustainable location strategy, cost arbitrage is no longer the primary driver that prompts enterprises to choose a particular location. Post pandemic, as we increasingly live in a borderless world with all pervasive digital transformation, organisations are exploring newer locations, seeking out desired talent and ecosystems while also keeping an eye on costs and prevalent risks.

We hope you find the report useful, and we welcome your feedback and comments.



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# Executive summary

## Engineering research and development – Global location analysis

### Resurgent ER&D industry with higher investments in research and adoption of new operating models

- ER&D spend rebound in 2021 with 7 per cent growth to reach USD1.25 trillion
- At USD827 billion, businesses led ER&D spending accounted for two-third of total ER&D spend, with ER&D spend in the APAC region expected to exceed Europe over the next few years, facilitated by increasing spend from the public sector
- India continued among one of the leading ER&D sourcing destinations with the country's ER&D sourcing market valued at USD40-41 billion in 2021. India accounted for a third of the USD120 billion global ER&D sourcing market.

Source: NASSCOM analysis, January 2022

### India emerges as a Leader among the global ER&D hotspots

- India and the U.S. lead global ER&D hotspots with their massive talent pools, installed ER&D capacity, and talent competitiveness
- India emerges as a leader among the other countries as most attractive for ER&D businesses focused on optimising cost benefits
- It also scores high from an ER&D industry ecosystem perspective, given the established industries, thriving start-up ecosystem, and existing ER&D hubs.

### Evolution of ER&D GCCs from providing support services to emerging as strategic partners and growth enablers

- ER&D GCCs have matured to drive end-to-end ownership for products and some centres drive the strategy and vision for entire engineering functions of their global organisations
- From executing less complex engineering work to achieve cost reduction, the ER&D GCCs have come a long way into becoming innovation centres and strategic partners developing new products and owning the entire product value chain as well as driving global innovation and developing future technologies and domains such as AI/ML, IoT, automation and robotics.

### ER&D GCCs witnessing rapid growth within Indian GCC landscape

- ER&D GCCs in verticals including telecom and networking, automotive, semiconductor, transportation and heavy engineering, and aerospace are rising to complement India's traditional GCC leader: software and internet vertical
- ER&D talent accounts for 42 per cent of the 1.38 million GCC talent pool in India in FY21
- Emerging metros such as Ahmedabad and Tier-2 Indian cities including Coimbatore and Jaipur are supporting the growth of ER&D centres along with the established hotspots
- Bengaluru emerged as the most attractive location for ER&D GCCs across India owing to its strong ER&D ecosystem across industry verticals followed by Delhi NCR region, Chennai, Hyderabad, and Pune
- While Bengaluru leads Indian ER&D hotspots in terms of talent availability and ER&D ecosystem, Hyderabad offers most conducive business environment and Coimbatore and Ahmedabad feature among leaders from cost attractiveness perspective owing to the locations' low cost of labour and operations.

Source: NASSCOM-KPMG in India analysis, January 2022

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# Section: 1

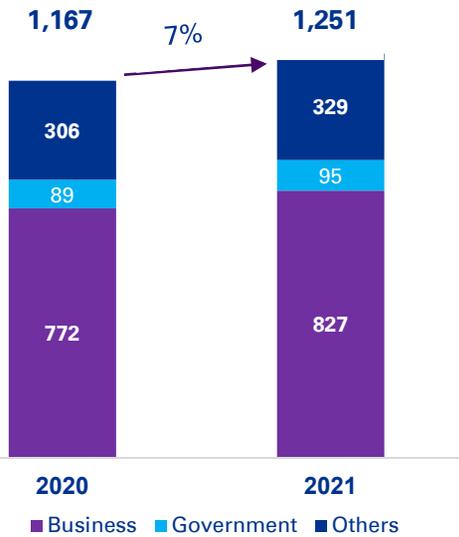
# ER&D global demand



The ER&D industry has witnessed substantial growth. **The ER&D spend, across industries, is expected to grow substantially in 2021 and is forecasted to continue its growth trajectory over the next few years due to investments in upcoming technologies and digital engineering.** In addition to these, the growth will be driven by other factors like:

- Continued R&D investment by multinational companies to pursue innovation and penetrating new and emerging markets
- Increasing use of electronics; consumers look for alternate fuel sources and greater fuel efficiency, and the convergence of technologies that enable a single device to perform multiple functions
- Growing maturity of the ER&D services
- Changing view on countries like India which are now seen as a strategic partners focused on innovation rather than merely sustenance and maintenance of prevailing products

### ER&D Spend (USD billion)



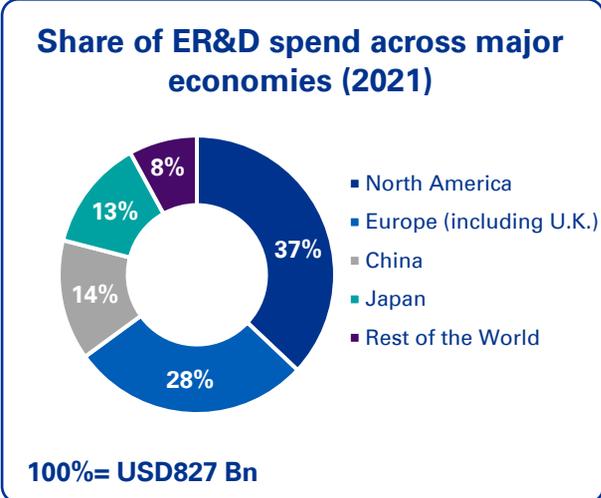
Note: Others spending include academia and public sectors. Business include 1,000 public companies that spend most on R&D of products, software, and services

Based on: NASSCOM analysis, January 2022





# Split of ER&D spending



Note: The forecast for 2021 is based on bifurcation of ER&D spending based on 1,000 corporates worldwide that spend the most on R&D products.  
 Based on: Technology Sector in India/Strategic Review 2021; NASSCOM analysis, January 2022

- North America represents the largest share of ER&D spend in 2021, driven by investments in sectors such as software and internet, and healthcare. It is home to some of the world’s largest companies including leading ecommerce players and technology leaders. Several of these companies are the highest spenders in ER&D globally.
  - ER&D spend in the region is expected to grow steadily in the coming years.
- *The ER&D spend in the APAC is expected to exceed EU over the next few years, due to increased funding from the public sector, and more preference given to ER&D related sectors by the countries in the region.*



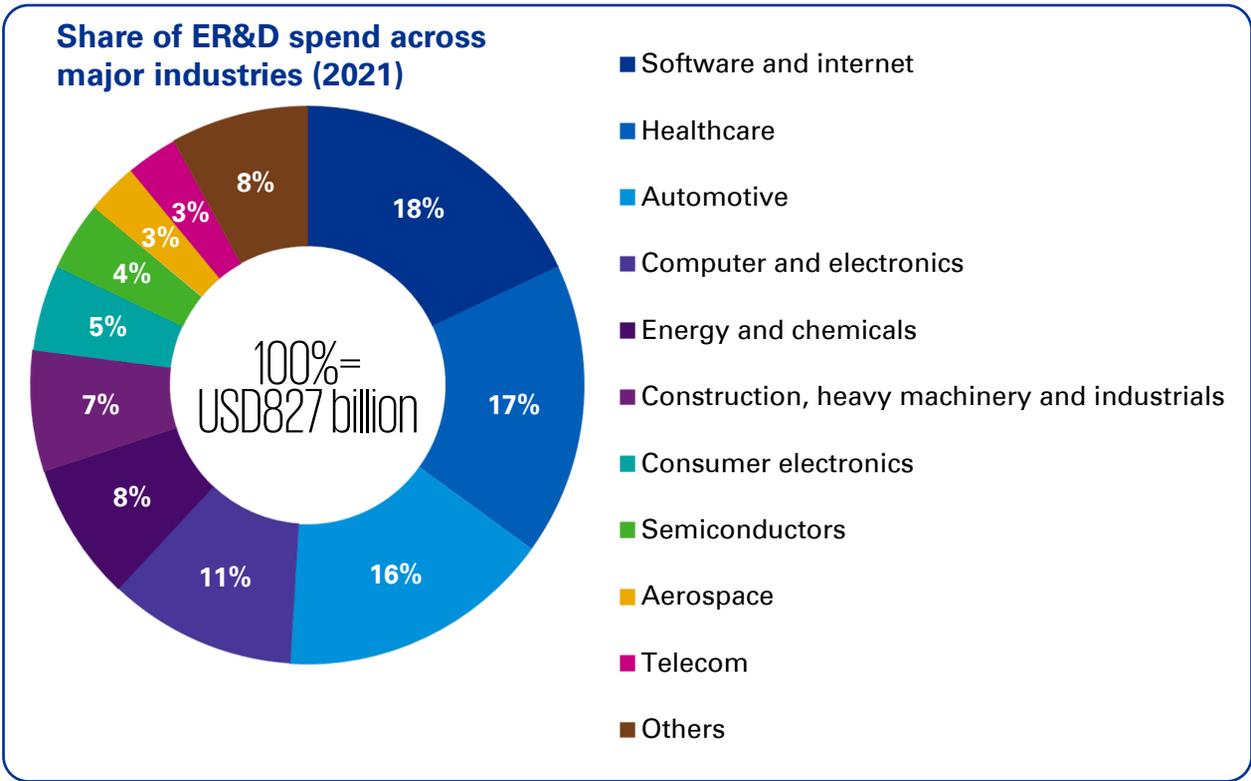


# Split of ER&D spending

The impact of COVID-19 varied across different sectors. Sectors such as software, medical devices, and healthcare emerged more resilient while industrial construction and engineering, aerospace and defence, energy and utility, and semiconductor faced major disruptions. The recovery and post COVID-19 growth is also expected to vary across sectors with increasing technological dependency, and companies witnessing a rapid digital transformation.

According to NASSCOM insights, during 2021, software and internet sector, owing to increased digitisation and digital transformation, and healthcare sector, owing to

focus on the sector during the pandemic, emerged as the highest spenders on ER&D. Automotive sector, which was among the highest spender in 2020, was adversely affected prior to the pandemic due to semiconductor chip shortage, shift towards electric vehicles, shared mobility and fall in demand in China. However, it emerged as the highest spender during COVID-19 primarily due to changes in customer preference to travel in their own vehicles rather than car-pooling and public transport. Some leading automotive companies have introduced digital technologies like AR/VR, to make virtual purchase easier for customers.



*Note: The forecast for 2021 spending is based on bifurcation of ER&D spending for 1,000 corporates worldwide that spend the most on R&D product.*

*Based on latest NASSCOM analysis, January 2022*



# Macro trends shaping global ER&D sector



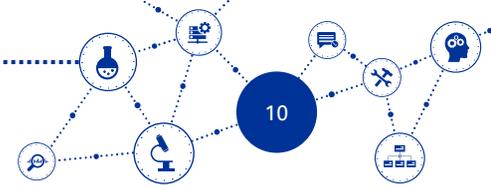
There is significant focus on technological developments across sectors, further supported by various government policies around subsidy on wages for skilled workers, increase in the availability of technical workforce and policies

regarding collaboration between various public and private bodies. Digital engineering will provide businesses and organisations with a better view of the future and endless possibilities offered by technology.<sup>1</sup>

Trends shaping the global ER&D sector	Description	Examples
<b>Digital engineering paving the way for ER&amp;D growth</b>	<ul style="list-style-type: none"> <li>Global Digital engineering is expected to reach USD385 billion by 2025<sup>2</sup>, growing at a CAGR of over 11 percent between 2019 and 2025.<sup>3</sup></li> <li>The growth is expected due to new data-driven business models and high demand for digital solutions and build connected products and services.</li> <li>Key industries for growth in digital engineering expenditure include software and internet, industrial, telecom, consumer electronics and automobile<sup>4</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>Fujitsu Laboratories has developed an AI-based system that detects and generate fixes for potential bugs in software using static analysis tools.<sup>5</sup></li> <li>An Indian IT consulting company collaborated with a North American technology leader to develop industry-specific cloud solutions enabling digital transformation and leveraging data-driven insights.</li> </ul>
<b>Government policies and political environment</b>	<ul style="list-style-type: none"> <li>Support measures from governments include:               <ul style="list-style-type: none"> <li>Treaties, intellectual property rights, environment, and energy regulations</li> <li>Lower tax rate on the return from patent</li> <li>Promoting cross country collaboration and foreign direct investment</li> <li>Subsidy on wages paid to the skilled workers in ER&amp;D</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>A central European country has launched an economic protection plan with a focus on maintaining R&amp;D jobs</li> <li>In March 2021, the government of Karnataka (India) in collaboration with NASSCOM announced ER&amp;D policy offering               <ul style="list-style-type: none"> <li>50 per cent rent-reimbursement</li> <li>Recruitment assistance</li> <li>Investment subsidies for centres offering more than 3,000 jobs</li> </ul> </li> </ul>

- Top 10 Trends That Will Shape Digital Engineering Services In 2021, Zinnov, 18 January 2021
- Digital Engineering, NASSCOM and Everest Group
- Strategic review report, NASSCOM; accessed 30 July 2021

- Zinnov Zonnes 2020 ER&D Services, Zinnov
- Innovative Software Development for the DX Era, Fujitsu



Trends shaping the global ER&D sector	Description	Examples
<b>Talent availability</b>	<ul style="list-style-type: none"> <li>Public and private players are collaborating to promote ER&amp;D skills               <ul style="list-style-type: none"> <li>Creation and promotion of educational programmes catering to skills in demand</li> <li>Governments and industry players stimulating innovation by offering work visas for people with specific skill sets and easy access to educational programs</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Developed markets such as North America and Europe are running 'Optional Work Visa' programmes for STEM graduates to enhance talent availability.</li> <li>EU policies on human capital are aimed at targeted education programmes and job-specific trainings focused on development of (lower) skill workers.</li> </ul>
<b>Adoption of sustainability in new product development strategies</b>	<ul style="list-style-type: none"> <li>Stakeholder activism, availability of green finance and consumer preference for sustainable products are driving this trend, while countries are working towards achievement of UN's Sustainable Development Goals by 2030.</li> <li>Present in sectors with high ecological impact including automobile, construction, energy, and manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>In October 2020, European aerospace company has started invested in hydrogen propulsion system and aims to develop a zero-emission aircraft by 2035.</li> <li>Leading Indian automaker has announced plans to launch a series of new commercial and passenger Electric Vehicles (EV) in India by 2025.</li> </ul>
<b>Changing customer preferences</b>	<ul style="list-style-type: none"> <li>Increase in subscription-based models over a standalone product, which can lead to increase in the value-propositions of the supplier and performance-based outcomes for users</li> </ul>	<ul style="list-style-type: none"> <li>In September 2021, a European automotive group in collaboration with a Japanese diversified financial services group launched a subscription-based car ownership model in India.</li> </ul>



## Trends by sector



Core manufacturing and industrial sectors such as automotive, industrials, energy, and consumer electronics are increasingly leveraging technologies such as IoT, automation, robotics, and digitalisation, increasing product and process efficiencies, and developing innovative solutions.

Sectors	Trends	Key focus areas
<b>Automobile</b>	<ul style="list-style-type: none"> <li>Shift in consumer preferences owing to volatility in oil prices, increased climate consciousness<sup>6</sup> and elevated demand for personal mobility.</li> <li>Industry players are undertaking initiatives to develop autonomous vehicles, connected automobile and alternate energy vehicles.</li> </ul>	<ul style="list-style-type: none"> <li>Smart engines</li> <li>Digital technologies</li> <li>Electric cars</li> <li>Autonomous vehicles</li> <li>Data monetisation and platformisation</li> </ul>
<b>Software and internet</b>	<ul style="list-style-type: none"> <li>ER&amp;D investments in the sector are driven by increased demand for software solutions to facilitate remote working and improve security.</li> </ul>	<ul style="list-style-type: none"> <li>Cloud technology, blockchain</li> <li>AI-driven capabilities</li> <li>Low-code/no-code (LCNC) programming</li> <li>Tele-X, digital thread, and spatial computing</li> </ul>
<b>Pharmaceutical and medical devices</b>	<ul style="list-style-type: none"> <li>Industry players look forward to speed-up drug discovery, reduce R&amp;D costs, and lower failure rates in clinical trials.</li> <li>Demand for telehealth solutions, wearable healthcare devices and self-diagnostic tools has increased due to COVID-19.</li> </ul>	<ul style="list-style-type: none"> <li>AI, Blockchain and cloud computing for clinical data collection, storage, and exchange</li> <li>Wearable healthcare device</li> </ul>
<b>Computing and electronics</b>	<ul style="list-style-type: none"> <li>Investments done to advance edge computing for data privacy and digital technologies expected to foster business resiliency.</li> </ul>	<ul style="list-style-type: none"> <li>Edge computing to enhance data privacy and sovereignty</li> <li>Digital technologies</li> </ul>
<b>Consumer Electronics</b>	<ul style="list-style-type: none"> <li>Increased consumer spending on new gadgets and enhanced penetration of new technologies.</li> <li>Consumer demand and ease of use are major criteria for new ER&amp;D spending.</li> </ul>	<ul style="list-style-type: none"> <li>Conferencing technology</li> <li>Gaming technology</li> <li>Smart homes</li> </ul>
<b>Construction, heavy machinery, and industrials</b>	<ul style="list-style-type: none"> <li>Industry 4.0 and the connected industrial ecosystem are expected to be the key focus areas for this industry.</li> </ul>	<ul style="list-style-type: none"> <li>Recycling, energy recovery, sustainability products</li> <li>Complex HVAC and building electrical systems</li> </ul>
<b>Semiconductors</b>	<ul style="list-style-type: none"> <li>Increasing pressure on the supply of semiconductors to various industries.</li> <li>Increased adoption of AI, IoT and 5G technologies is expected.</li> <li>The sector witnessed an increased demand for wireless communications owing to rise in remote working</li> <li>Other target areas for the sector are reduced chip size and low energy consumption.</li> </ul>	<ul style="list-style-type: none"> <li>AI and connected devices</li> <li>Memory chips and data centres</li> <li>Cloud computing</li> <li>COVID-19 related medical devices</li> </ul>

6. Technology Sector in India/Strategic Review 2021, NASSCOM; accessed 30 July 2021

## Digital engineering in adjoining sectors: BFSI, CPG, retail, and healthcare



The rise of digital technologies such as AI, cybersecurity and blockchain and business disruptions caused by the pandemic are driving adoption of digital engineering in non-core sectors such as BFSI, CPG and retail.

Sector	Trends	Case studies
<b>Banking, Financial Services and Insurance</b>	Enhanced focus on digital technologies such as cybersecurity, robotics, AI etc.	<ul style="list-style-type: none"> <li>A Japanese investment bank has created a group of humanoid robots and chatbots to reinvent the BFSI service model and client journey.</li> <li>An Asia-based bank has deployed Secure Access Service Edge (SASE), to upgrade its network security to support remote working.</li> </ul>
<b>Consumer Packaged Goods (CPG)</b>	Significant focus on digital shelf-life, direct-to-customer business models, adoption of digital technologies and last-mile delivery systems.	<ul style="list-style-type: none"> <li>A global e-commerce player has launched a marketing opportunity for brands to 'go live' using their application to share makeup tips, showcasing recipe demonstrations and hawking wares.</li> <li>An India-based e-commerce company has developed AI based software solution that uses data from popular products to develop its own designs.</li> </ul>
<b>Retail</b>	Increased use of AI and ML technologies to improve demand forecasting and provide enhanced customer assistance through chat-bots and smart devices.	<ul style="list-style-type: none"> <li>Peapod, a U.S.-based online grocery seller, leverages a service called 'Order Genius' that creates personalised recommendations for online grocery shoppers using AI and ML.<sup>7</sup></li> <li>An Indian food delivery company is focused on developing a hub-to-hub delivery system using drones.</li> </ul>
<b>Healthcare</b>	Upsurge in partnerships with technology companies offering blockchain, robotics, cloud computing etc. to improve data management, develop advanced surgical robots and wearable medical devices.	<ul style="list-style-type: none"> <li>A U.S.-based biotech company has formed collaborations with a software company to improve health monitoring using wearable smart devices.</li> <li>A Swiss healthcare company is advancing partnerships with tech companies to help patients and healthcare professionals in China develop solutions for management of heart diseases.</li> </ul>

7. Retail Marketing Trends To Consider in 2022, Marketing evolution, accessed 21 December 2021

## Government initiatives to promote cross-sector innovation programmes



There are collaborations between governments, the private sector, foundations, and other enterprises to overcome global challenges, along with achieving industrial modernisation through constant innovations and research. Some of the key government initiatives to promote innovation programmes across the globe are stated below.

Initiative	Government support	Impact
<b>Horizon Europe (2021)</b>	<ul style="list-style-type: none"> <li>Horizon Europe has a budget of EUR 95.5 billion for the 2021–27 period, which includes EUR 5.4 billion from the Next Generation EU instrument.</li> <li>It supports research projects through its 'European Research Council', fund research fellowship through 'Marie Skłodowska-Curie. Actions' and invest in research infrastructure.<sup>8</sup></li> </ul>	<ul style="list-style-type: none"> <li>The five key areas identified with a dedicated mission board and assembly are <ul style="list-style-type: none"> <li>– Climate-neutral and smart cities</li> <li>– Soil health and food</li> <li>– Cancer</li> <li>– Healthy oceans, seas, coastal and inland waters</li> <li>– Adaptation to climate change including societal transformation</li> </ul> </li> </ul>
<b>Canada Superclusters</b>	<ul style="list-style-type: none"> <li>In 2017, the government of Canada announced an investment of USD950 million over five years for the growth and development of highly innovative industries, which led to the launch of Innovation Superclusters<sup>9</sup> Initiative.</li> <li>Canada supercluster through its 'Innovation Canada' programme supports business innovation by providing funding, advice and developing collaborations.</li> </ul>	<ul style="list-style-type: none"> <li>To support its objective, the National Research Council (NRC) of Canada developed five funded collaborative research and development (R&amp;D) programmes made up of a series of projects.<sup>10</sup></li> </ul>
<b>America's Seed Fund</b>	<ul style="list-style-type: none"> <li>Funds of approximately USD200 million<sup>11</sup> per year are earmarked for entrepreneurs across the U.S. The funds aim to foster innovation and help create businesses and jobs in the U.S.</li> <li>It provides start-ups with funding of up to USD2 million to develop new technologies, which include funding to support R&amp;D and prototype development.</li> </ul>	<ul style="list-style-type: none"> <li>America's Seed Fund powered by the National Science Foundation (NSF) has helped start-ups and small businesses transform their ideas into marketable products and services.</li> </ul>

8. Horizon Europe, the EU research and innovation programme, Publication office of EU

9. Supercluster support programs, National Research Council of Canada, accessed on 9 August 2021

10. Innovation Superclusters Initiative, Government of Canada, accessed on 9 August 2021

11. About America's Seed Fund powered by NSF, National Science Foundation, accessed on 9 August 2021

Initiative	Government support	Impact
<b>Sandbox Framework-Japan</b>	<ul style="list-style-type: none"> <li>The mechanism was introduced to initiate regulatory reforms for supporting the development of innovative technologies and business models in Japan.</li> <li>The initiative has three legislative measures that can support companies with innovative solutions<sup>12</sup> <ul style="list-style-type: none"> <li>Small Business Credit Insurance Act</li> <li>Small and Medium Enterprise Investment Training Corporation Act</li> <li>Independent Administrative Agency Small Business Infrastructure Development Organization</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Companies, including foreign players, can use this framework to apply for conducting feasibility of innovative technologies including AI, IoT or blockchain for future business.</li> <li>The projects are monitored for social and economic viability of the technology and how the technology fits in with current regulations.</li> </ul>



12. Japan's Regulatory Sandbox, Medium, as accessed on 6 September 2021



# Global outlook of top R&D spenders and Engineering Service Providers



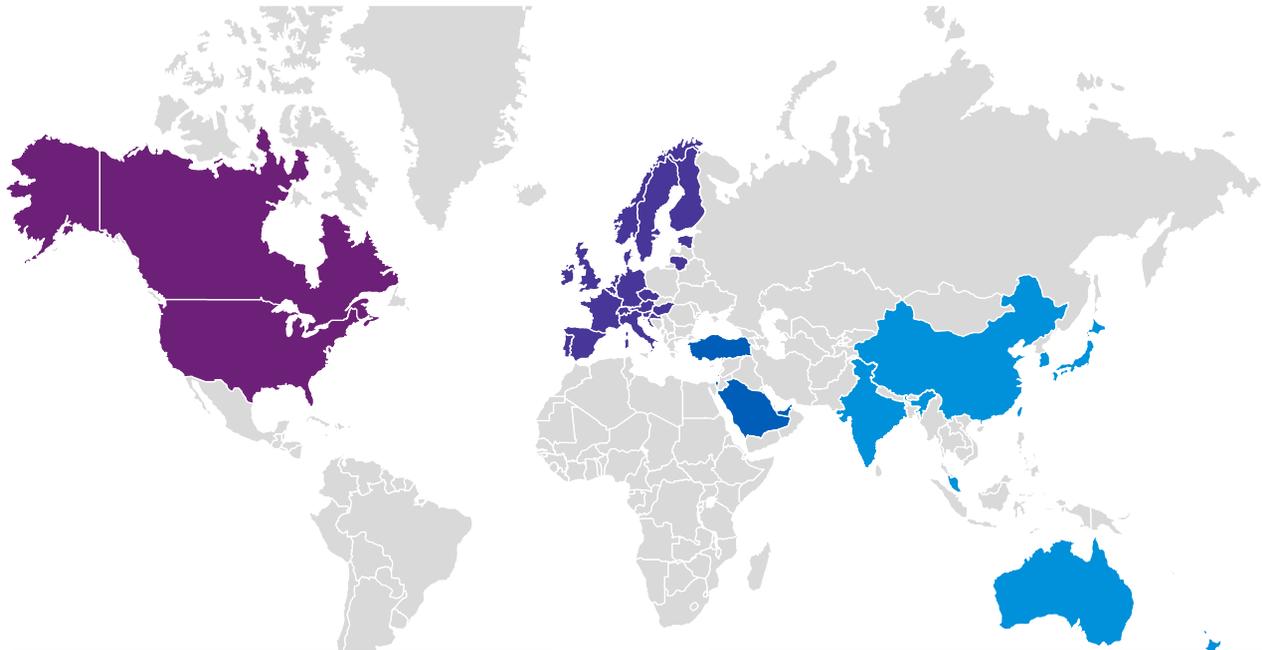
The top 1000 companies in R&D spent a combined USD995 billion in 2020. While the global GDP declined by 3.5 per cent in 2020<sup>13</sup>, the R&D spend of top 1,000 R&D spending companies grew by 13.9 per cent. The leading

2,500 companies also improved their R&D spending by 6 per cent in 2020. Globally, the overall spend on R&D across industries and geographies is expected to improve to USD2,440.5 billion in 2021<sup>14</sup>.

## R&D Scoreboard 2021: Geographical split of the top 1000 organisations based on R&D spending

North America	
Number of Companies	332
Total R&D expenditure (2020)	USD388.5 billion

Europe	
Number of Companies	263
Total R&D expenditure (2020)	USD272.6 billion



Africa and Middle East	
Number of Companies	9
Total R&D expenditure (2020)	USD3.72 billion

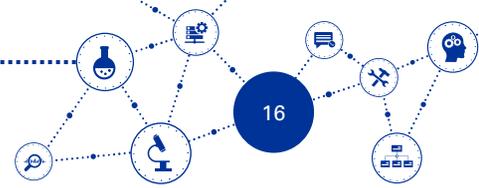
Asia Pacific	
Number of Companies	396
Total R&D expenditure (2020)	USD330.26 billion

**Note:** The data is for top 1000 R&D spending companies from the regions in 2020

**Source:** EU R&D scoreboard 2021, R&D ranking of world top 2500 companies, accessed on 20 January 2022

13. Global Economic prospect, World Bank

14. 2021 Global R&D Funding Forecast, R&D World



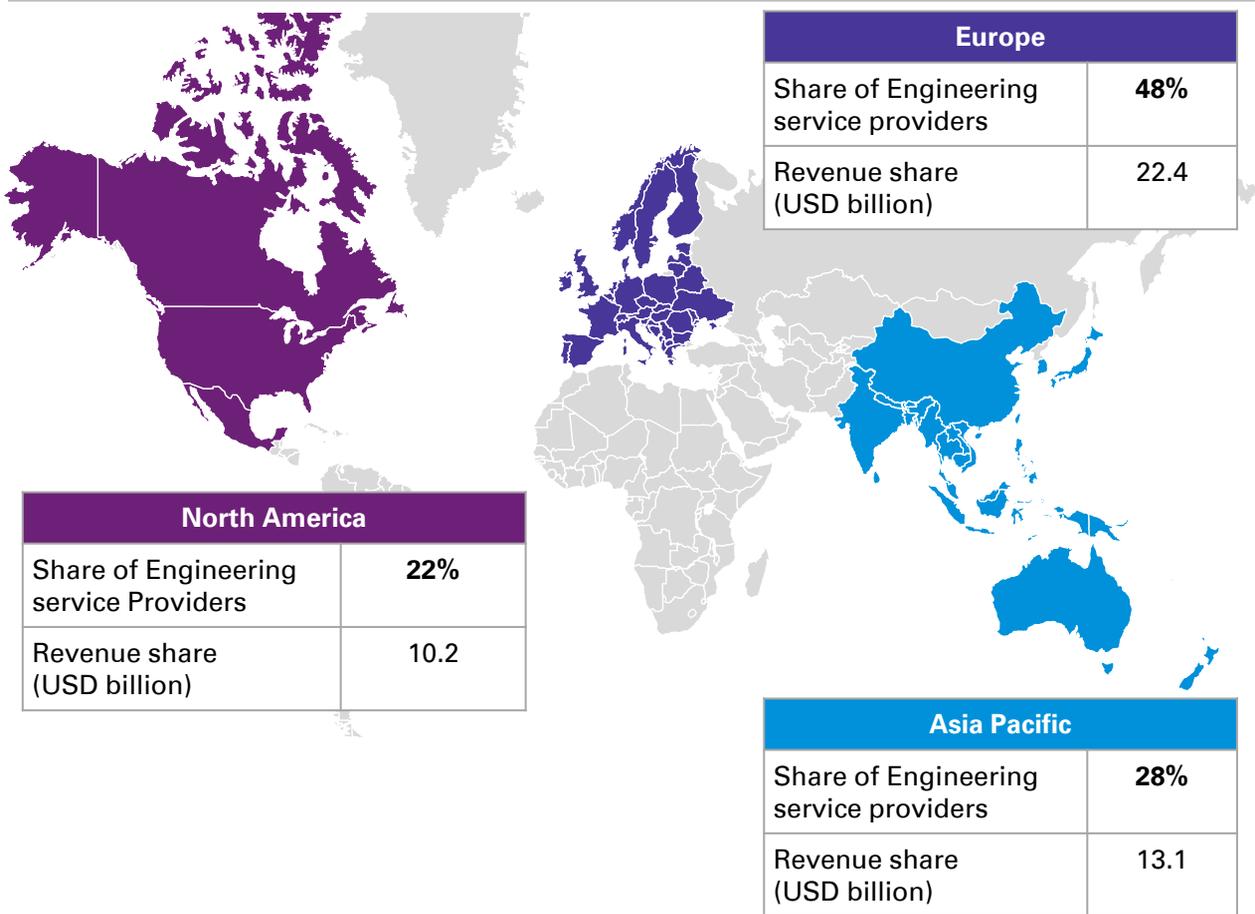
## Top 50 Engineering service providers (ESP) by revenue:



In 2020, European ESPs had the largest share (48 per cent) in the top 50 ESP list, followed by APAC (28 per cent) and North America (22 per cent). ESPs such as Cyient and some of the leading Indian and global IT consulting

companies are acquiring other companies and building partnerships to develop niche capabilities in areas such as automotive ER&D and digital payment services and create market access as part of their recovery strategy.

### Region wise revenue split of top 50 Engineering Service Providers (ESPs) – 2021



**Note:** Engineering services providers in Rest of the World (RoW) represent 2 per cent of the global market share by revenue

**Source:** Engineering Services Providers, Top 50 – 2021, Everest Group

# Value chain of ER&D

The ER&D value chain can be broadly classified into three categories including discovery, develop and deploy as explained below:

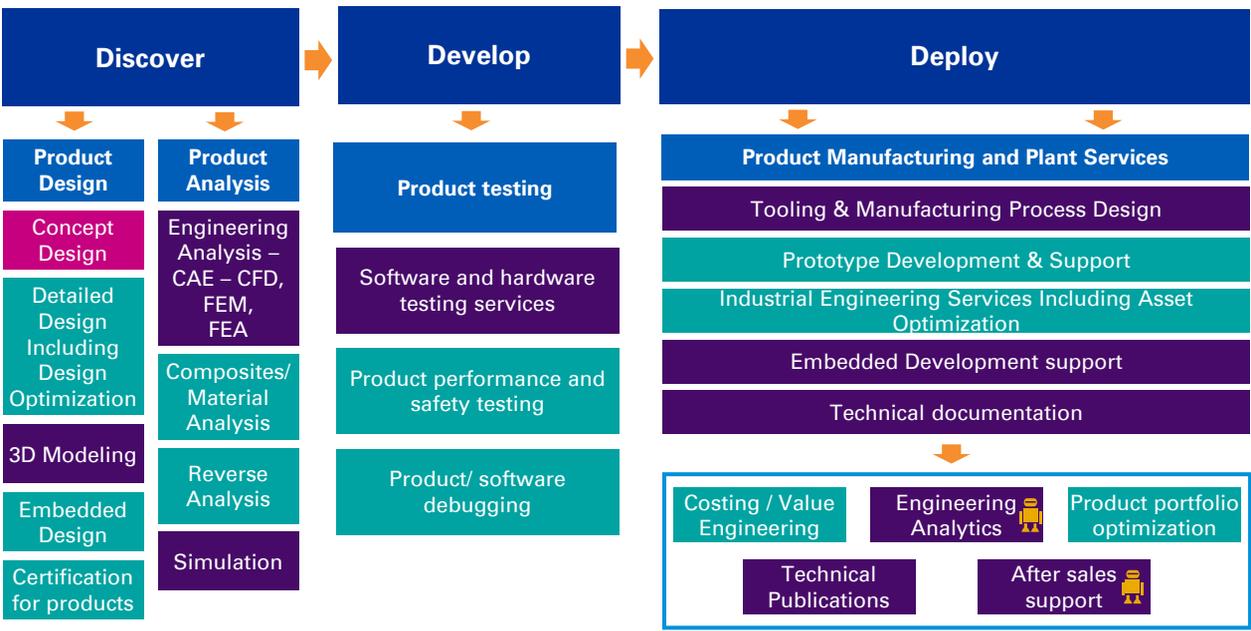


The product council and owners, and engineering team identify market needs, draft proposal, conceptualize the idea, scope the process. The market needs are identified through voice of customer, benchmarking competitor's product and technology road map design before transitioning to developing phase.

The engineering team creates the design, integrates testing, and develops a prototype. The team reviews, completes final production design, and clears the product for deployment. This phase may involve a cross functional design review before creating a prototype.

Product knowledge is shared with the global customer teams, dealers, distributors, service teams, along with other pre-launch activities. Post-production process includes inventory back-up and management and addressing customer grievances followed by other value-added services.

### ER&D value chain



### Legend(s):

High degree of offshoring (>65%)	Moderate degree of offshoring (40%-65%)	Nascent degree of offshoring (<40%)	Automation potential
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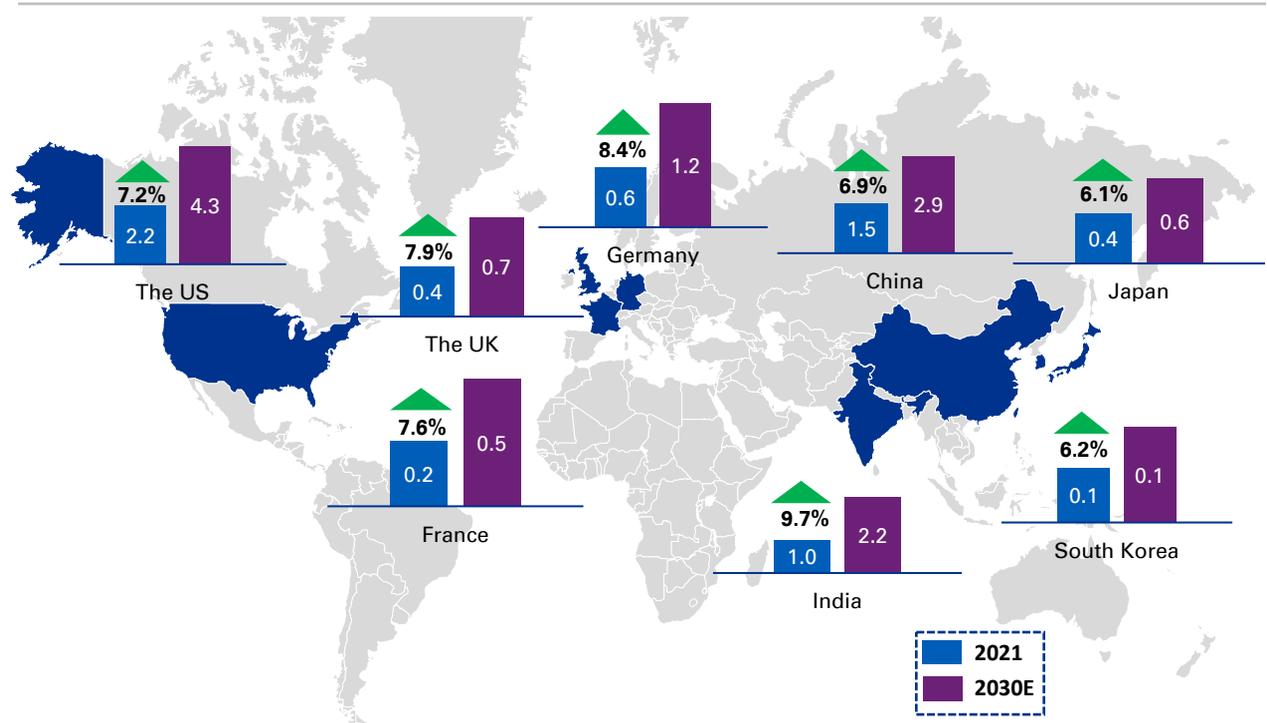
# Supply side: Overall ER&D installed talent, key geographies and verticals



The availability of talent plays a pivotal role in choosing a global destination for setting up ER&D centres. *As of 2021, the U.S. accounts for the maximum share of the overall global ER&D installed talent, followed by China and India. However, a younger population and high availability of STEM<sup>15</sup> graduates position India*

*As a promising ER&D talent hub*, followed by Germany, the U.K. and France that are driven by favourable policy measures such as offering educational programmes and work visa arrangements by the EU and respective governments.

## Top eight countries in terms of ER&D talent supply (in millions)



— Talent supply for India is expected to grow at a CAGR of 14.7 per cent by 2025 and 9.7 per cent by 2030 from 2021 levels

Source: Talent supply estimates have been sourced from Draup’s Proprietary Talent Module, accessed on 11 September 2021

Skills such as big data processing, predictive analytics, platform development, and cyber threat monitoring and management are highly sought after, owing to rising penetration of technologies such as cloud, data science and cybersecurity across industries. For example,

**India is the second largest<sup>16</sup> nation after the U.S. in terms of demand for data scientists.** Some of the top industries generating this demand include healthcare, automotive and software development along with a surge in demand across other sectors too.

15. STEM is a curriculum based on the idea of educating students in four specific disciplines — science, technology, engineering, and mathematics — in an interdisciplinary and applied approach

16. Demand and Opportunities for Data Science in India – 2021, 360DigitMG, accessed on 28 August 2021

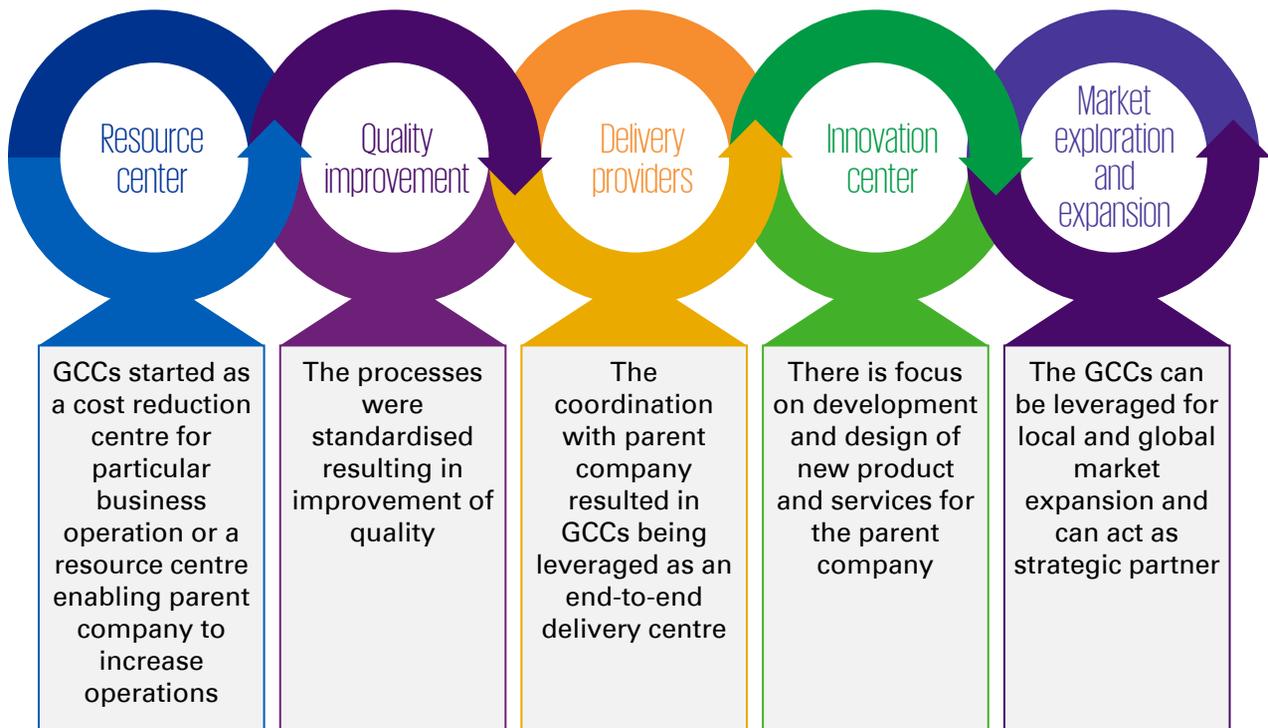
# GCC and TP disruption



Post COVID-19, companies have increasingly embraced the concept of remote working, which is expected to lead to the decentralisation of ER&D centres to global locations. Companies have started using their GCCs as centres of excellence for automation, digitalisation, and analytics. This has enabled an increase in budget allocation for these GCCs leading to more innovation and new developments. Some of the key growth drivers for GCCs include digital technologies such as RPA, AI, ML, IoT, cyber, edge computing and cloud.

## Evolution cycle of GCCs

GCCs have transitioned from being resource centers to strategy enablers and value creators. The new generation of GCCs is expected to provide self-directed decision support and an AI-augmented human intelligence. GCCs also provide a strong business process integration. They are investing in off-shore capability centres which have leaders with multi-dimensional business orientation and act as an intermediary between strategy and operations. They also collaborate with start-ups, educational institutes and government bodies to drive innovation and exploit the unexplored opportunities.



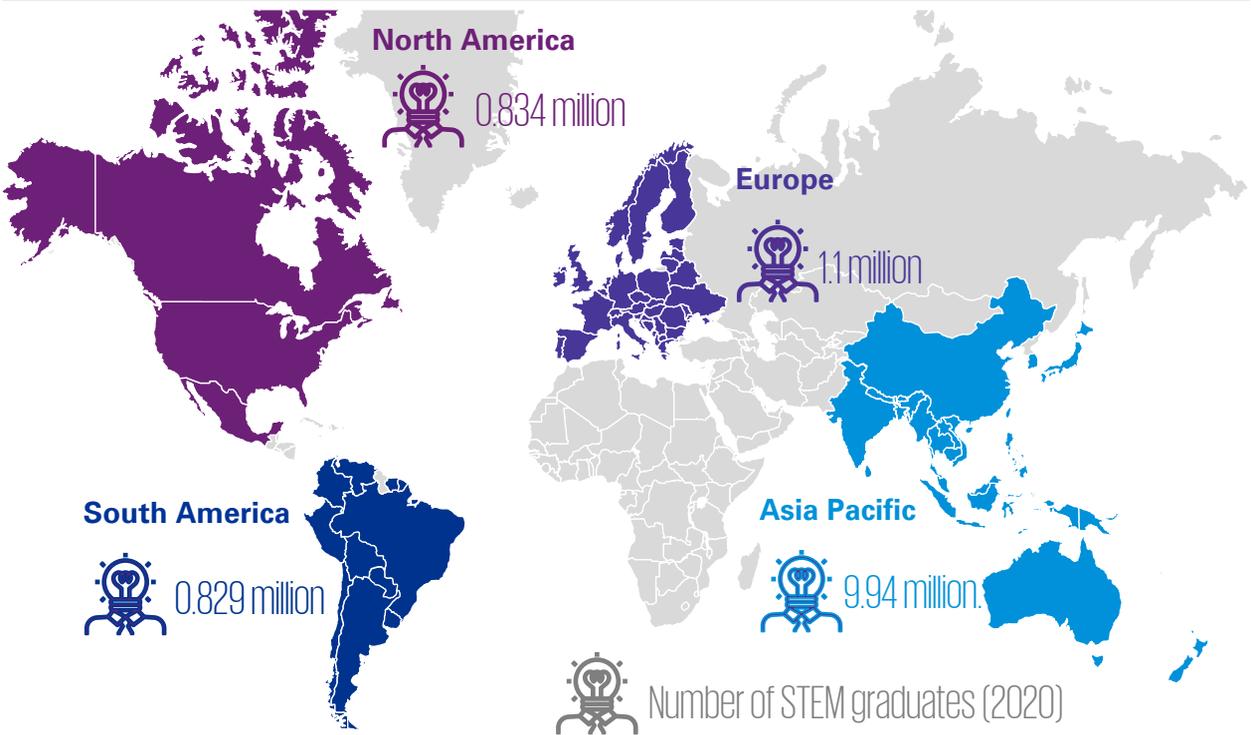


# STEM graduates

A robust education system plays a pertinent role in shaping a rich and qualified talent pool. Enterprises prefer locations with an abundance of talent while establishing headquarters, offshore and nearshore offices.

The Asia-Pacific region leads the global tally in terms of available workforce and total number of STEM graduates owing to a higher share of the young population and brighter employment opportunities in the STEM sector. **India, with nearly 27 per cent share of STEM graduates in APAC, has the second largest number in the region.**

## Region-wise split of STEM graduates (2020):



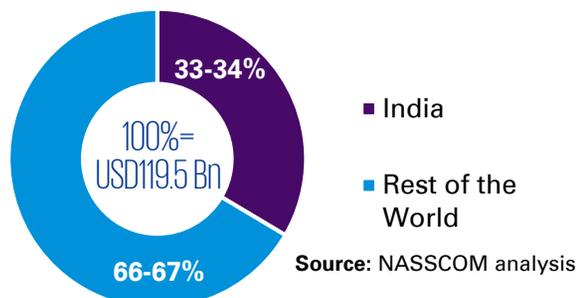
Note: 2020 figures are based on estimates

Source: Number of STEM graduates by country, UNESCO Institute for Statistics (UIS), accessed on 24 August 2021

# Global ER&D Sourcing

The global ER&D sourcing market is estimated at nearly USD120 billion by 2021. **In 2021, the Indian ER&D sourcing market is valued at USD40-41 billion.** India accounted for a third of the overall ER&D sourcing market in 2021 globally.

## ER&D Sourcing Market (2021E)



## Section: 2

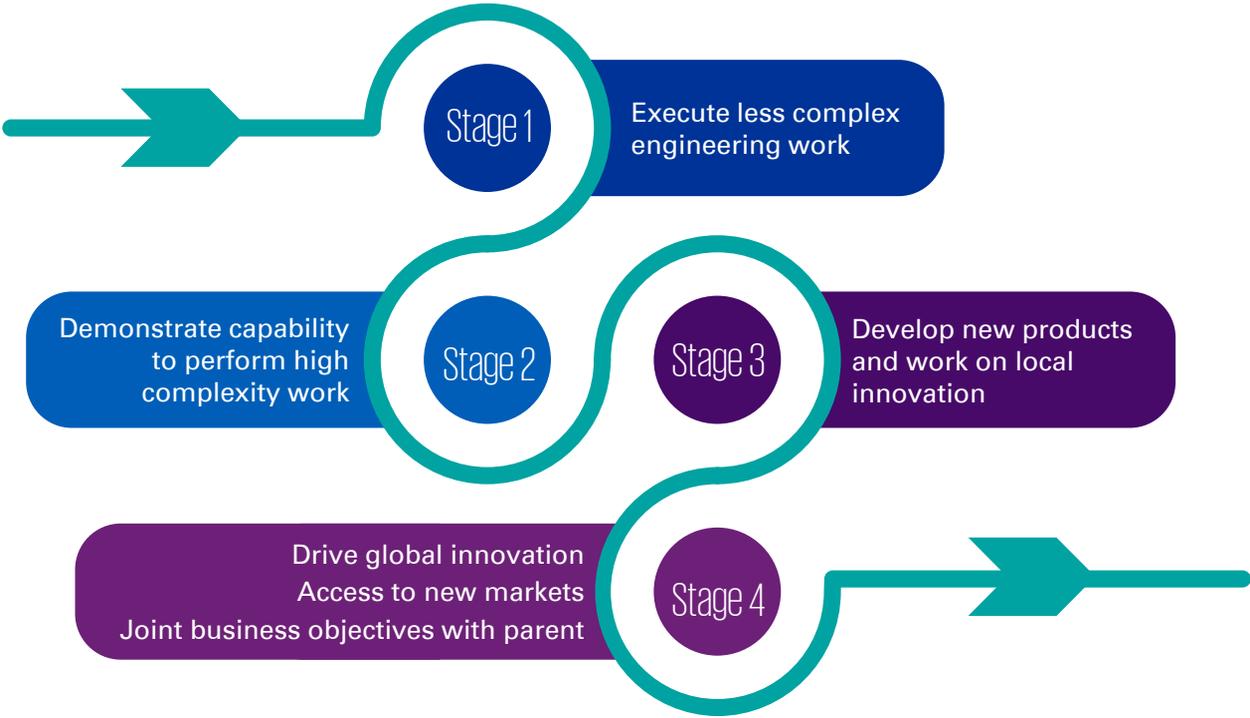
# Location as a key driver of the delivery strategy



# Location as a key driver for capabilities

The ER&D ecosystem has witnessed transformations and with an addition to the list of conventional services, driven by increasing complexity and demand, there are multiple determining factors in location assessment exercise for ER&D centres.

## Evolution of ER&D Centres



## Evolution of location strategy - shift in focus from only delivery centres to growth partners

Global enterprises are seeking innovation and value creation through their offshore ER&D centres. Location strategies have been selected by the ER&D companies with increasing reliance on talent availability, industry ecosystem and market proximity, among others.

Organisations have for a long time leveraged the ER&D centres as strategic partners, where the role extends beyond a supporting arm to being a centre of excellence and innovation. The transition in location strategy over the years has enabled GCCs to bring high-value

work, transforming offshore locations into global innovation hubs, driving IP creation and functioning as a true extension of the parent organisation. This innovation driven ER&D ecosystem is enabled by locations which have strong talent ecosystem, favourable business climate, and presence of stakeholders such as suppliers, partners, and customers.

Over the years, ER&D GCCs have matured to drive end-to-end ownership for products and some centres drive the strategy and vision for entire engineering functions of their global organisations.

## Evolution of location strategy - shift in focus from only delivery centres to growth partners

### 1 Reduced focus on offshoring

Over the past many years, the GCCs have transitioned from offshoring centres to growth partners, with talent capabilities, evolving skills-sets, investment opportunities, and conducive business infrastructure.

**Case example** - A leading enterprise in the engineering and consumer electronics industry has opened an ER&D centre in South-East Asia on account of a mix of favourable considerations. Some of the major rationales included proximity to the ASEAN customer base, opportunities to connect with multiple universities, ability to work with partner organisations (to help industrialise the company's product offerings), and accessibility to nearshore markets within APAC.

### 2 Maturity of ER&D centres

There is a shift in the performance metrics of the GCCs, from being delivery driven towards value creation. ER&D centres are moving up the maturity curve towards higher product ownership and encouraging innovation at an enterprise level.

**Case example** - GCC of a leading telecommunications and technology conglomerate, based out of an emerging ER&D hub in Asia Pacific, was initially set-up as a small business unit. Twenty-five years later, the GCC's national footprint contributes to 50–70 per cent of the product portfolio, and 25–30 per cent of the global engineering headcount.

### 3 Capability-driven location strategy

The enhanced working of ER&D centres demands a rich and qualified talent pool that can sustain the value creation activities and generate end-to-end capabilities to drive long-term growth.

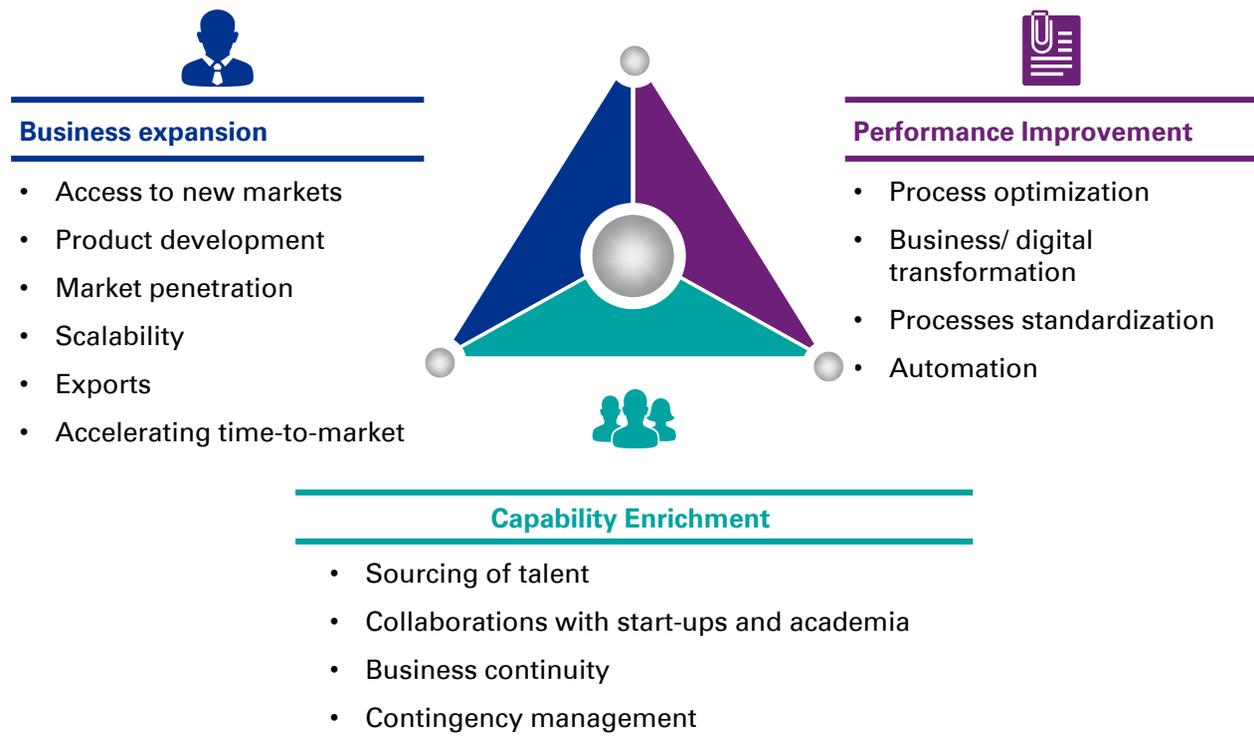
Enterprises, while establishing offshore/ nearshore centres, prefer locations which have proximity to competent talent and strong educational ecosystem, backed by facilitative business environment.

**Case example** - A North America based service provider has collaborated with engineering institutions present near the ER&D facilities of their clients in South Asia. The company strengthened educational interactions by establishing long-term affiliations with the academia and offering internship programmes to the students. ER&D facilities housed by the company also inked partnerships with start-ups to leverage their competencies and seek proficiency in bolstering its tech capabilities.

## Role of location in the delivery strategy

In line with most business decisions, carving out the objectives for expansion or facility establishment is among the initial steps imperative for the location selection exercise. It is essential to maintain an equilibrium between the achievability and challenge of these goals.

As location is a function of numerous benchmarks that need careful assessment to optimise the pros within a particular set of restraints. This assessment supports in ascertaining the competitive advantage and choosing an appropriate location.

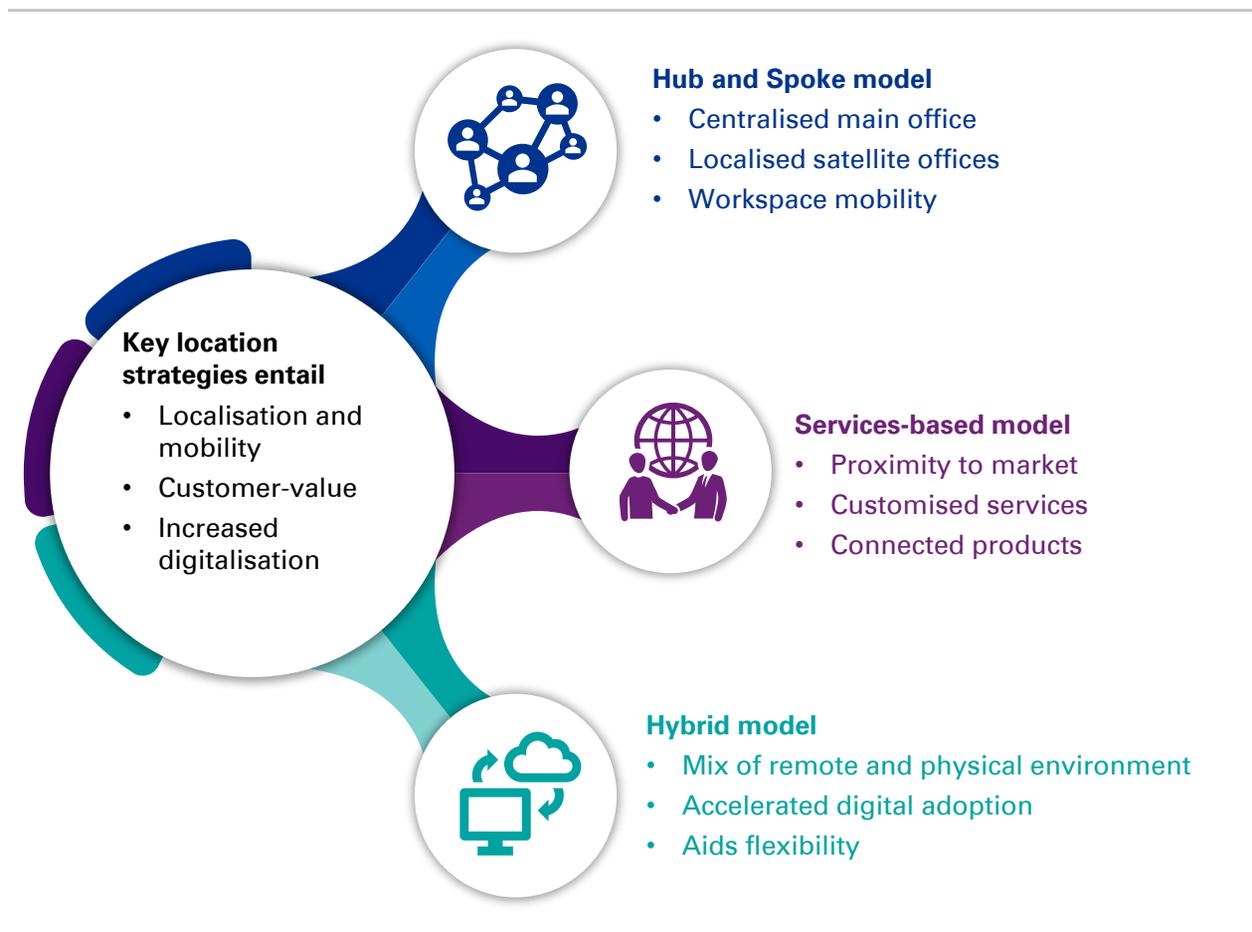


## Different location strategies used by ER&D companies

Every company has a distinct array of business objectives, resources, and processes that need to be addressed in a customised approach.

**Traditional hub and spoke models** catered to organisations in identifying a base location and a few offshore locations to support the main hub based on the maturity of geographies and complexity of work.

However, the ER&D industry has evolved, with the nature of work at ER&D facilities demanding considerable physical presence during different phases of research, product development, testing, configuration, and quality checks. The execution of these stages requires controlled environment, secure networks, adequate tools, and effective collaboration. ER&D companies have thus come up with exclusive approaches to manage complex engineering and product development activities from decentralised locations.



Some enterprises have established satellite offices in offshore / nearshore locations to gain access to wider market, strategically manage service delivery through disseminated location portfolio, and harmonise global operations, whereas in **service-based models**, organisations focus on customised service experiences, proximity to stakeholders (customers, suppliers, partners, employees, and investors), delivery channels, and customer-specific offerings.

At the same time, a few ER&D companies have adopted **hybrid environment** with focus on remote working, wherever feasible. These enterprises are leveraging advanced digital technologies to virtualise the ER&D atmosphere and work in controlled settings.

## Case studies highlighting evolving location strategies

1

### A semiconductor manufacturer embraced the hub and spoke workflow to reconcile its global functions

A leading technology company leveraged hub and spoke workflow to synchronize operations across its base location in North America and satellite offices in three locations across Asia Pacific. All the ER&D facilities are established as design centres which broadly focus on hardware & software development, PCs, servers, IoT, AI, assisted driving, product architecture, and testing. The distribution of functions across locations is determined by set of factors such as legacy knowledge & experience, talent capabilities, and domain expertise. For instance, the extended office in South Asia has competency in embedded systems, product management, project management and system architecture.

2

### A North American engineering enterprise has set-up operations in South Asia to improve services for aviation industry clients

The multinational conglomerate has identified key locations as home to their ER&D centres based on the market demand and ecosystem maturity. The organisation has expanded its facilities across South Asia, Central and Western Europe, Middle East, and Latin America for its aviation and healthcare verticals. The company's ER&D centre in South Asia focusses on product development and innovation specifically for catering to customers in the aviation vertical within the Middle East region, which is an aviation hub.

3

### Electronics conglomerate uses service-delivery model to address customer requirements

A consumer electronics major in Asia-Pacific opened an ER&D facility in the subcontinent. The service-based model followed by the organisation has enabled them to entail a shift from supplying a product to addressing customer requirements and delivering value to customers. According to company's stakeholders, they leverage wireless communication, imaging process, AI, and IoT to enhance their existing competencies. Analytics algorithms are leveraged to gather insights on product consumption levels, performance, and predictive maintenance. These insights are also leveraged for discussions around product design and feature enhancement.





# Parameters advocating the selection of key business locations



The establishment of physical facilities counts as a pivotal decision for any enterprise. An appropriate location can reform the profitability of a business and enhance its market position. It becomes imperative to scrutinise a country based on the following criteria before finalising the subsequent steps.

ER&D companies contemplate an extensive list of features to bolster their evaluation such as accessibility, demographics, competition, proximity to market, security, skill base, and growth potential etc. However, as the focus is to highlight the most substantial facets, the list is narrowed down to four crucial aspects. Some of the broad factors influencing location strategy to set-up ER&D centres include **conducive ecosystem, talent competitiveness, cost advantages, and a supportive business environment.**

Weightages	Parameters	Sub-Parameters	Sub-Parameter weightages
40%	Talent availability	<ul style="list-style-type: none"> <li>Proximity of talent</li> <li>Number of Graduates / STEM Graduates</li> <li>Availability of experienced workforce</li> <li>Talent competitiveness</li> </ul>	<ul style="list-style-type: none"> <li>60%</li> <li>40%</li> </ul>
25%	Cost attractiveness	<ul style="list-style-type: none"> <li>Cost of labour</li> <li>Cost of operations</li> <li>Tax incentives</li> <li>Cost of living</li> </ul>	<ul style="list-style-type: none"> <li>60%</li> <li>20%</li> <li>10%</li> <li>10%</li> </ul>
25%	ER&D ecosystem	<ul style="list-style-type: none"> <li>Presence of ER&amp;D centres</li> <li>Eminent educational hubs</li> <li>Presence of unicorn startups</li> <li>R&amp;D Index</li> </ul>	<ul style="list-style-type: none"> <li>30%</li> <li>30%</li> <li>20%</li> <li>20%</li> </ul>
10%	Business environment	<ul style="list-style-type: none"> <li>Ease of doing business</li> <li>Macroeconomic landscape</li> <li>Political stability</li> <li>Climate risk</li> </ul>	<ul style="list-style-type: none"> <li>30%</li> <li>30%</li> <li>30%</li> <li>10%</li> </ul>

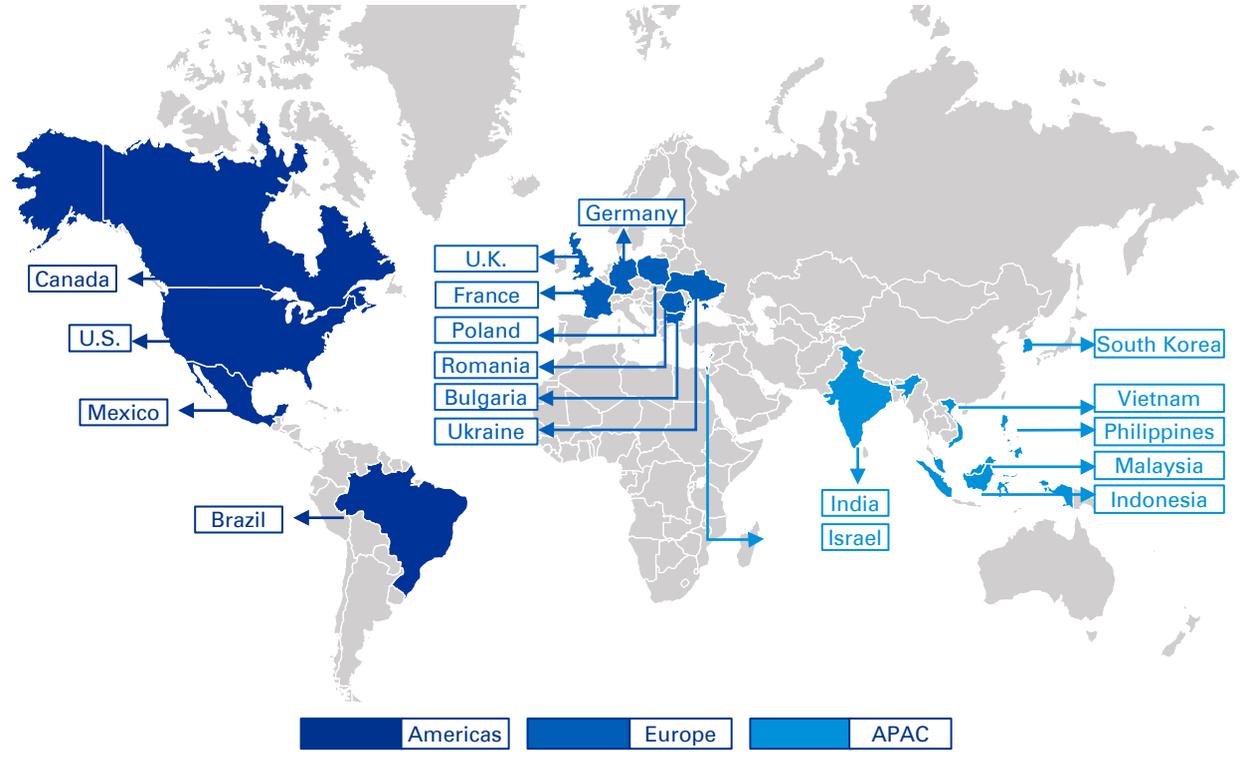
Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

# Hotspots: Global ER&D Centres

For this study, a total of 18 countries across the APAC, North and Latin America, and European regions were identified as the leading locations for harbouring ER&D centres. These 18 ER&D hotspots have emerged as more stable business destinations around the world which offer an established industrial ecosystem along

with strong talent pool among other factors. A comprehensive assessment of these hotspots aim to highlight the relative strength of different locations, in terms of attractiveness to set up ER&D centres, across the determining parameters.

## Overview of locations assessed

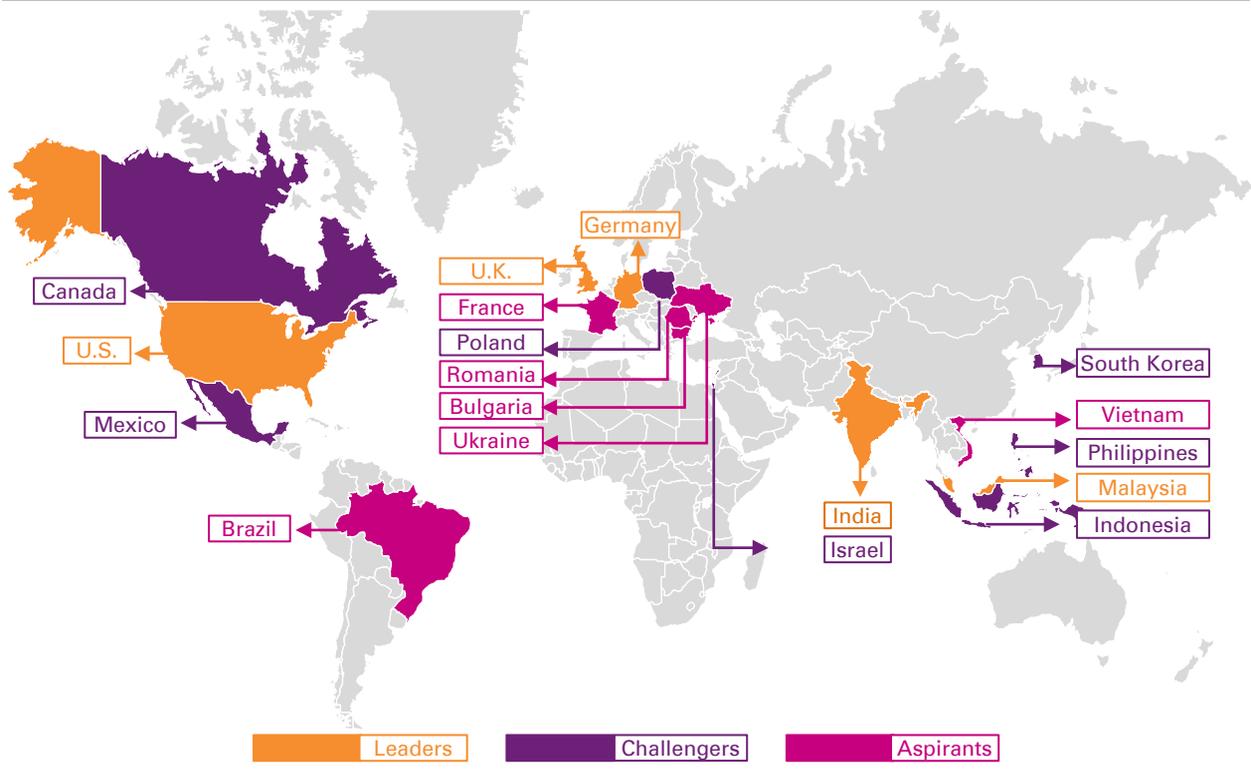


# Location assessment: Global ER&D hotspots

A detailed location assessment of the global hotspots indicated the relative strength, to set up ER&D centres, of respective countries against the different parameters. The top-5 locations within the global ER&D hotspots are termed as **Leaders** which are closely followed by seven lucrative locations in the **Challengers** pool. The **Leaders** and **Challengers** locations are joined by the remaining six locations, classified

as **Aspirants** which are already among the established GCC hubs globally and follow the **Leaders** and **Challengers** as preferred destinations for the ER&D players.

**India emerged as the leader in the overall assessment across the four parameters and is joined by the U.S., the U.K., Germany, and Malaysia in the Leaders pool of ER&D hotspots.**



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

The ER&D location attractiveness analysis maps four key parameters to assess the relative advantage offered by identified locations across each parameter. The subsequent sections discuss the four parameters – **talent, cost attractiveness, ER&D ecosystem, and business environment in detail** individually to identify the most attractive locations across different parameters.



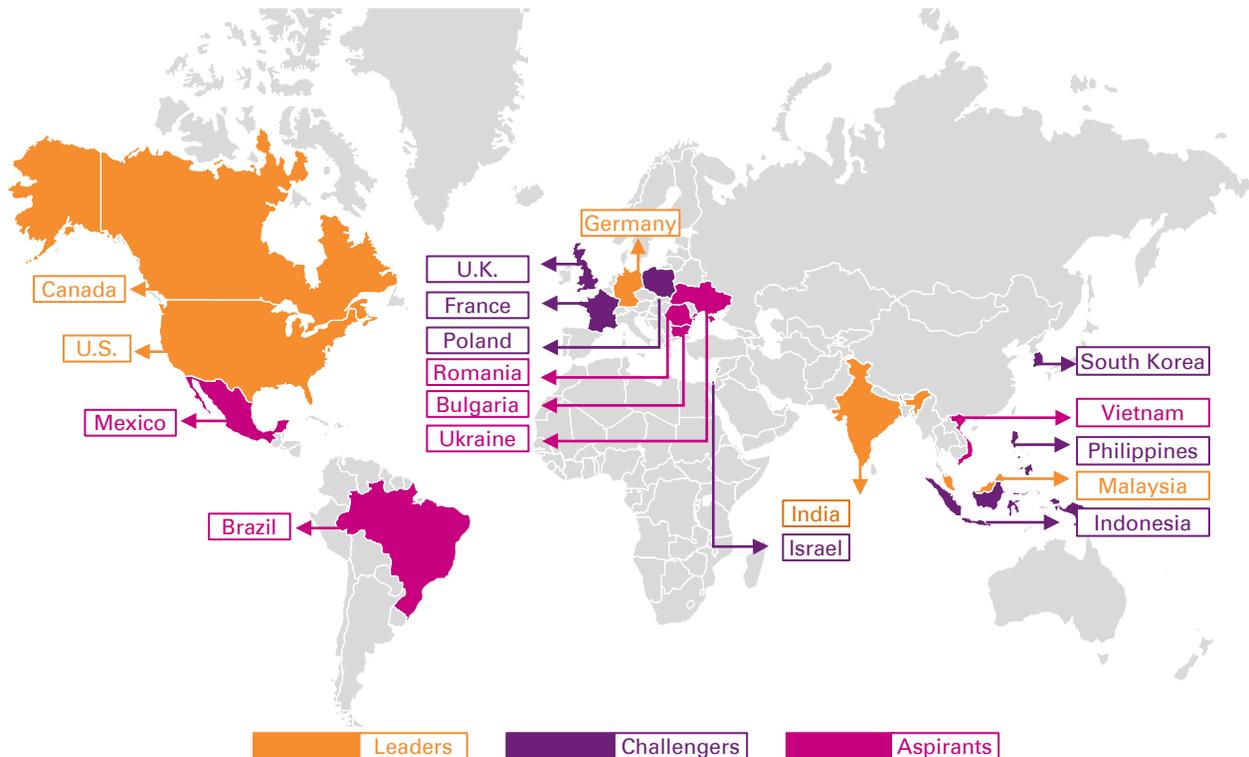
## A. Talent availability



Talent is one of the most important parameters while establishing ER&D centres. Several factors within talent proximity and talent competitiveness sub-parameters such as labour force, STEM graduates, availability of finding skilled employees, scientists, and researchers impact the attractiveness of any location in terms of talent.

For several years, companies have been setting up their ER&D centres within regions that offer better talent availability. Often, organisations join hands with local universities for development and training of graduates who are engaged in full-time roles by the respective organisations. Asia Pacific remains an attractive location for the ER&D industry, driven by a large pool of workforce and graduates, equipped with skills required for engineering services.

### Location assessment: Talent availability within global ER&D hotspots



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

As talent availability has taken centre stage in ER&D centres setting up decision making, two clear aspects weigh prominently:

- Proximity to relevant, globally accessible talent which considers total labour force, number of total graduates and STEM graduates, and number of research personnel
- Competitiveness and quality of the available talent pool focusses on ease of finding skilled employees, availability of scientists and researchers, and the country's overall talent competitiveness score

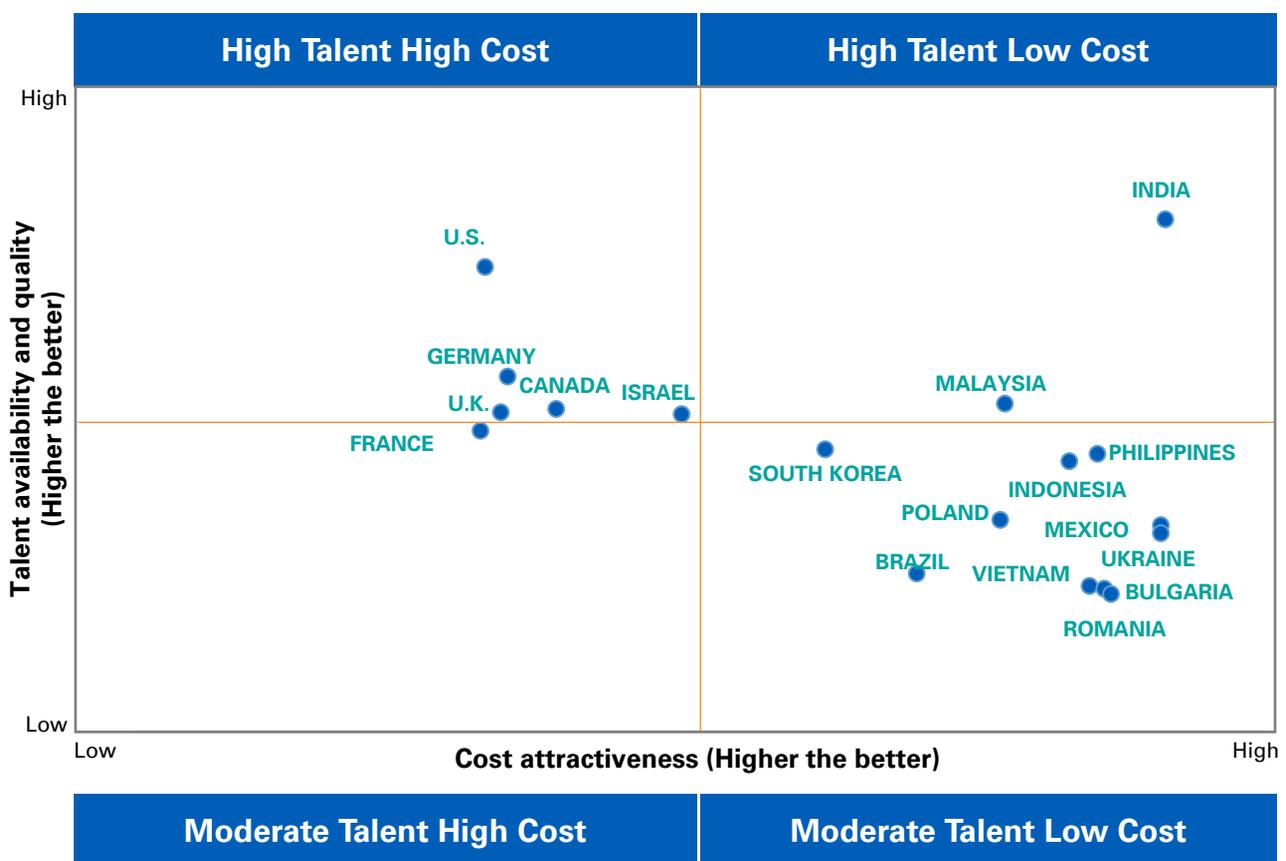
With the highest workforce and STEM graduates along with considerable R&D personnel, **India ranks better than all the other locations considered.**

**India performs better than most APAC locations in talent competitiveness with relative ease of finding skilled employees, engineers and scientists.**

The U.S. follows India in the talent parameter. Canada also features in the *Leaders*, owing to its exceptional talent competitiveness score.

In Europe, Germany, the U.K. and France have featured as *Leaders* and *Challengers*, owing to a robust pool of R&D personnel and impressive scores in the talent competitiveness factor.

### Talent - Cost Analysis



**Source:** KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

*Talent availability and cost attractiveness parameters account for nearly two-thirds weightage to the location assessment exercise for establishing ER&D centres.* Locations offering better talent and low cost outrank competitors in terms of attractiveness and suitability to operate ER&D facilities. **India is placed in the most lucrative position with its large qualified talent pool and significant cost**

**advantage compared with other locations.** The U.S. closely follows India on the talent front however falls behind in terms of cost attractiveness owing to its high labour cost. Along with India, Asian economies including Malaysia, the Philippines, Indonesia, and South Korea also offer cost advantage. However, these locations lag in terms of talent availability and scalability when compared with India.

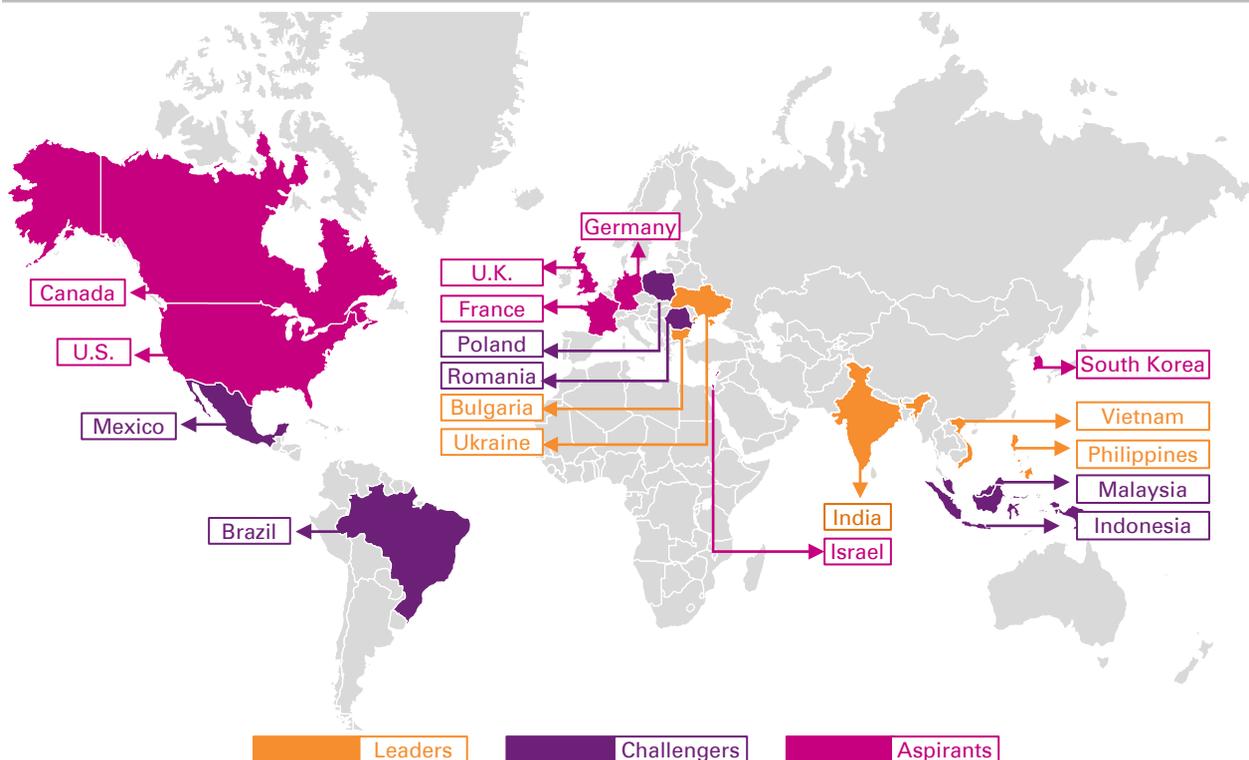
## B. Cost attractiveness



Cost features among the important parameters that help organisations shortlist locations for establishment and expansion of ER&D centres. Facets such as cost of living, cost of labour<sup>17</sup>, cost of starting a business, rent and tax rates, reflect the competency of a location.

Companies setting up ER&D centres prefer to gain an explicit view of these components while they assess the wider cost parameter. A comprehensive understanding of potential expenses helps reckon the future cash flow.

### Location assessment: Cost attractiveness of global ER&D hotspots



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

17. Salary costs for three key engineering verticals - electronics, software, and mechanical - are evaluated to offer a holistic view of labour cost in respective regions. Salary costs for these verticals are analysed at multiple skill levels. For electronics vertical, the roles studied include R&D Manager (Technical), Electronics Consultant, Instrumentation Engineer, and R&D Engineer. Roles considered under software vertical include Software Analyst, Software Engineer, Principal Software Engineer, and Engineering Manager. Mechanical vertical is represented through skills such as CAD Designer, Mechanical Design Engineer, and CAD Design Manager.

Cost competitiveness of a location was determined by considering the following key factors:

- Labour cost for job profiles pertinent to key engineering verticals
- Operating cost including rental cost, broadband cost, and electricity cost
- Cost of living
- Tax rates

**India emerges in the Leaders segment in the cost competitiveness parameter, along with Ukraine, Bulgaria, the Philippines, and Vietnam.**

These locations offer among the lowest cost of labour and relatively low rental costs. Central European hotspots such as Poland and Romania, and APAC locations Indonesia and

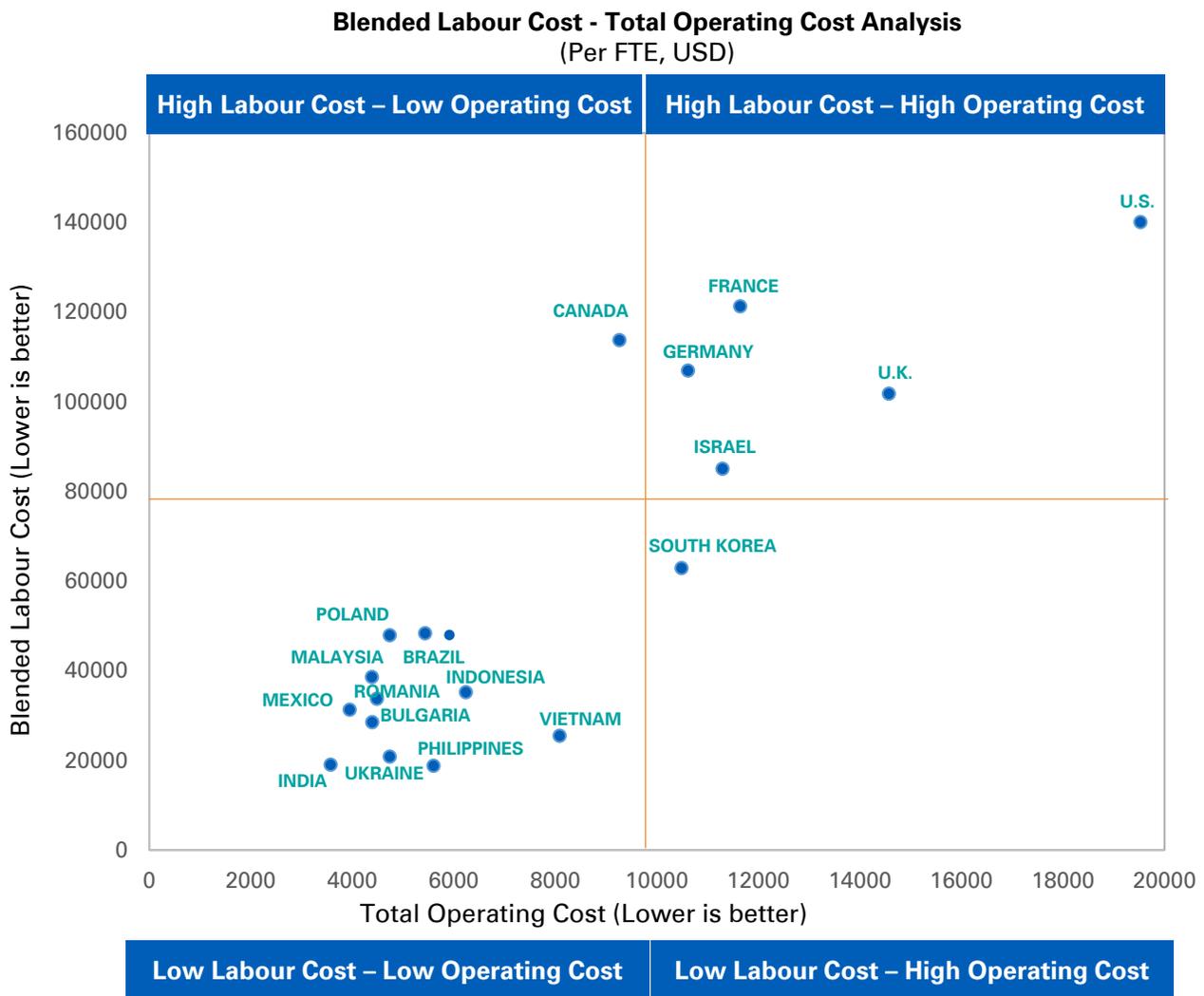
Malaysia feature among *Challengers* and offer relatively better cost competitiveness than other Western European and North American locations.

Western European locations including the U.K., Germany, France and the North American region including the U.S. and Canada lag in cost advantage due to high cost of labour and considerable high cost of operations including electricity, broadband and rentals.

Major Latin American economy, Mexico is a lucrative option featuring within *Challengers* cost attractive locations. Both LATAM locations including Mexico and Brazil offer cost attractiveness on the basis of the region's low cost of labour and among the least cost of living globally.



Labour to operating cost analysis for identified locations highlights the major cost components, labour cost and operating cost, associated within the cost parameter. Locations including India, Mexico, and Bulgaria placed in the *low labour cost - low operating cost quadrant* register lower costs which indicates that these locations offer most cost advantage for both the cost components.



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

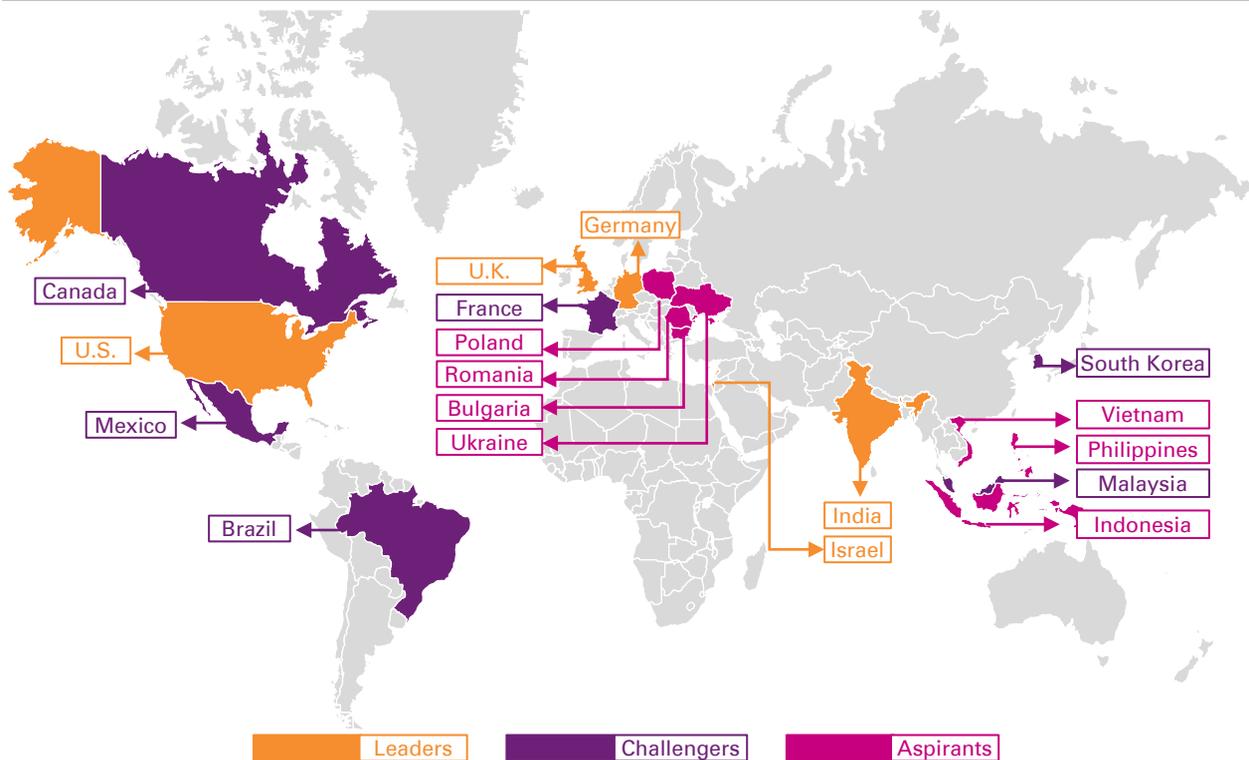
## C. ER&D ecosystem



The presence of a robust existing ER&D ecosystem makes it easier for companies to open ER&D centres and initiate key activities supporting innovation and product development. Given the volatilities of any industry, the ER&D industry also encounters various macro factors, which either accelerate or retract its growth over a period.

The biggest deterrent presently for most industries is COVID-19. However, industries such as ER&D find ways to overcome hurdles and keep up the pace through the selection of different offshore/nearshore locations that enable organisations to ensure business continuity.

### Location assessment: ER&D ecosystem of global ER&D hotspots



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

An established ecosystem reinforces the attractiveness of a location for setting up ER&D centres. The ecosystem relies significantly on four key factors:

- Presence of eminent educational hubs that cover both the quantitative aspect of the number of universities along with the quality of educational hubs in terms of top ranked educational institutions
- A thriving startup ecosystem with a significant number of startups including technology startups, unicorn startups emerging as industry influencers, which reflects the strength of the ER&D industry in the region

- Presence of existing R&D centres
- R&D index

**India, along with the U.S., the U.K., Israel, and Germany emerged as Leaders in the ER&D ecosystem parameter owing to extensive R&D ecosystem featuring a strong startup ecosystem, presence of eminent educational hubs along with among the best ER&D centres' across industry verticals and a wide network of educational institutions.**

In the *Challengers* pool of ER&D hotspots with established ER&D ecosystem, Canada features along with France and South Korea. The *Challengers* hotspots for ER&D ecosystem also include LATAM locations such as Brazil and Mexico.

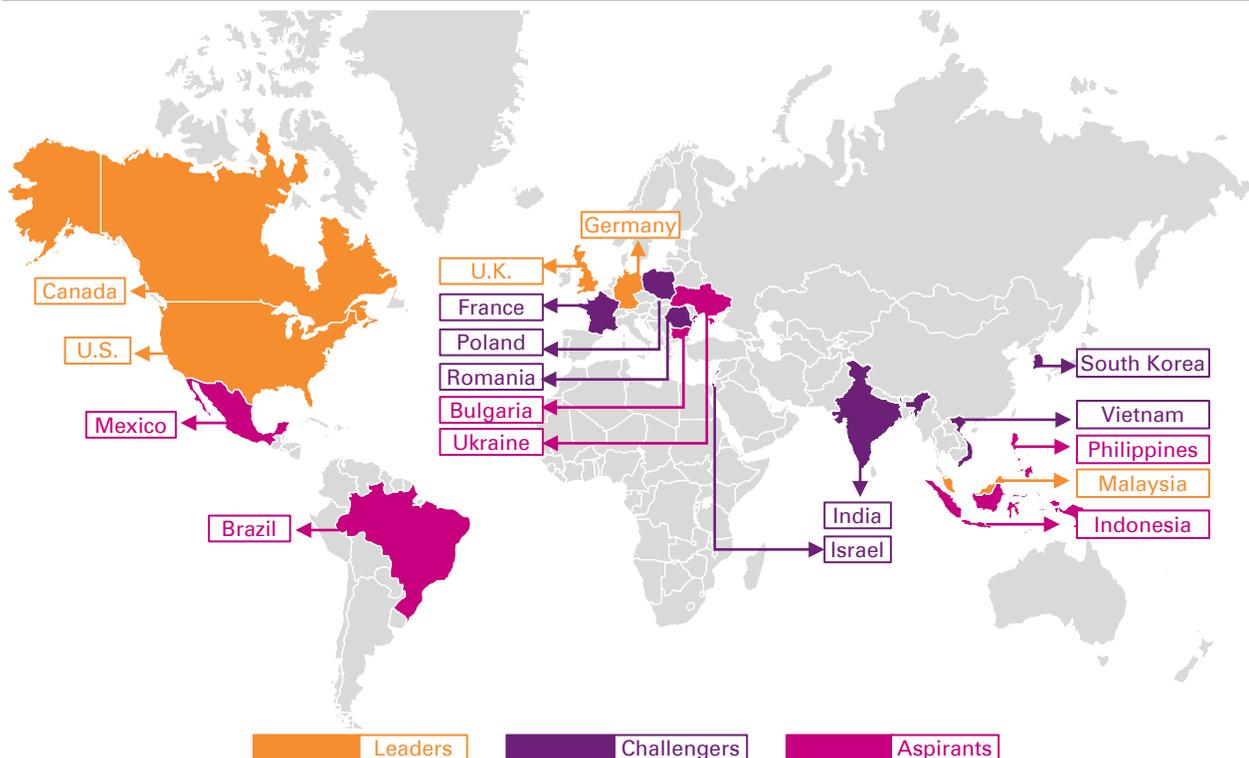
## D. Business environment



A conducive business environment is another essential parameter for companies to set up an ER&D centre in a particular location. North America and Europe are among the key regions with an established presence of ER&D centres owing to business-friendly regulations, ease of doing business, transparent, fair and stable

legal systems. However, over the years, the Asia Pacific and Latin American regions have gained significant traction in the ER&D landscape, driven by the improving business landscape and availability of a large pool of STEM talent.

### Location assessment: Business environment of global ER&D hotspots



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

For evaluating the business environment, the identified locations were mapped against key factors to reflect the strength of the business climate and supportive regulatory landscape, and these include:

- Macroeconomic risk
- Climate risk
- Ease of doing business
- Political stability risk

Within the business environment parameter, the U.K., the U.S., Canada, and Germany are *Leaders* within the ER&D hotspots largely owing to their stable political environment and a high score in ease of doing business factor.

India, Malaysia, and South Korea are the leading APAC locations offering a facilitative business environment by virtue of a strong macroeconomic footprint and continuously improving political stability and feature among *Challengers* along with France, Israel, and Poland among others.

# City framework: Key city hubs for ER&D centres across the globe

A deep dive into the location assessment for the city-industry vertical view highlighted the global ER&D hotspots from a mix of **38** leading city-regions across the 18 identified countries. The sectoral analysis focused on the existing industry ecosystem, talent pool for the respective sector, and the presence of R&D centres. The talent pool factor comprises

number of engineers and R&D personnel employed in the city. Industry ecosystem comprises city attractiveness in terms of number of company HQs and startups operating in the location while also accounting for the presence of major ER&D/R&D centres with respect to various verticals.



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

The assessment highlighted leaders within the cities, along with identifying emerging and transformational cities across all regions for the eight identified industry verticals — Aerospace, Automotive, Healthcare, Software & Internet, CHM & Industrials, Consumer Electronics, Computing and Semiconductor.



Strength Level	Factors Considered		
	Industry ecosystem	Talent availability	R&D presence
<b>Leaders</b>	Presence of HQs of leading companies and thriving startup ecosystem for the vertical in the location	Locations which are leaders in the vertical basis voluminous Engineering and R&D talent pool	Presence of a number of global and domestic R&D and innovation centers for respective verticals
<b>Challengers</b>	Considerable startup ecosystem along with moderate presence of HQs of leading companies for the vertical	Relatively high availability of Engineering and R&D talent in the respective vertical	Presence of R&D centers of leading organizations but not emerged as a leading hub
<b>Aspirants</b>	Strength of industry basis number of HQs or startup ecosystem is relatively lower for the vertical compared to other locations	Low availability of Engineering and R&D talent in the respective vertical	Presence of R&D centers of few leading organizations



### Global ER&D Sector View: Top Locations

	Bengaluru New York	Bristol Paris	Hyderabad Pune	London San Francisco	Montreal Toulouse	Aerospace
	Bengaluru Munich	Chennai Paris	Delhi NCR Pune	Detroit San Francisco	London Sao Paulo	Automotive
	Bengaluru Paris	Delhi NCR San Francisco	London Seattle	Mumbai Tel Aviv	New York Toronto	Computing & Electronics
	Bengaluru Pune	Delhi NCR San Francisco	London Sao Paulo	Mumbai Seattle	Toronto New York	CHM & Industrials
	Bengaluru Mumbai	Chennai Pune	Delhi NCR San Francisco	Hyderabad Sao Paulo	London Seattle	Software & Internet
	Bengaluru Munich	Boston New York	Delhi NCR San Francisco	Hyderabad Seoul	Mumbai Tel Aviv	Semiconductor
	Bengaluru San Francisco	Delhi NCR Seattle	New York Seoul	Paris Toronto		Consumer Electronics
	Bengaluru London	Boston Mumbai	Delhi NCR New York	Hyderabad Seattle		Healthcare

Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

**Within the APAC region, Indian cities, led by Bengaluru, Delhi NCR, Chennai and Hyderabad, emerged as leaders across sectors owing to established industry and a voluminous talent pool. Tel Aviv, Seoul and Kuala Lumpur also lead in a few sectors**

The San Francisco – San Jose bay area, Boston-Cambridge region in the U.S. and Toronto in Canada emerged as hotspot for most sectors within the Americas. While U.S. cities including

New York and Seattle featured as leaders for multiple sectors, Montreal in Canada and Sao Paulo in Brazil also featured among leaders across industry verticals.

London, Paris, and Berlin emerged as European ER&D hotspots across sectors along with a strong ER&D ecosystem in Munich. Toulouse, Bristol, Cambridge and Budapest also have an established ER&D industry presence for select sectors.



# City Framework: Sectoral Heatmap

Region	Country	City Clusters	Aerospace	Automotive	Software and Internet	Healthcare	Computing and Electronics	Consumer Electronics	CHM and Industrials	Semi conductors
Latin America	Mexico	Guadalajara	Leaders	Aspirants	Challengers	Leaders	Aspirants	Aspirants	Aspirants	Aspirants
	Brazil	Sao Paulo	Aspirants	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants
Europe	Germany	Berlin	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		Frankfurt	Aspirants	Aspirants	Leaders	Aspirants	Leaders	Leaders	Aspirants	Leaders
		Munich	Challengers	Challengers	Aspirants	Aspirants	Aspirants	Aspirants	Aspirants	Challengers
	Poland	Warsaw	Aspirants	Leaders	Aspirants	Aspirants	Aspirants	Aspirants	Leaders	Leaders
		Krakow	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders
	United Kingdom	London	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants
		Bristol	Challengers	Aspirants	Leaders	Leaders	Aspirants	Aspirants	Aspirants	Aspirants
		Edinburgh	Leaders	Leaders	Aspirants	Aspirants	Leaders	Leaders	Aspirants	Aspirants
		Cambridge	Aspirants	Leaders	Aspirants	Aspirants	Aspirants	Aspirants	Leaders	Challengers
		Oxford	Aspirants	Aspirants	Leaders	Aspirants	Leaders	Leaders	Leaders	Leaders
	France	Paris	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants
		Toulouse	Challengers	Aspirants	Leaders	Leaders	Leaders	Leaders	Aspirants	Leaders
	Romania	Bucharest	Leaders	Aspirants	Aspirants	Leaders	Aspirants	Aspirants	Aspirants	Leaders
Bulgaria	Sofia	Leaders	Leaders	Aspirants	Leaders	Leaders	Leaders	Leaders	Leaders	
Ukraine	Kiev	Aspirants	Aspirants	Aspirants	Aspirants	Aspirants	Aspirants	Aspirants	Leaders	
North America	Canada	Toronto	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		Montreal	Challengers	Aspirants	Challengers	Challengers	Aspirants	Challengers	Aspirants	Aspirants
	U.S.	San Francisco - San Jose	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		New York	Challengers	Aspirants	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		Detroit	Aspirants	Challengers	Aspirants	Aspirants	Aspirants	Aspirants	Aspirants	Aspirants
		Seattle	Challengers	Aspirants	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants
Boston - Cambridge	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers		

Leaders      Challengers      Aspirants

Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

Region	Country	City Clusters	Aerospace	Automotive	Software and Internet	Healthcare	Computing and Electronics	Consumer Electronics	CHM and Industrials	Semi conductors	
Asia-Pacific	Israel	Tel Aviv	Leaders	Challengers	Aspirants	Challengers	Leaders	Challengers	Challengers	Challengers	
	India	Bengaluru	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		Hyderabad	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		Delhi NCR	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		Chennai	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		Pune	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		Mumbai	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		Ahmedabad	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Leaders	Challengers	Challengers
		Coimbatore	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers
		South Korea	Seoul	Challengers	Leaders	Challengers	Challengers	Challengers	Leaders	Challengers	Leaders
	Philippines	Manila	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	
	Indonesia	Jakarta	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	
	Vietnam	Ho Chi Minh City	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	
Malaysia	Kuala Lumpur	Challengers	Challengers	Challengers	Challengers	Challengers	Challengers	Leaders	Challengers		

Leaders Challengers Aspirants



## Section: 3

# India as a location of choice





## India as a location of choice



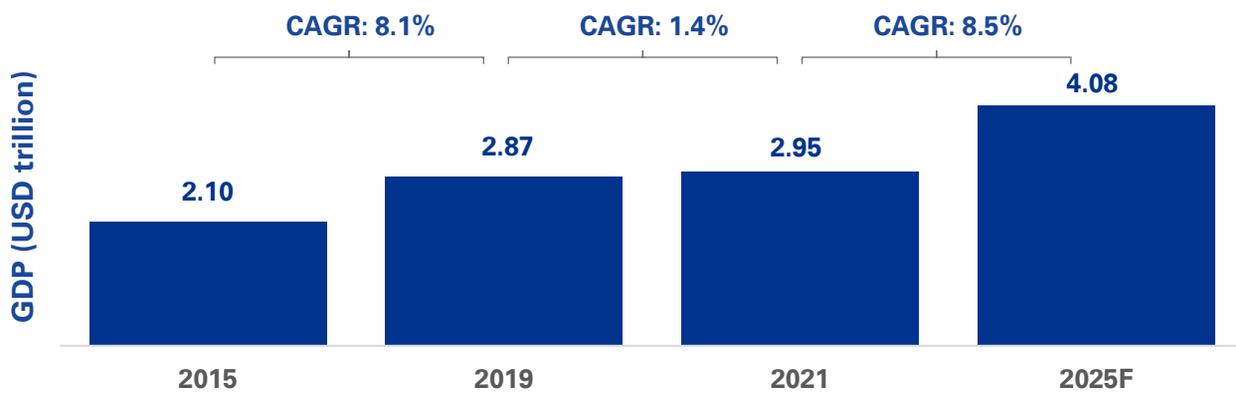
India, the world's largest democracy and second-largest economy (by purchasing power parity<sup>18</sup>) in the Asia Pacific region, witnessed one of the highest growth rates for large economies, in the previous decade, globally. It has created significant economic opportunities for people and emerged as a location of choice for domestic and foreign organisations looking to establish and expand their businesses in the region. The Indian economy witnessed a recovery in 2021.

The growth in the country's GDP (nominal) is forecasted at 17.6 per cent during FY2021-22 and the economy is estimated to reach over USD3 trillion<sup>19</sup> by March 2022.

India's GDP in H1 2021–22 showed a 23.9 per cent growth compared with a contraction of 13.4 per cent in H1 2020–21. This surge is mainly due to a rebound in consumer spending in the first half of the financial year.

**Source:** Press note on estimates of GDP, Government of India, accessed on 24 January 2022

### India's GDP forecast for 2025 indicates strong growth



**Source:** International Monetary Fund, accessed on 24 January 2022

### Demographics



18. World Bank Open Data, The World Bank, accessed on 20 October 2021

19. Press note on first advance estimates of national income 2021-22, Government of India, accessed on 24 January 2022



## Digitisation



The proliferation of smartphones and internet subscribers has fuelled digital adoption in the country. This is further underlined by the growing digital payments landscape with more than 4.5 billion UPI transactions during December 2021.

**Source:** Highlights of telecom subscription data, Telecom Regulatory Authority of India, accessed on 24 January 2022

**Source:** UPI Product Statistics, National Payment Corporation of India, accessed on 24 January 2022

## India's ER&D landscape

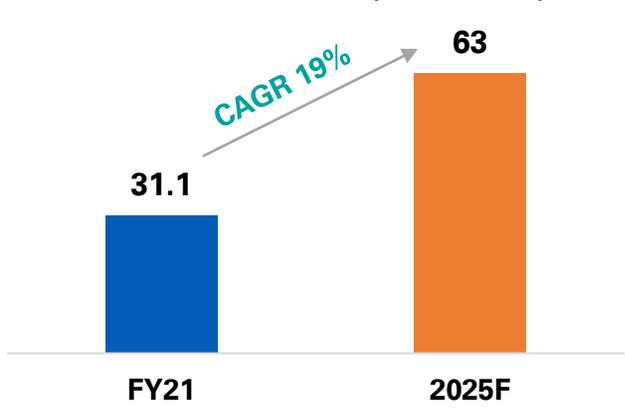
India is the second most preferred<sup>20</sup> location for MNCs to establish ER&D centres, after their base/HQ locations. The ER&D ecosystem's technological capabilities, favourable investment policies and strong laws for intellectual property protection are boosting India's profile as a major destination for international R&D investment.

### Expected business potential and additional employment generation



**Source:** A \$100 bn opportunity for engineering R&D, Trade Promotion Council of India

### India's ER&D market (USD billion)



With ER&D emerging as one of the fastest growing segments in the country, India has emerged as a global engineering and design hub for several industries including aerospace, automotive, machinery, electronics, and semiconductors.

**Source:** NASSCOM analysis

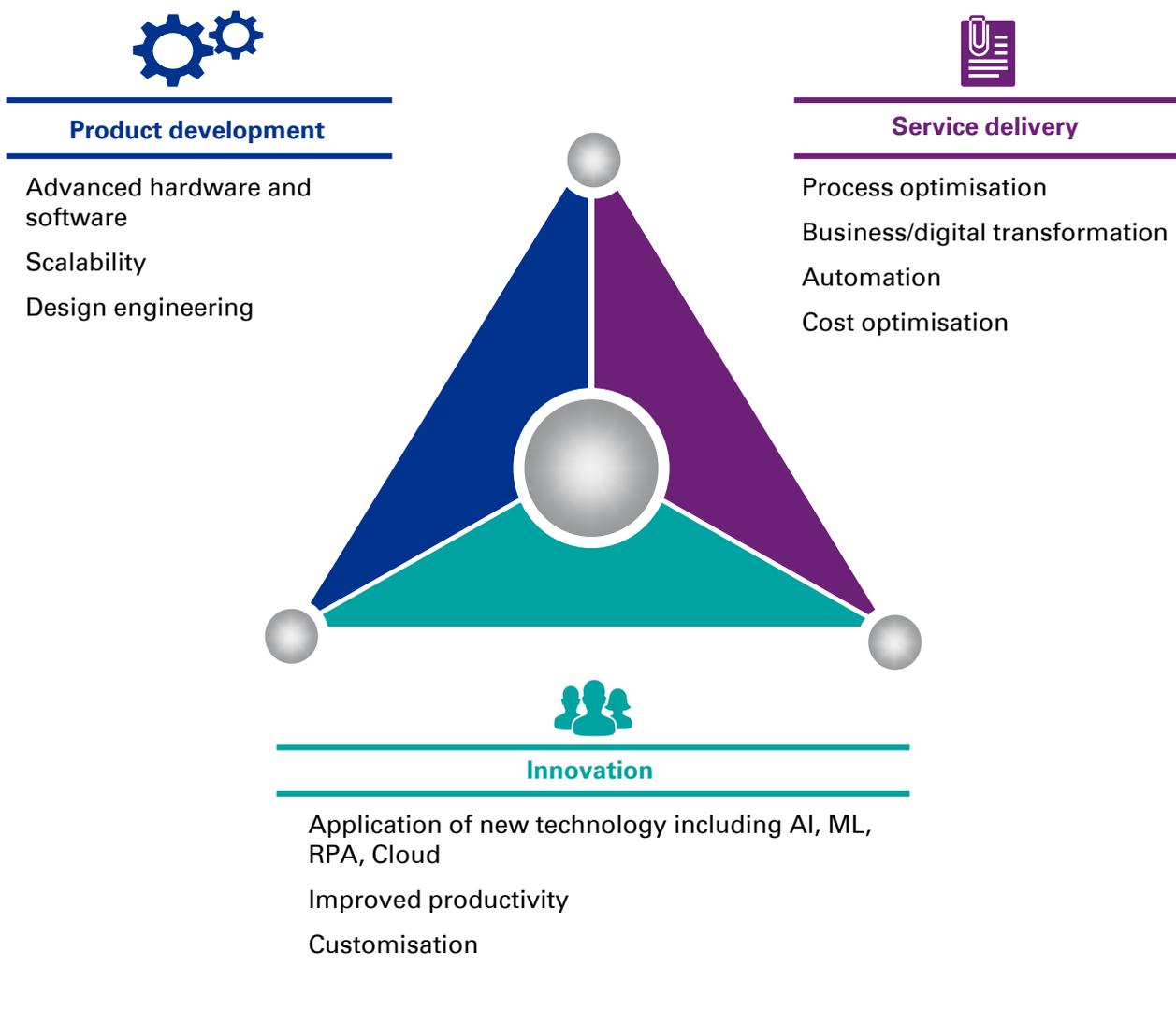
20. The Next Paradigm: India as the Innovation Hub for the World, NASSCOM, 20 July 2021

India is one of the largest ER&D services exporter in the world, with its ER&D market expected to reach USD63 billion<sup>21</sup> by 2025 from USD31.1 billion<sup>22</sup> in FY21, growing at a CAGR of 19 per cent<sup>23</sup>. It is driven by global enterprises across several sectors which are tapping into Indian ER&D's ability to innovate and deliver high-impact service. The country's massive English-speaking population and engineering talent offer a unique cost and quality advantage to international companies. The Indian ER&D segment has also increasingly adopted

next-generation technologies including IoT, analytics, robotics, big data, and others that have become the crux of product development programmes in the country.

ER&D centres in India have matured in terms of innovation, advancement in product development and improved service delivery. A number of global organisations have set up key ER&D centres in India that drive innovation for the global business, while also servicing major clientele of the organisations in the region.

## Indian ER&D Centres: Evolution of service portfolio



21. India's engineering, research, development market to reach USD 63 bln by 2025: NASSCOM, ET, 24 June 2021

22. India's engineering, research, development market to reach USD 63 bln by 2025: NASSCOM, ET, 24 June 2021

23. India's engineering, research, development market to reach USD 63 bln by 2025: NASSCOM, ET, 24 June 2021

## Case studies highlighting product development

1

A European automotive giant's development centre in India has a pool of 10,000 people supporting product development

A European automotive giant's research and development centre in India is a notable example for demonstrating the transformation of Indian ER&D centres over the years. The centre was set up in 1996 to provide computer-aided design and engineering support and IT programming capabilities to the company's business units. With 10,000 employees, the India centre has now become an integral part of the company's product development and undertakes several strategic initiatives for its global operations. Some key focus areas of the India centre include computer-aided design and simulation for powertrain, chassis and exteriors, embedded systems, telematics and development of IT tools and applications.

2

A European multinational engineering company's Bengaluru centre acts as a dedicated facility for research and product development

A European multinational engineering company's Bengaluru centre is its only R&D centre globally, which houses a business R&D unit for product development, global research centre and global engineering services centre in the same building. The centre undertakes engineering functions for hardware and software in India and R&D for products and solutions. The company employs more than 1,200 people in India.

3

A European multinational software corporation inaugurated a large R&D centre in India with focus on product conceptualization and development

**A European multinational software corporation has the second-largest global R&D centre in India, after the company's headquarters in Europe and is integral to the company's product conceptualization and development for both domestic and global markets. The company's R&D centre in India drives its product strategy and contributes to flagship products. It has an India headcount of nearly 13,000 employees.**

## Case studies highlighting service delivery

1

An automotive strategic alliance's engineering centre transitioned from being a product delivery site to a service offering unit

An automotive strategic alliance's engineering centre in Chennai has matured from being just a product delivery site to becoming a site wherein services have outgrown product. Also, the company does not launch too many products from the Chennai centre, thus enhancing their service delivery.

2

**A European multinational corporation inaugurated real-time monitoring of machine performance to enhance service delivery**

A European multinational corporation inaugurated the SMART Factory that has been focusing primarily on open architecture and real-time monitoring of machine performance to significantly enhance agility and optimize costs. All these processes that are part of their engineering centre, facilitate product innovation and digital transformation in service delivery. The Bengaluru set up of the company has end-to-end ownership from specifications to testing, certifying, and sending to factories that will monitor production efficiency.

### Case studies highlighting innovation

1

**A North American automotive giant leveraged its engineering talent and manufacturing expertise to showcase innovation**

A North American automotive giant has approximately 10,000 FTEs in India out of which 1,200 are engaged in engineering and 1,000 are part of manufacturing. Some key focus areas of the India centre include computer-aided design and computer-aided engineering.

2

**A North American aerospace company's innovation centre in India focuses on flight sciences, structure, materials, and processes**

A North American Aerospace company's research and technology centre in India plays a vital role in the various business segments including flight sciences, structure, materials and processes, and software. The company's R&D centre in India has delivered key solutions for Airplane Health Management and Air Traffic Management. Engineers in the India R&D centre are also leveraging AI, ML and IoT to improve quality of the company's wide body planes and enhance passenger experience during air travel. The company employs more than 3,000 people, with 12 R&D and 17 University partners.

3

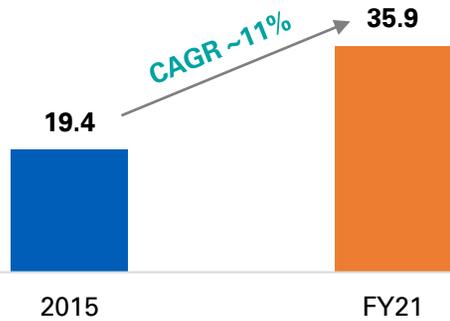
**A European multinational conglomerate established the Innovation Campus with focus on advanced technologies including AI and ML**

A European multinational conglomerate established the Innovation Campus in Bengaluru in 1996 as a software research and development of the unit. It currently ranks among the company's four major innovation hubs globally, employing more than 4,500 people who develop products and solutions across the healthcare spectrum. The centre has expertise in advanced technologies and develops solutions based on AI and ML, cloud-based solutions, AI-based radiology solutions, smartphone and tablet-enabled data analytics and others. The company's innovation campus in Bengaluru also engages with markets and businesses in other regions to ideate, build and deliver solutions.



## India's GCC landscape

### Annual revenue from GCCs in India (USD billion)

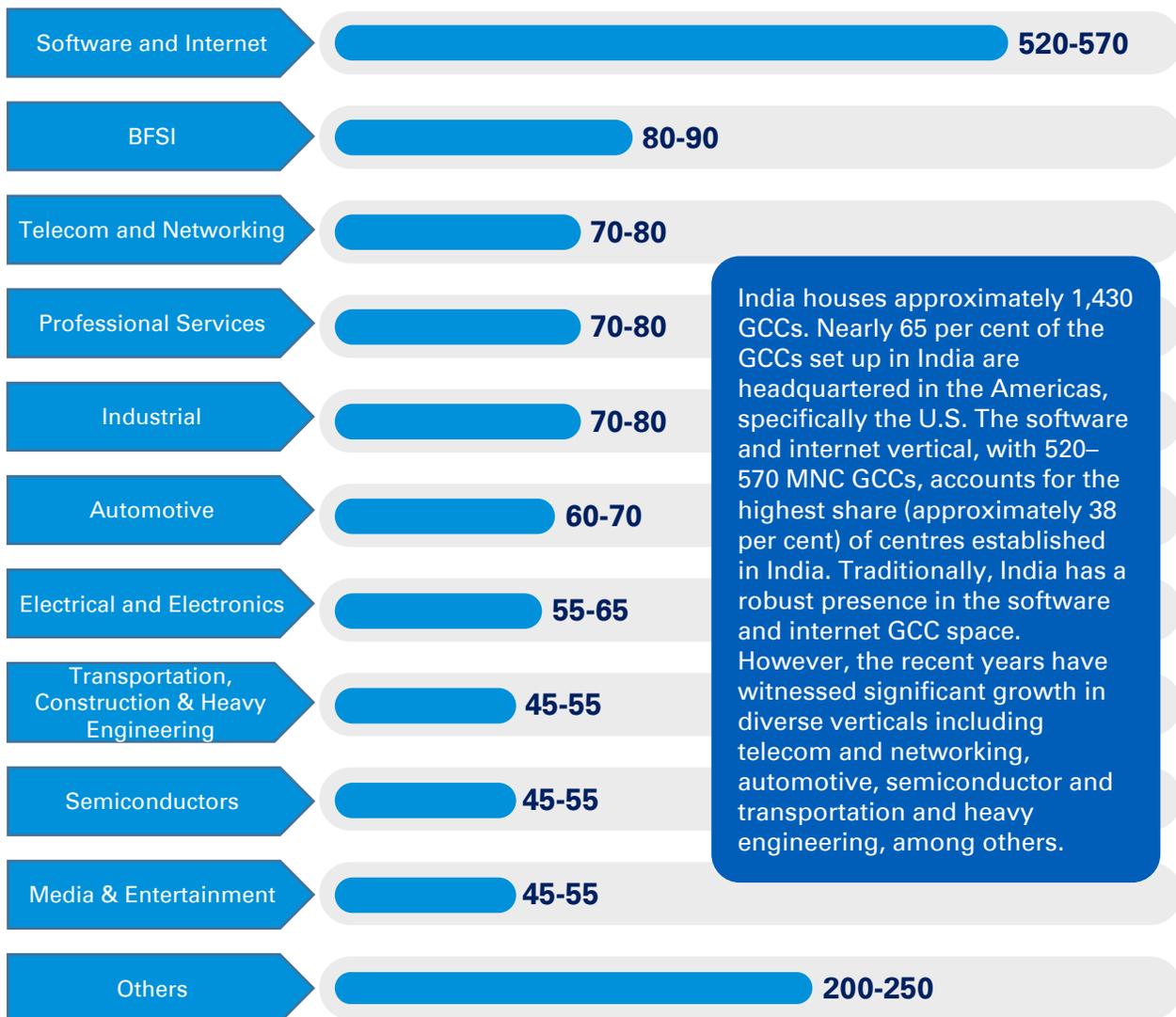


GCC revenues from India are expected to reach USD35.9 billion in FY21, with ER&D sector leading the Indian GCC growth story. The GCC headcount in India is expected to reach 1.38 million in FY21, of which 42 per cent is ER&D talent.

According to NASSCOM insights, approximately 90 per cent of the GCC headcount is based out of Tier-I cities. However, Tier-II cities have also witnessed steady growth during the pandemic.

Source: NASSCOM analysis, January 2022

## Distribution of GCCs by industries<sup>24</sup>



India houses approximately 1,430 GCCs. Nearly 65 per cent of the GCCs set up in India are headquartered in the Americas, specifically the U.S. The software and internet vertical, with 520–570 MNC GCCs, accounts for the highest share (approximately 38 per cent) of centres established in India. Traditionally, India has a robust presence in the software and internet GCC space. However, the recent years have witnessed significant growth in diverse verticals including telecom and networking, automotive, semiconductor and transportation and heavy engineering, among others.

Note: Others include Healthcare, Retail, Biotech, Energy & Utilities, Travel & Hospitality etc.

24. GCC India Landscape: 2021 and beyond report, NASSCOM

## Key parameters essential for ER&D players to select key business locations in India



India is home to more than 45 cities with a population of more than a million residents. However, for this study, eight locations including **Bengaluru, Delhi National Capital Region, Hyderabad, Chennai, Pune, Mumbai, Coimbatore and Ahmedabad** are chosen as they emerge as key locations based on strong

talent pool availability, a facilitative business environment, existing ER&D industry infrastructure and cost competitiveness. These metropolitan locations are also among the leading urban centres in the country and offer vast opportunities to businesses looking to establish and scale facilities rapidly.



While multiple factors determine the final shortlist of locations within India, four key parameters including

- Talent availability
- Cost attractiveness

- ER&D ecosystem
- Business environment

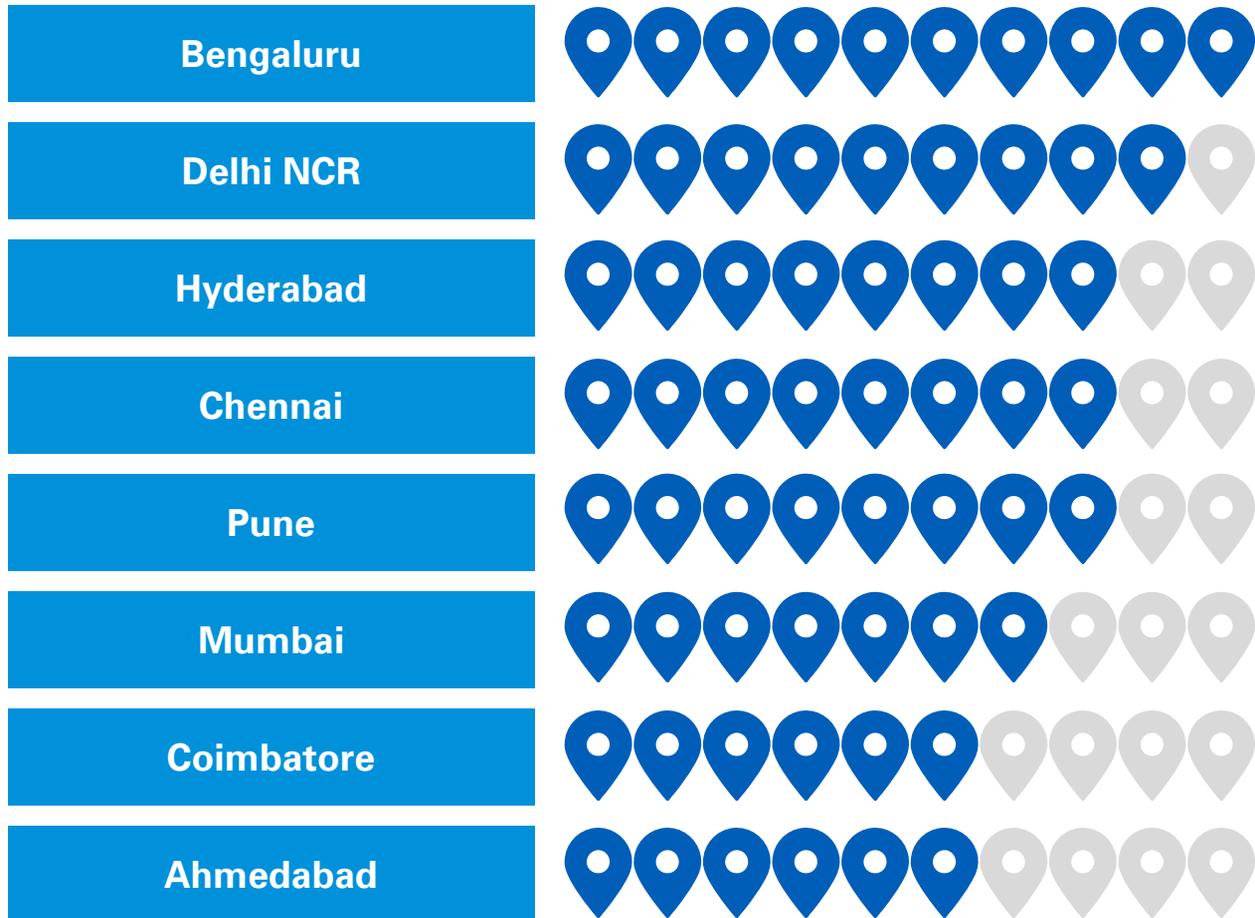
are major determinants, which are consistent with the global assessment of locations and are also critical for selecting country of preference for ER&D facilities.

Weightages	Parameters	Sub-Parameters	Sub-Parameter weightages
40%	Talent availability	<ul style="list-style-type: none"> <li>Proximity of talent</li> <li>Number of Graduates/STEM Graduates</li> <li>Availability of experienced workforce</li> <li>Talent competitiveness</li> </ul>	<ul style="list-style-type: none"> <li>50%</li> <li>50%</li> </ul>
25%	Cost attractiveness	<ul style="list-style-type: none"> <li>Cost of labour</li> <li>Cost of operations</li> <li>Cost of living</li> </ul>	<ul style="list-style-type: none"> <li>70%</li> <li>20%</li> <li>10%</li> </ul>
25%	ER&D ecosystem	<ul style="list-style-type: none"> <li>Presence of similar (GCC) centres</li> <li>Presence of unicorn startups</li> <li>Eminent educational hubs</li> </ul>	<ul style="list-style-type: none"> <li>40%</li> <li>30%</li> <li>30%</li> </ul>
10%	Business environment	<ul style="list-style-type: none"> <li>Ease of doing business</li> <li>Infrastructure</li> <li>Macroeconomic landscape</li> <li>Political stability</li> </ul>	<ul style="list-style-type: none"> <li>40%</li> <li>30%</li> <li>15%</li> <li>15%</li> </ul>

Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021



## Location Index: City Attractiveness



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

An objective assessment of the eight Indian locations, along with the analysis of emerging trends, across the four identified parameters highlighted the leaders and emerging cities based on multiple sub-parameters considered within the evaluated factors.

Within the eight Indian locations, **Bengaluru** emerged as the most preferred location owing to its strong ER&D ecosystem, particularly due to the presence of the highest number of GCC centres, technology startups, and unicorn startups in India. The city, also known as the Silicon Valley of India, has been at the centre of innovation and attracted skilled talent from across the country.

*Delhi National Capital Region* follows Bengaluru in the location attractiveness shortlist, ahead of Hyderabad, which has emerged as the leader in business environment parameter.

Cities including *Chennai* and *Pune* are established ER&D locations in India. These locations have strong ecosystem for different industries and emerge among leaders for the respective industry verticals.

*Mumbai* follows Bengaluru and Delhi as the most attractive location in terms of ER&D ecosystem and Talent availability. However, the city scores the least in the cost attractiveness parameter owing to high cost of living and rental rates.

Coimbatore and Ahmedabad, which feature among the emerging locations within India, offer significant cost advantage, attributed to their low cost of labour and cheaper cost of living, over other locations.

Consistent with the assessment of global ER&D locations, the following sections discuss the strengths of Indian locations in the four parameters – talent, cost attractiveness, ER&D ecosystem, and business environment.

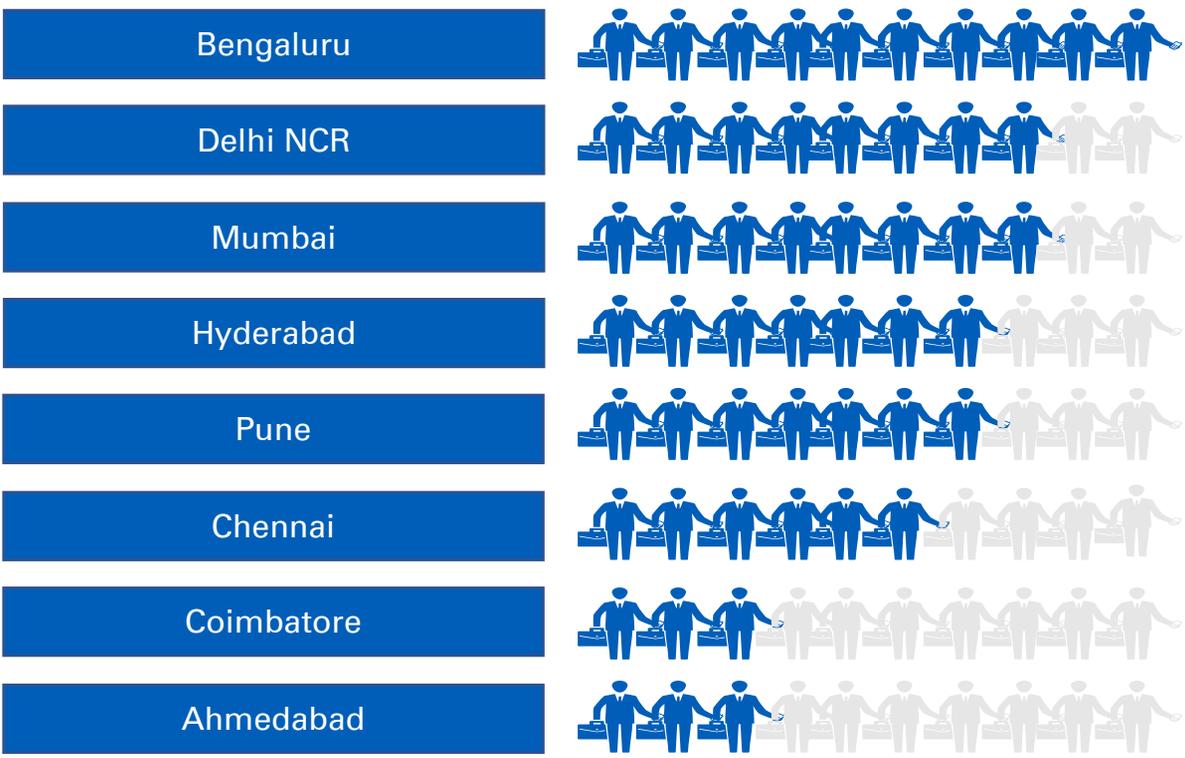
# A. Talent availability

India is home to a large, skilled and cost competitive talent pool across engineering, IT, arts, science, management, commerce and others. The country has more than 1.5 million<sup>25</sup> engineering students graduating every year in streams including mechanical, electrical and electronics, civil, computer science, IT and others. Engineers in the country graduate from some of the best institutions in the Asia-Pacific region and are skilled in programming, coding, product design and algorithm development.

Alongside, several international organisations have established their R&D centres in India to leverage on the country’s rising technology talent.

India also has favourable policies for patent filings, alongside tax benefits and other incentives that drive innovation, thereby enabling international companies to undertake significant innovation and product development activities at their centres in India.

## Location Index: Talent availability scores



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

Two key aspects which focus on a set of relevant factors to evaluate the different Indian cities on talent availability and scalability include:

- Proximity to relevant, globally accessible talent, which considers number of R&D personnel, GCC talent pool, number of total graduates and STEM graduates, and number of cloud technology relevant talent

- Competitiveness and quality of the available talent pool focuses on share of employable<sup>^</sup> talent, access to educational facilities, unemployment rate, participation of women in the workforce and the city’s overall talent competitiveness score

25. Explained: Why engineering graduates should look beyond IT firms as a career?, India Today, 20 October 2020

<sup>^</sup>Employability percentage for Maharashtra has been considered for Mumbai, since Mumbai numbers were unavailable



**Bengaluru** leads Delhi NCR and Mumbai in the talent availability parameter. While Delhi NCR has the highest number of graduates, including STEM graduates, Bengaluru fares better in the number of R&D personnel and the overall talent competitiveness score of cities across India. Bengaluru also offers the highest GCC talent pool in the country, close to twice than the next location, Delhi.

Bengaluru, Delhi-NCR, Hyderabad, Mumbai, Chennai and Pune are the major Tier 1 hubs for talent in India. These cities house majority of the country's corporate offices and GCCs, attracting talent from across the country. They are established hubs for talent and account for a talent pool of nearly 1.4 million.<sup>26</sup>

### Key skills offered across major talent hubs

	Bengaluru	Delhi-NCR	Hyderabad	Mumbai	Chennai	Pune	Coimbatore	Ahmedabad
<b>Traditional Skills</b>								
Computer Aided Design (CAD)	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants
Product Design	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants
Software Development	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants
Engineering Design	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants
Test Engineering	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants
<b>Niche Skills</b>								
RPA	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants
AI	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants
Blockchain	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants
Quantum Computing	Leaders	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Aspirants

Leaders Challengers Aspirants

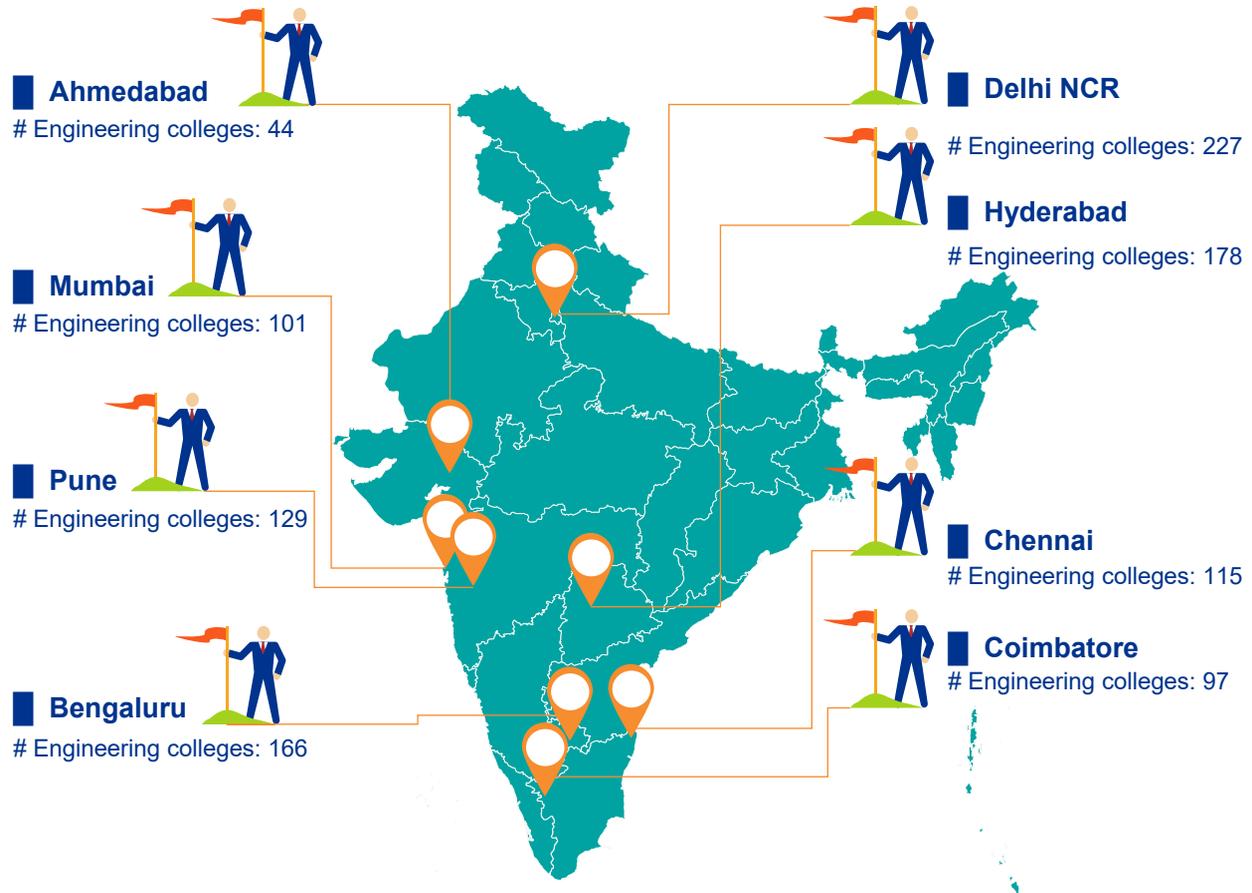
Source: NASSCOM-KPMG in India analysis, January 2022

The 'Work from Home' and 'Work from Anywhere' policies announced by organisations post pandemic are also promoting upcoming Tier 1 locations such as Ahmedabad, Tier 2, and Tier 3 cities such as Coimbatore, Kochi, Jaipur, and Mysore as upcoming talent hubs. Remote working is emerging as a strategic advantage for both companies and employees. While

location-agnostic roles enable employees to work from their native places/smaller cities with relatively lower costs of living, they facilitate access to a larger talent base for companies to recruit from. However, while this is an emerging trend, Tier 1 cities continue to remain hotspots for installed ER&D talent in the country.

26. FutureSkills Talent in India: Demand-Supply Analysis, NASSCOM, October 2020

## India talent hubs: Engineering institutions



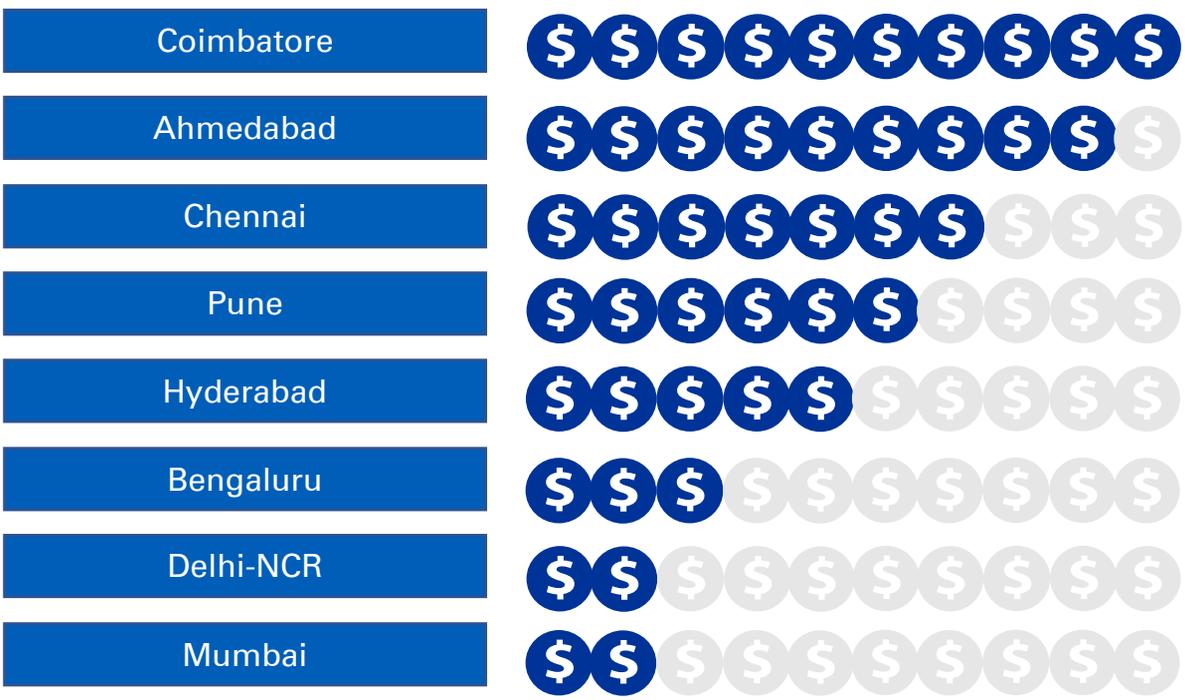
Source: KPMG in India analysis based on various career portals, January 2022



# B. Cost attractiveness

Across global locations, India offers the highest cost advantage attributed to the lower cost of labour and operating cost. To assess Indian cities in terms of cost competitiveness, while certain factors such as cost of broadband remain constant, labour cost and rentals are considered as these factors vary to a great extent across different locations within India.

## Location Index: Cost attractiveness score



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

Cost competitiveness for Indian locations was assessed based on three key factors:

- Labour cost for job profiles pertinent to key engineering verticals such as mechanical, electrical & electronics, and computer science for entry, mid and senior level roles
- Operating cost with a focus on average rental rates within a location
- Cost of living

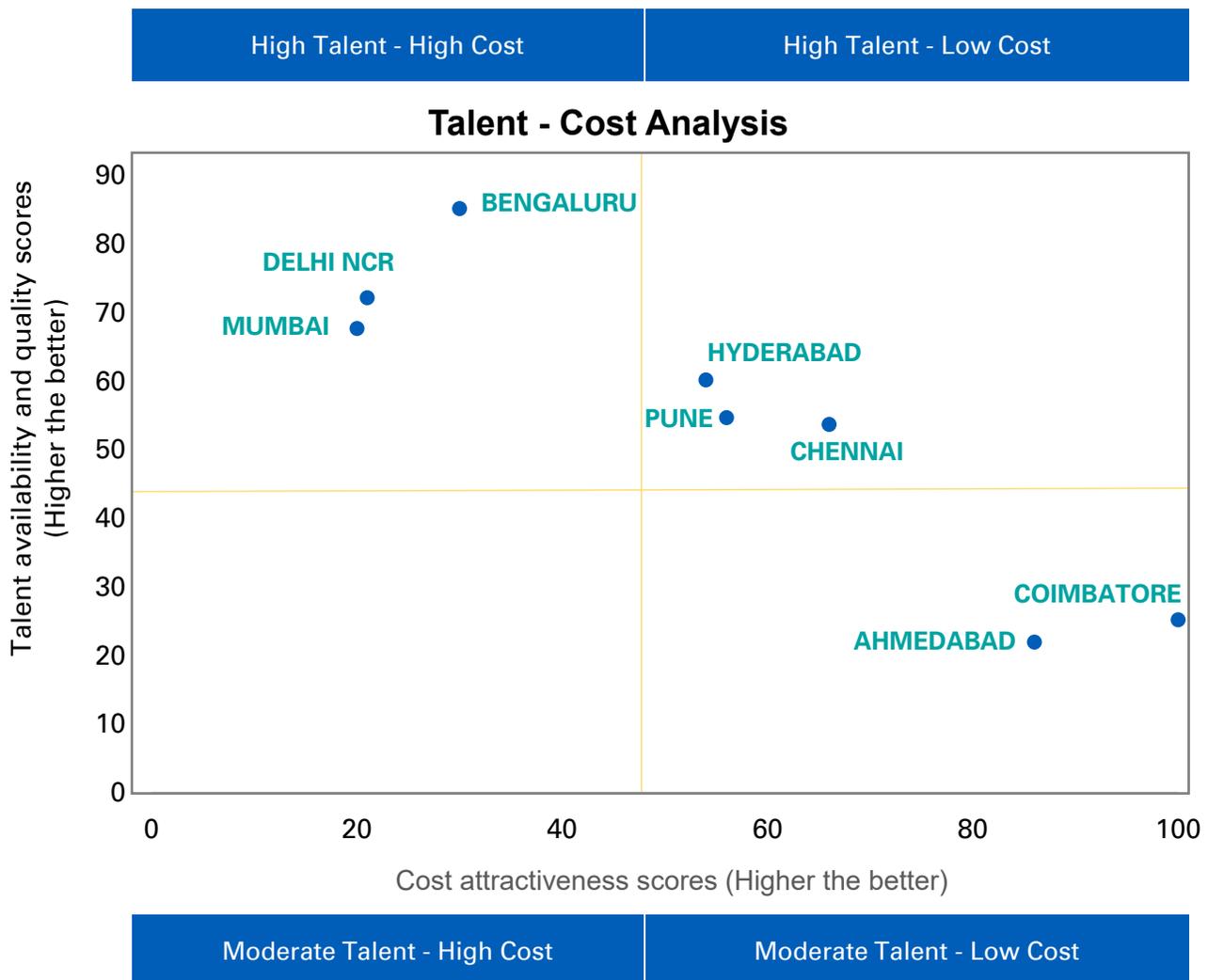
**Coimbatore** has emerged as the most competitive location in the cost parameter, ahead of Ahmedabad, among the eight Indian locations part of the analysis.

Chennai follows Coimbatore and Ahmedabad in offering highest cost advantage among Indian cities. Chennai’s cost competitiveness is attributed to lower operating cost, whereas Coimbatore and Ahmedabad feature among the top two lucrative destinations owing to their low cost of labour. Mumbai and Delhi NCR have the highest cost of labour, operating cost, as well as significantly high cost of living, leading to relatively limited cost benefits. However, even Mumbai and Delhi NCR offer significant cost advantage over their global counterparts.

While Coimbatore and Ahmedabad offer the cheapest cost of living among the evaluated Indian cities, Hyderabad and Pune also have low cost of living when compared with Bengaluru and Chennai.

**Talent availability and cost attractiveness** – these two parameters account for the majority of the weightings. Talent-cost parameters, when analysed together, indicate the scalability offered by a location in terms of ease of functioning by attracting relevant and skilled talent pool for ER&D centres in a short span of time.

## Talent - Cost Analysis



**Source:** KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

Locations in the *high talent and low-cost quadrant* which include **Hyderabad, Chennai, and Pune offer significant talent pool along with certain cost advantages**. These cities are positioned more favourably as compared with locations offering only cost or talent advantage.

While Bengaluru, Delhi NCR and Mumbai have higher costs associated with setting up and operating ER&D businesses within India, these locations offset high costs with their strong talent scalability.

For businesses with a keen focus on cost benefits, Ahmedabad and Coimbatore feature among leading preferences.



# C. ER&D ecosystem

**7,000**  
R&D institutions



**48<sup>th</sup>**  
Rank in Global  
Innovation Index 2020



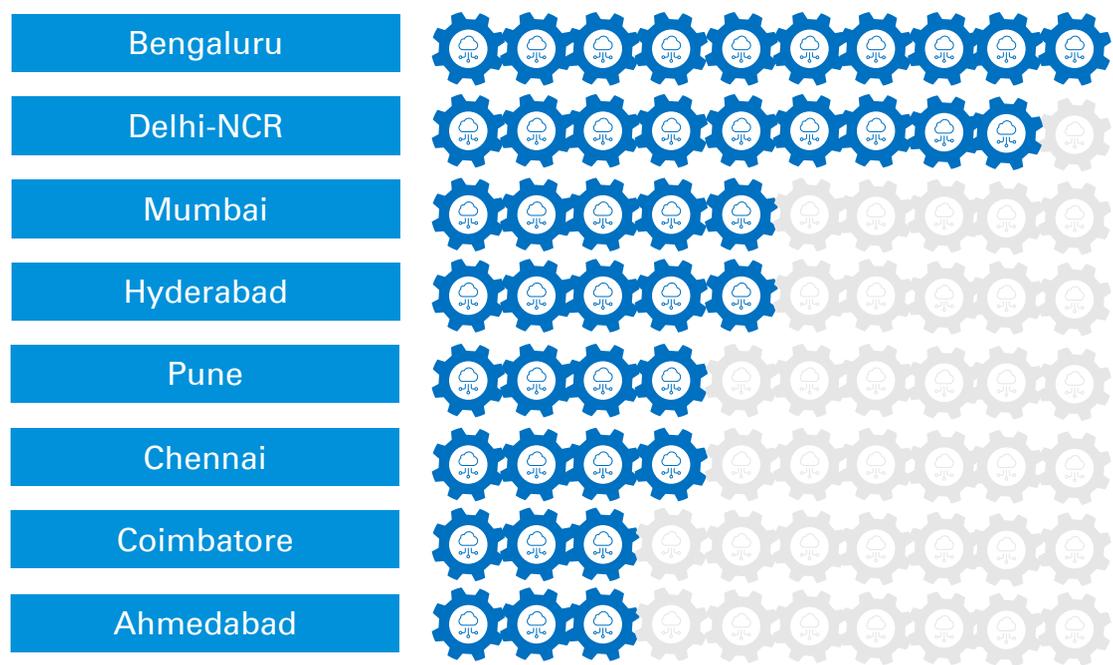
**26**  
Indian companies among  
the list of top 2,500  
global R&D spenders



Over the years, India has evolved significantly as a major hub for research and development. It is among the top 10<sup>27</sup> R&D spenders in the world and has close to 7,000 R&D institutions.<sup>28</sup> 26 Indian companies<sup>29</sup> also feature in the list of top 2,500 global R&D spenders. The country has been ranked 48<sup>th</sup> in the Global Innovation Index 2020,<sup>30</sup> and is also the top destination for new innovation centres in Asia.

India's massive talent pool and technical competencies, alongside cost efficiencies and favourable government policies, have propelled the growth of R&D centres. MNCs have set up R&D centres in the country through several government initiatives including Make in India, FAME, Start-up India and others. India is perceived as a talent heavy country in terms of both quality and availability of talent.

## Location Index: ER&D ecosystem score



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

27. Only 26 Indian companies in top 2500 global R&D spenders, Business Today, 2 November 2020  
 28. Only 26 Indian companies in top 2500 global R&D spenders, Business Today, 2 November 2020

29. Only 26 Indian companies in top 2500 global R&D spenders, Business Today, 2 November 2020  
 30. Global Innovation Index 2020, WIPO



An established ecosystem reinforces the attractiveness of a location for setting up ER&D centres. The ecosystem relies significantly on four key factors:

- Presence of existing GCC centres
- Presence of eminent educational hubs including number of total and top ranked universities and engineering colleges
- Startup ecosystem with a focus on technology startups to reflect the strength of the ER&D industry

Within the eight Indian locations, **Bengaluru** leads the ER&D ecosystem parameter attributed to the city's strong presence of the highest number of GCC centres, technology startups, and unicorn startups in the country. However, Delhi NCR placed at the second position, leads in terms of an established educational hub with the highest number of universities and engineering colleges.

## Startup hubs

### Ahmedabad

Technology Startups	~330
Unicorn Startups	0

### Delhi-NCR

Technology Startups	2,400+
Unicorn Startups	12

### Mumbai

Technology Startups	~1,300
Unicorn Startups	3

### Hyderabad

Technology Startups	670
Unicorn Startups	2

### Pune

Technology Startups	~570
Unicorn Startups	3

### Chennai

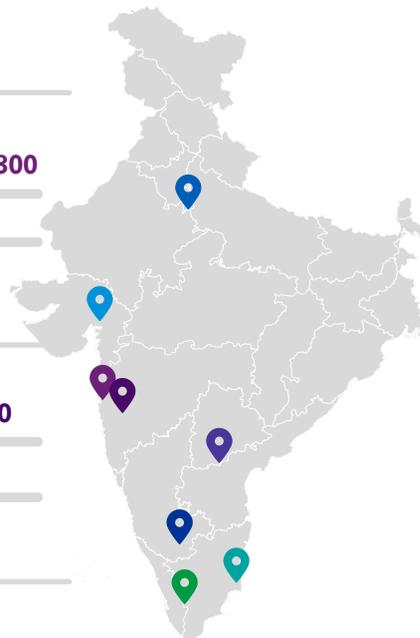
Technology Startups	500
Unicorn Startups	2

### Bengaluru

Technology Startups	2,100+
Unicorn Startups	16

### Coimbatore

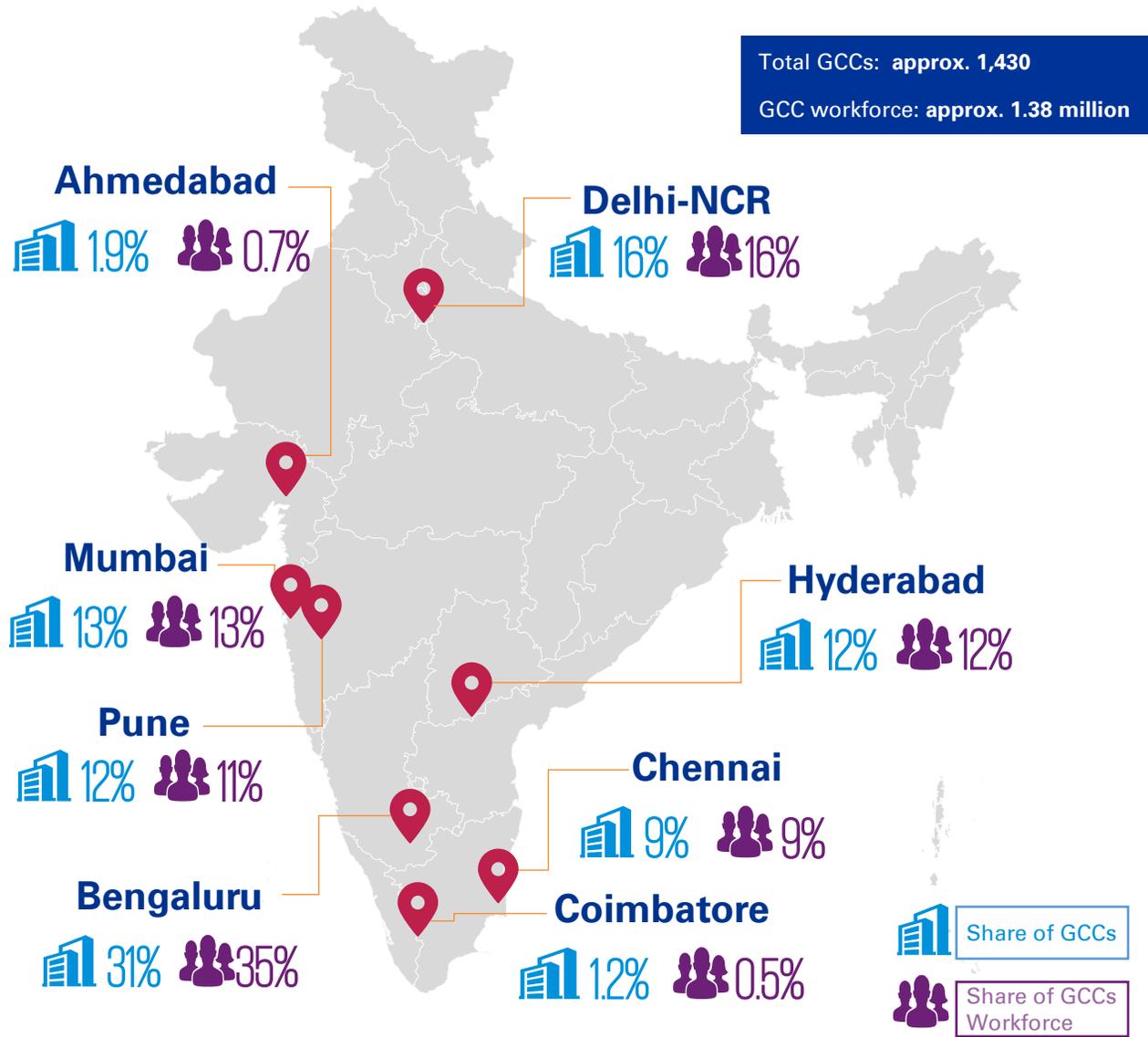
Technology Startups	75+
Unicorn Startups	0



Source: Indian Startup Ecosystem 2020, NASSCOM, January 2022

## Established hubs

### Developed cities: Share of GCCs and GCC workforce



Source: GCC India Landscape: 2021 and beyond report, NASSCOM



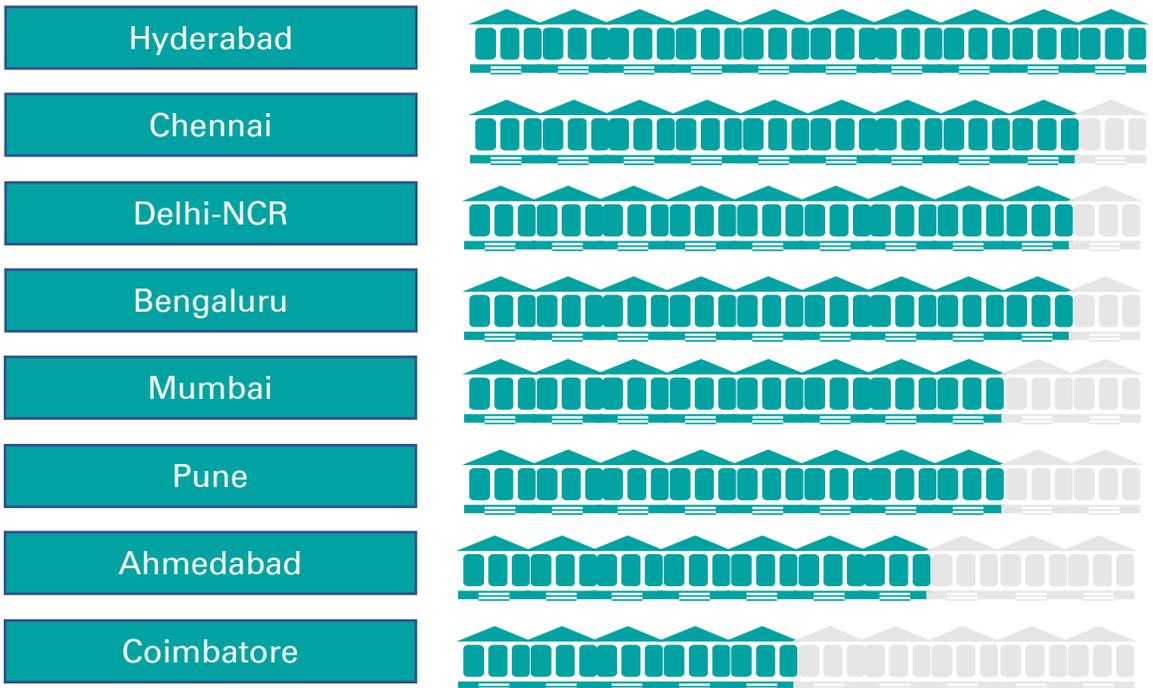


## D. Business environment

The Indian government is actively promoting R&D in the country and targets to increase gross expenditure in R&D to at least 2 per cent of the country's GDP by 2022.<sup>31</sup> Several research parks and business incubators are also being established to promote innovation. Alongside, the government had announced plans to establish a National Research Foundation<sup>32</sup> for enhancing R&D in the country. To encourage R&D investments in India, the government offers various incentives to Indian/foreign entities. Some of the key R&D incentives<sup>33</sup> include:

- **In-house R&D:** Tax deduction of 100 per cent of capital expenditure incurred to conduct scientific research related to the business
- **In-house R&D with Government of India approval:** Tax deduction of 100 per cent of the total expenditure incurred on the R&D facility
- **Contribution to Indian company for R&D:** 100 per cent tax deduction on amount paid by foreign entities/individual outsourcing R&D to eligible Indian companies
- **Contribution to notified institutions for R&D:** Tax deduction of 100 per cent of sum paid to university, college, scientific research association, university college, IIT and notified institutions
- **Tax benefits on R&D activities exported by units setup in Special Economic Zones (SEZs):** Income tax benefits on R&D activities undertaken in SEZs ranging between 50 per cent and 100 per cent of eligible profits.

### Location Index: Business environment score



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

31. Science and Technology Development in India, IBEF, 31 August 2021

32. National Research Foundation, Government of India, 2020

33. Global R&D Incentives Guide, KPMG, November 2021

The business environment parameter at a city/region level for Indian locations was mapped with respect to the following four key factors:

- Ease of doing business
- Infrastructure
- Macroeconomic landscape
- Political stability

to assess the performance of the cities and the respective states within India for facilitating business growth.

**Hyderabad** scores the highest in business environment parameter largely owing to the facilitative policies adopted by the state of Telangana to transform the region into a hub of innovation and research. Hyderabad also features at the top for providing relevant infrastructure to new businesses.

Chennai and Delhi NCR are placed closely at the second and third position, respectively, and both the cities perform better than other locations in the macroeconomic risk and quality of governance (political environment) factors.



# City framework: Key hubs for ER&D centres in India

For sector level ER&D view of Indian cities, an approach similar to the assessment of global locations was followed. The sector level strength of Indian locations was evaluated based on the analysis of the existing industry ecosystem, talent pool for the respective sectors and presence of major R&D centres. The talent factor included number of engineers and R&D personnel whereas industry ecosystem comprised number of company HQs and startups operating in the location to gauge city attractiveness.

## India's ER&D Sector View: Top Locations

	Bengaluru	Hyderabad	Pune	Aerospace				
	Bengaluru	Pune	Chennai	Mumbai	Delhi NCR	Automotive		
	Bengaluru	Delhi NCR	Mumbai	Computing & Electronics				
	Bengaluru	Pune	Delhi NCR	Chennai	Hyderabad	Ahmedabad	Mumbai	CHM & Industrials
	Bengaluru	Mumbai	Delhi NCR	Pune	Hyderabad	Chennai	Software & Internet	
	Bengaluru	Delhi NCR	Mumbai	Semiconductor				
	Bengaluru	Hyderabad	Delhi NCR	Pune	Mumbai	Consumer Electronics		
	Bengaluru	Mumbai	Delhi NCR	Hyderabad	Healthcare			

Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

**Bengaluru** is among the leading locations across all the industry verticals and the city has the highest number of company HQs for seven industry verticals except CHM & Industrials, while Mumbai is home to most CHM organisations.

Bengaluru and Delhi NCR lead the relevant talent pool (engineers and R&D personnel) across majority of the other verticals. However, in the automotive vertical, Pune and Chennai lead the sector-specific engineering talent and the two automotive hubs have the second and third-largest pool of R&D personnel after Bengaluru.

Delhi NCR follows Bengaluru as the second most preferred destination for organisations, in terms of company HQs, in automotive, software & internet, computing & electronics and consumer electronics verticals, whereas Mumbai is the second-most preferred location for healthcare companies.

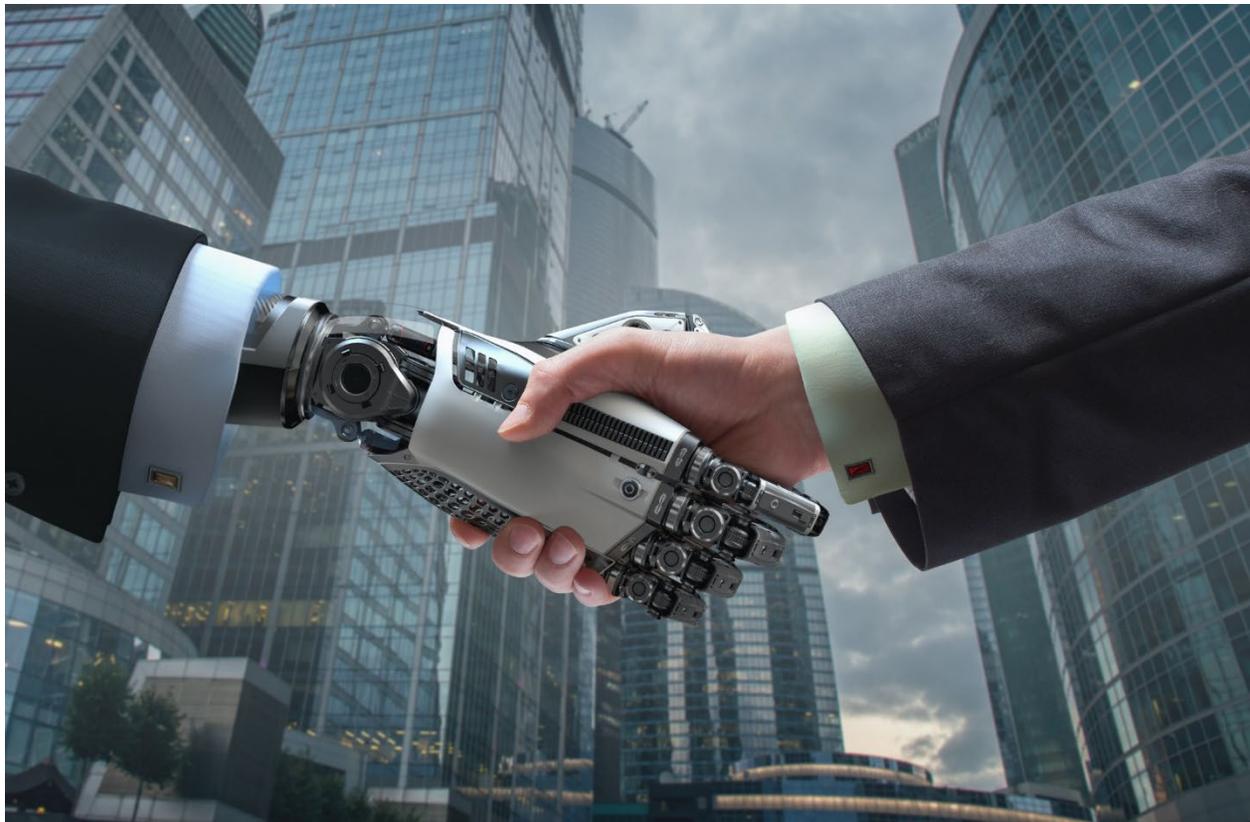
Mumbai also leads in terms of CHM sector talent pool with the largest pool of engineers and R&D personnel along with highest number of R&D professionals and second-highest engineers in the healthcare sector.

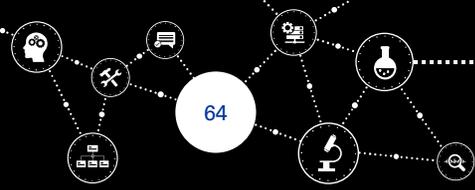
### City Framework: Sectoral Heatmap

City	Aerospace	Automotive	Software and Internet	Healthcare	Computing and Electronics	Consumer Electronics	CHM and Industrials	Semi conductor
Bengaluru	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders
Hyderabad	Leaders	Challengers	Leaders	Leaders	Challengers	Leaders	Leaders	Challengers
Delhi NCR	Challengers	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders
Chennai	Challengers	Leaders	Leaders	Challengers	Challengers	Challengers	Leaders	Challengers
Pune	Leaders	Leaders	Leaders	Challengers	Challengers	Leaders	Leaders	Challengers
Mumbai	Challengers	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders	Leaders
Ahmedabad	Challengers	Challengers	Challengers	Challengers	Challengers	Aspirants	Leaders	Challengers
Coimbatore	Aspirants	Challengers	Aspirants	Aspirants	Challengers	Challengers	Challengers	Aspirants



Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021





## Section: 4

# Recommendations and way forward







## Cloudification: A rapidly emerging platform in operating model for ER&D GCCs



ER&D companies are adopting various technology driven initiatives to enable digital transformation of business processes and operating strategies across different sectors. This has also positively impacted the efficiency of their delivery models.

ER&D GCCs are expected to increase spending to create intelligent workplaces that incorporate automation and safety in the workplace while also enhancing productivity and innovation. Furthermore, they are anticipated to augment focus on digital thread, which plays a key role in conceptualisation, design, manufacturing, and product support.

Organisations are considering establishing 'home labs' with required infrastructure and mobile workstations to ensure a disruption-free environment.

Many companies have explored the strategy to cloudify their operations across multiple geographies and operating locations with a view to diversify supply chains and limit risks arising out of operations limited only to one geography. As a result, ability to cloudify operations features among another key factor in the location shortlisting decision-making process.

## Location selection approach adopted by leading global ER&D players



### **Focus towards tapping talent and industry ecosystem across geographies**

Locations with a large and stable talent pool on offer attract ER&D players for their right blend of technical competence, domain knowledge, upskilling opportunities, and digital skills. Companies in the ER&D domain have leveraged on the local ecosystem to enhance maturity and degree of ownership. Enterprises are also bolstering their research arms to augment existing capabilities.

A key initiative is the setting up of R&D laboratories within the educational institutions and providing students with opportunities to work on live projects. Such collaborations have been beneficial for both parties, as these help the centres to identify fresh talent with a demanding skill set and facilitate institutions to offer job opportunities to their students.

Organisations are now focusing on talent capabilities, evolving skills-sets, investment opportunities, and conducive business infrastructure while identifying suitable locations for their ER&D operations.

Enterprises, at present, have shown a propensity to choose locations offering a

favourable ecosystem, in both nearshore and offshore locations. Innovation and business impact have also been the key factors driving performance within the evolved GCC ecosystem.

### **Need for a tailored location strategy**

While some ER&D organisations have existing established presence across different locations driven by their respective business priorities, other organisations are still exploring locations to expand their ER&D operations and are at nascent stage in identifying the appropriate location strategy.

While devising a location expansion strategy, a 'one size fits all' approach does not work for ER&D companies and it becomes imperative to objectively gauge business needs in detail and build the right fit location framework.

ER&D companies have adopted functional strategies to overcome the possible hurdles that might impact the continuity of services in a hybrid work environment spread across multiple locations especially after the accelerated adoption remote working culture.



# Illustrative location strategy templates

As we delve deeper into studying the location strategy that leading organisations have adopted, it is prudent to view their strategy and subsequent journey from their perspective and in relevance to their context.

Leading ER&D players globally could therefore be represented by the following archetypes and their characteristics. Each of the archetype has been provided with a location strategy imperative driven by NASSCOM-KPMG in India insights.

Archetype	Characteristics	Location Strategy Imperative	Case in Point
<b>Archetype 1</b>	<ul style="list-style-type: none"> <li>Organisations with a mature delivery footprint that comprises of multiple GCC locations across geographies, multiple product lines and a well-defined service architecture</li> </ul>	<p><b>Tap into the talent landscape</b></p> <ul style="list-style-type: none"> <li>Tap into the emerging talent landscape to take advantage of cost levers</li> <li>Shape service portfolio intricacies as a function of location drivers (talent availability, business requirement and cultural distance)</li> </ul> <p><b>Drive efficiencies</b></p> <ul style="list-style-type: none"> <li>Rebalance portfolios to drive efficiency by automating and standardising tools, and optimising processes</li> </ul> <p><b>Mitigate risks</b></p> <ul style="list-style-type: none"> <li>Respond to concentration risk by diversifying the location mix</li> <li>Deliver economies of scale by standardising and consolidating resources</li> <li>Minimise operations fragmentation</li> </ul> <p><b>Location sustainability</b></p> <ul style="list-style-type: none"> <li>Long term strategy for the center to ensure location sustainability</li> </ul>	<p><b>1. British automotive machinery and construction equipment player invested in leading Indian locations for access to ER&amp;D talent</b></p> <p>A leading U.K. based manufacturer has expanded to Delhi NCR and Pune, which feature among global automotive ER&amp;D hotspots. The company considered talent access as the key factor in zeroing in the locations in India, where the organisation is foreseeing considerable growth after the U.S. market</p> <p><b>2. European automotive leader has leveraged a South Indian automotive hotspot for their technical and development centre</b></p> <p>One of the leading European automotive brands with global development centres has setup multiple R&amp;D centres at Chennai with a focus on niche domains such as solid-state battery, vehicle testing and benchmarking to leverage the region's diverse capability landscape within the automotive industry</p>

Archetype	Characteristics	Location Strategy Imperative	Case in Point
<b>Archetype 2</b>	Organisations with a nascent global sourcing strategy and footprint	<p><b>Cost savings &amp; process efficiency</b></p> <ul style="list-style-type: none"> <li>• Deliver economies of scale by standardising and consolidating resources to avoid fragmentation</li> <li>• Drive efficiency by automating and standardising tools, and optimising processes</li> <li>• Labour cost arbitrage offered by low cost locations/cities in India</li> </ul> <p><b>Tap into the talent landscape</b></p> <ul style="list-style-type: none"> <li>• Tap into the emerging talent landscape to take advantage of cost levers</li> <li>• Shape service portfolio intricacies as a function of location drivers (talent availability, business requirement and cultural distance)</li> </ul> <p><b>Smart sourcing strategy</b></p> <ul style="list-style-type: none"> <li>• Finalize on a 'smart sourcing' strategy for the company using location selection frameworks such as the hub and spoke model</li> <li>• Build a comprehensive business case reinforced by the location possibilities and respective opportunities</li> <li>• Evaluate the total potential value add of each potential location using a comprehensive location evaluation framework</li> </ul> <p><b>Location sustainability</b></p> <ul style="list-style-type: none"> <li>• Centre long term strategy around location sustainability</li> </ul>	<p><b>1. North American semiconductor and devices major focused on an Indian ER&amp;D hotspot location to double their talent pipeline</b></p> <p>An American peripherals and storage company has planned to double their high-tech talent in Hyderabad to about 5,000 in the coming 2-3 years. The organization has aligned their talent pipeline to the growth potential of the location's talent along with the region's conducive policy on skilling and talent development</p> <p><b>2. A North American engineering conglomerate has identified an East European location for design capabilities</b></p> <p>Leading aviation company with global operations has zeroed in on Poland to develop their design capabilities within the aviation sector as the location provides specific design and calibration capabilities. The organization has set up a nearly 2,000 people strong facility specific to the aviation designing domain</p>

Archetype	Characteristics	Location Strategy Imperative	Case in Point
<b>Archetype 3</b>	Niche product/tech organisations that wants to tap into talent ecosystems across the world to drive growth	<b>Access to specialized talent pool</b> <ul style="list-style-type: none"> <li>Employ a discerning strategy to primarily focus on the specific talent and skill sets with secondary focus on other location drivers.</li> <li>Deploy a virtualised way of working approach to offset any secondary limitations of location.</li> </ul>	<b>1. An engineering services MNC has aligned their ER&amp;D facilities to hotspots which house their current and potential customers</b> The engineering services provider set-up a CoE in Houston to cater to Oil and Gas clientele. The company also acquired a company in Southern India in proximity with India's aviation and automotive ER&D and manufacturing hotspots
<b>Archetype 4</b>	Organisations entering a new market due to its proximity to business	<b>Proximity with business/ Headquarters</b> <ul style="list-style-type: none"> <li>This manifests itself in a number of ways, with some organisations preferring cultural and language proximity especially for decisions to select Mexican locations for U.S./ Chinese locations for China, or time zone and access proximity for their shared services and GBS operations.</li> <li>Regulatory requirements/ limitations</li> <li>Focus is on identifying and assessing the value add of possible revenue and/or cost synergies</li> <li>Build capability chain and evaluate business case for market entry</li> </ul>	<b>1. A European engineering company has ER&amp;D centers aligned with their customer presence</b> The German multinational has set up a facility in Mexico to provide testing and quality services to North America based customers due to the synergies between locations. <b>2. A South Korean electronics leader has aligned ER&amp;D locations in China for the Chinese market</b> Due to the unparalleled volume, language constraints, rapid pace of technology and regulatory landscape, the Chinese market is primarily supported by the Chinese ER&D centers.

As is seen across the above archetypes, the going in positions are different according to the size, scale, complexity and geographic spread and consequently the way the organisations frame their location strategy. However, what is central to these strategies is the long-term sustainability view around the choice of location.

## The India Advantage



### Indian ER&D locations among established global industry hotspots

India is expected to continue to expand as a key technology and innovation hub and as a location of choice for businesses to integrate their global ER&D strategy and growth imperatives. The geographical vastness and diverse demographic expanse offered by India presents an unparalleled opportunity for global ER&D players to explore multiple locations for a wide range of scenarios.

The country has ~1,430 GCCs with the installed capacity of more than 1.38 million people owing to the locations' lower cost of labour, low operating costs, and availability of relevant labour force. In the coming years, the expected business potential for India in the ER&D sector is USD100 billion<sup>34</sup> with additional employment for nearly 1.25 million people<sup>35</sup>.

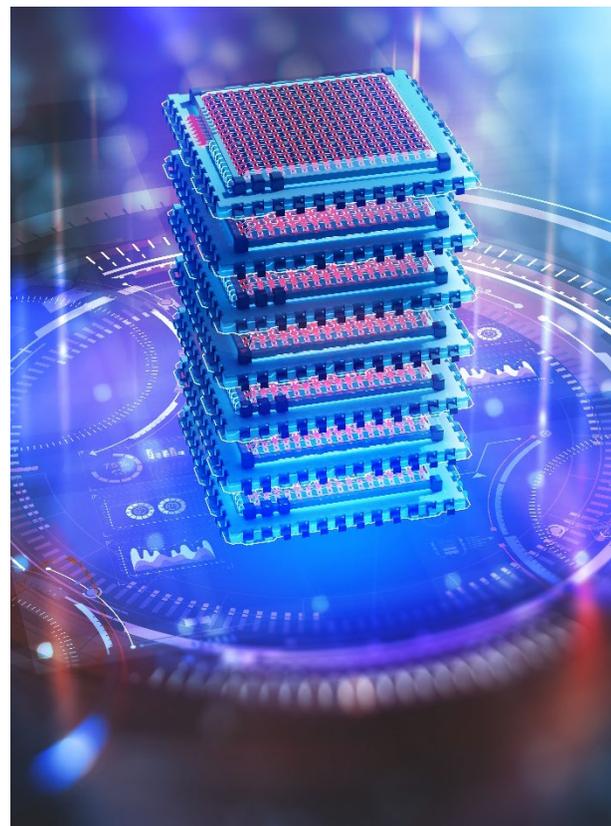
Key ER&D hotspots within India including Bengaluru, Delhi NCR, and Hyderabad offer significant talent availability for niche skills such as AI and quantum computing favourably complimenting the large talent availability within traditional skills relevant for establishing GCCs.

As a result, Bengaluru and Delhi NCR have emerged among global leaders in the Semiconductor and Computing and electronics industry verticals along with in Software and internet vertical owing to strong talent pool for traditional skills such as software development.

Engineering R&D is the fastest growing vertical in the GCC space. Post the outbreak of Covid-19 pandemic in India, ER&D companies have been involved in various deals, mergers, and acquisitions.

Evolving service delivery requirements drive ER&D players towards leveraging established ecosystem within ER&D locations which offer both customer proximity and exposure to respective industry hotspots. India offers a network of established locations which provide platform for ER&D expansion opportunities across major ER&D industry verticals and host leading global ER&D players as well as new entrants in the ER&D space.

Indian ER&D hotspots including Bengaluru, Delhi NCR, Mumbai, and Hyderabad have extensive presence of ER&D players owing to existing industry infrastructure and availability of talent across industry verticals. Locations such as Chennai, Pune, Coimbatore, and Ahmedabad also offer established ecosystem for certain key industry verticals.



34. A \$100 bn opportunity for engineering R&D, Trade Promotion Council of India, 10 November 2020

35. A \$100 bn opportunity for engineering R&D, Trade Promotion Council of India, 10 November 2020



<h2>Bengaluru</h2>	<ul style="list-style-type: none"> <li>• Bengaluru is the most attractive in location in India in terms of industry hotspots The city is a leader for various sectors including, Aerospace, Automotive, Software and internet, among others</li> <li>• ~250,000 engineers and ~28,000 R&amp;D personnel are employed in the Software and internet space</li> <li>• Amongst other cities in India, Bengaluru has the maximum HQs for aerospace companies</li> </ul>
<h2>Delhi</h2>	<ul style="list-style-type: none"> <li>• Delhi is an attractive location as it is a leader in industry hotspots for various sectors including Automotive, Software and internet, Computing and electronics, and Consumer electronics</li> <li>• The city is an established hotspot for Software and Internet companies with ~350 startups operating in the region</li> <li>• Delhi NCR has the maximum number of R&amp;D personnel who are tagged to the Consumer Electronics sector</li> </ul>
<h2>Mumbai</h2>	<ul style="list-style-type: none"> <li>• Mumbai is a vital hotspot for industries including Automotive, Software and internet, Healthcare, Computing and electronics, among others</li> <li>• The city has the maximum company HQ in the CHM and Industrials space, in comparison to other Indian cities</li> <li>• Also, there are ~7,600 R&amp;D personnel employed in the healthcare sectors</li> </ul>
<h2>Hyderabad</h2>	<ul style="list-style-type: none"> <li>• Hyderabad is a hub for sectors including Aerospace, Software and internet, Healthcare, Consumer electronics, and CHM and Industrials</li> <li>• The city has a considerable number of startups operating in the Semiconductor and Software and internet sectors</li> </ul>
<h2>Pune</h2>	<ul style="list-style-type: none"> <li>• Pune is an attractive destination for companies who want to set up their ER&amp;D centres for Automotive, Aerospace, Software, CHM and Industrials industries</li> <li>• The city has the second highest concentration of Aerospace sector company HQs in India after Bengaluru</li> <li>• Pune is home to the largest number of engineers who are tagged to the Automotive sector</li> </ul>
<h2>Chennai</h2>	<ul style="list-style-type: none"> <li>• Chennai is a hub for sectors including Automotive, Software and internet, and CHM and Industrials</li> <li>• The city has a considerable number of startups operating in the Automotive space</li> <li>• The Automotive hotspot also employs ~28,000 engineers in the sector, second highest in India after Pune</li> </ul>

Source: KPMG in India analysis on the basis of proprietary location assessment framework, December 2021

The centrality of any one location is no longer as vital as it used to be and with the onset of the pandemic, ER&D players around the world have had to re-examine traditional notions of working. As a result, regardless of going in position, it is imperative that organisations have a location strategy with a sustainability view on the location choice, built evaluating the business needs in detail.

The focus on dispersed location portfolio and improving operational mobility can be achieved by adopting a 'string of pearls' location strategy. The approach encourages ER&D organisations to add new locations to their portfolio incrementally and arranges them together in strings of diverse capabilities, such as product development, design, and other niche requirements to strengthen the parent organisation. The strategy enables organizations to access a wider pool of competent talent and provides greater flexibility to employees with the increasing adaption of remote working culture.

Going forward the ER&D landscape is evolving with the requirement of lot more niche engineering and technological skills. India is well positioned to strengthen its leadership in ER&D space owing to its among the best in world talent supply and the country's forecasted cost attractiveness in comparison with other established and emerging GCC locations in the coming decades.

India will continue to offer clear advantage to ER&D players in terms of its well-established hotspots across key ER&D industry verticals. The multi-city ER&D landscape in India is well developed to provide an added dimension to organisations with a view to reinforce and diversify their location strategy. This ecosystem is an enabler in achieving improved operational feasibility through hybrid operating models, digitization, and cloudification capabilities to mitigate future disruptions and uncertainties.

A combination of India's existing ER&D industry ecosystem leveraged with the talent scalability potential can form an integral core for organisations in identifying and expanding location presence within the global ER&D landscape.



## Road ahead



The relevance of Engineering Research & Development (ER&D) in accelerating growth of businesses across industries has become prominent with the emphasis on innovation and leveraging technology for improving processes, design, and services.

The year 2021 paved way for an increased focus on ER&D to drive solutions for challenges related to talent shortage, supply chain diversification, research to fuel growth and meeting rising consumer demand.

The renewed interest in R&D led growth has also shifted the focus on identifying the most

suitable locations to expand ER&D operations. While locations that offer the right mix of talent availability and existing industry presence are attractive for enterprises, the level of maturity associated with a location to facilitate digital transformation and readiness to implement hybrid working models also feature prominently in the location strategies of companies to set up ER&D delivery centres.

Organizations need to develop a comprehensive location strategy that underpins their blueprint to build, grow and sustain their ER&D centres.





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