



# India Innovation Study

India's emerging innovation landscape  
and prospects for collaboration with Germany



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# EXECUTIVE SUMMARY

## A. Project background and context

### *Germany – need for introspection*

Given the volatile, uncertain, complex and ambiguous (VUCA) world we live in, innovation is a critical means by which countries can create and sustain a competitive advantage and drive inclusive growth. Innovation has been central to the economic development of countries such as the United States, Germany and Japan. While Germany has long been at the forefront of global innovation, this position can no longer be taken for granted for three main reasons. First, recent demographic shifts and a low birth rate have given rise to an aging population, which is creating a scarcity of highly skilled labor. Second, Germany's performance in innovation, while solid, has been behind that of a number of European peers such as Switzerland, Sweden, Finland, Ireland, Denmark and the Netherlands.<sup>1</sup> Finally, although innovation is not a zero-sum game, competition between countries to drive innovation and capture larger shares of global markets is intensifying. This competition is no longer restricted to the most advanced countries of the world. Emerging countries, such as India and China, with their large young populations and abundance of skilled labor are also innovating. This could have a variety of consequences for Germany's innovation efforts – for example, competition may increase, but new collaboration opportunities may also arise. In light of its demographic challenges, Germany stands to gain from understanding what emerging countries such as China and India have to offer in the context of innovation and, where possible, should identify mutually beneficial areas of cooperation.

### *India – the “real” story*

Much has been said and written on innovation in India. However, the increasing “buzz” regarding India and its role in the global R&D landscape has generated a significant amount of contradictory information. Home to nearly 1,000 R&D centers for leading multinationals, India is often touted as a top destination for R&D. Bangalore is globally recognized as the fifth most preferred destination by large companies and start-ups for technology and innovation.<sup>2</sup> Yet India spends significantly less than its global peers on R&D as a percentage of GDP (R&D spending amounts to 0.9% of India's GDP as compared to 1.95% of China's GDP and 3.6% of South Korea's, for example). Moreover, despite an improvement in some rankings, India ranks relatively low on a variety of

innovation and related indicators.<sup>3</sup> Given this contradictory information, what is the real story? Is innovation in India real or is it just hype? If it is real, what does innovation in India look like?

Our study is an effort to shed light on what is genuinely taking place in India. It attempts to provide a realistic depiction of innovation in India while identifying its key characteristics, the types of organizations involved, the country's strengths and weaknesses, and the areas needing improvement. Moreover, we identify the impact that India's rise to an innovative economic power has on Germany while outlining how corporate executives, researchers and policymakers in both countries can collaborate in developing a synergistic partnership.

### *Approach and methodology*

Our study has been a first-of-its-kind comprehensive assessment of corporate innovation in India and its impact on Germany.<sup>4</sup> We believe that innovation is multifaceted and does not always fit within the confines of a particular definition. We have therefore adopted respondent companies' definition of innovation. As a consequence, innovation in this report refers to products, process, business models, organizational innovation and combinations thereof.

The heart of our study is made up of primary interactions with 80 companies and more than 150 stakeholders.<sup>5</sup> This includes Indian and multinational companies, Indian and German industry associations, universities and research organizations, and government bodies. In addition to the in-depth interviews, we held workshops in Germany (Berlin) and in a number of major cities in India – specifically Mumbai, Delhi/NCR, Bangalore, Chennai and Pune to help us gain multiple perspectives and incorporate regional and industry-wide differences on this topic. Our primary analysis was supplemented by secondary research, including a review of leading academic and business literature on this topic.

# INNOVATION IN INDIA

## Innovative imitation and frugal innovation

Our nine months of research show that innovation in India is both real and complex, and that it is gaining in momentum. We identify two major characteristics of innovation in India.

First, “innovative imitation” which involves adapting products and services offered in developed markets to a heterogeneous and underpenetrated Indian market, is a key feature of many successful Indian companies. Innovative innovation is inevitable; indeed, many developed economies such as South Korea, China, Japan and even Germany imitated others early on in their economic development.

Second, innovation in India is typically “frugal,” meaning that firms create sometimes radically new products, services and business models with limited resources. As a structured approach to innovation, **frugal innovation** clearly focus on delivering customer value at predetermined price points. Our interviews with Indian firms show companies of all types – Indian and multinational companies, large and small companies, established firms and start-ups – employing frugal approaches to innovation.

India is rapidly becoming both the lead market and global hub for frugal innovation. Resource constraints and the desire to open untapped markets to products and services through adequate price points and acceptable value-for-money propositions are driving frugal innovation forward.<sup>6</sup> We believe that frugal innovation will play a key role for decades in the innovation landscape of emerging markets. Emerging markets are expected to be the source of some 95% of global population growth and 70% of global GDP growth until 2030.<sup>7</sup> These markets will feature varying but nonetheless high levels of resource scarcity, institutional voids and low disposable incomes. Companies will need to innovate for these emerging markets, and India, given its large customer base, is ideal for both Indian and foreign multinationals to test frugal solutions.

## Challenges in India (and other emerging markets)

- Low per-capita income
- Weak & highly invariable infrastructure
- Non traditional supply channels
- Weak distribution channels and media infrastructure
- Poor access to electricity & transportation means
- Low levels of awareness
- Shortage of trained staff to operate modern sophisticated technologies

## Attributes of frugal solutions

Dimension	Attributes	Characteristics
Product-related characteristics	<b>F Functional</b>	Low-low-end   Low-end   Mid-end   High-end
	<b>R Robust</b>	Robust/maintenance-friendly   Fragile/laborious to maintain
	<b>U User-friendly</b>	Simple   Complex
Market-/customer-related characteristics	<b>G Growing</b>	High volume   Medium volume   Low volume
	<b>A Affordable</b>	Low price   Medium price   High price/premium
	<b>L Local</b>	Emerging markets   Low-end segments in established markets   High-end segments in established markets

■ Characteristics typical of FRUGAL offerings

## A. Five archetypes of innovation in India

We identify five archetypes of innovation taking place in India that cater to global and Indian customers alike.

### 1. Innovation as a service

As an offshoring/outsourcing destination of choice, India is a major provider of “**innovation services**” to global and Indian companies alike. The service verticals range from traditional industries (e.g., aerospace, automotive, telecom, semi-conductors, consumer electronics and construction/heavy machinery) to new and emerging verticals (e.g., computing systems, energy, infrastructure, industrial automation and medical devices).

While some of these companies started off as “body shopping” sites 25 years ago, they have since moved up the value chain to provide high-end managed services. This has facilitated India’s transition from a global vendor to a global partner. This kind of innovation in partnership with another firm is complex. The intellectual property “generated may be co-owned, and sometimes, everything but the final branding and distribution takes place in India.”<sup>8</sup> Given the B2B nature of the R&D services provided and confidentiality issues, end consumers often remain unaware of the innovation involved.



Innovation as a service

### 2. Globally-segmented innovation<sup>9</sup>

Around 930 multinationals currently have R&D centers in India, many of which are the largest outside the multinational’s home country. Because these multinationals often operate innovation projects in several countries or across multiple locations within a country, many of these activities are either vertically (part of a sequential process) or horizontally segmented (part of parallel work packages) and therefore not easily identified by external players. Though this type of innovation has been key to India’s growth by contributing to FDI and generating know-how, system and process spillovers, many remain unaware that these activities are taking place in India.<sup>10</sup>

Indian multinationals are also segmenting their innovation activities across different regions in order to leverage capabilities in different parts of the world. Examples include Indian automotive manufacturers and pharmaceutical companies that conduct innovation activities in the United States and/or Europe to access new technology, specialist know-how or gain global customer insights.



Globally-segmented innovation

### 3. Product innovation

Though rarely “disruptive,” a significant amount of innovation, specifically product development, is taking place in India by Indian and multinational companies. **Product innovation** extends across a variety of



Product innovation

industries, including the pharmaceutical, automotive and engineering industries. The Tata Ace, for example, was developed in response to the need for a small-goods carrier for last-mile distribution. Indian start-up, IdeaForge, has developed one of the lightest unmanned aerial vehicles (UAV) in the market, which can be used for both military and civilian applications. Another start-up, Grey Orange, is innovating in cutting-edge areas like robotics and warehouse automation.

#### 4. Process innovation

Process innovation typically refers to innovations in a business process at any point in the value chain – from the procurement of raw materials to the design process, manufacturing, sales and post-sales (customer engagement/retention) – in which a company is involved. Driven by the historical need to conserve resources and minimize waste, Indian companies, particularly in pharmaceuticals, engineering, steel, agrochemicals and IT-enabled services, excel in process innovation.

Though generally less visible than product innovation among end consumers, the importance of process innovation is recognized by global customers, who increasingly value speed-to-market, operational efficiency and economy of scale.<sup>11</sup> The unique nature of process innovation in India features a workforce typically more qualified than its counterparts in other countries. Employees in India apply their training and intelligence to what might elsewhere be considered “mundane” process innovations and thereby render the companies they work for more competitive, which can generate new products and services.<sup>12</sup>



Process innovation

#### 5. Business model innovation

Subject to increasing pressure to open up new market segments in new and existing markets while technology and the VUCA world are regularly displacing established businesses, firms must continually adapt their business and operating models to changing environments.

In order to succeed in the Indian market, companies operating in India must adapt to account for institutional voids (poor supply chain and infrastructure, business and regulatory hurdles), underpenetrated markets, low disposable incomes and a poor purchasing power.<sup>13</sup> Such companies have also had to develop additional service offerings or modify their traditional business models in order to achieve greater adoption or penetration into the market. There are several examples here of Indian companies operating in areas such as healthcare delivery, banking, financial services, insurance and logistics. With some modification, several business model innovations in India can be exported to other emerging and/or developed markets. For example, semi-rural hospital chain Vaatsalya’s unique operating model can be applied to provide quality healthcare in hard-to-access parts of the world.



Business model innovation

## B. Five organization types

Companies are key drivers of innovation in India, which is in part an effect of the limited role played by research institutions and universities in this regard. While our interview respondents cited **several reasons for innovation**, companies across all sectors and stages of development identify innovation as essential to their success in achieving objectives such as topline performance and accessing new market segments.

We also find that while respondents almost unanimously rate themselves as “more innovative” than their Indian peers, they are ambivalent when it comes to **ranking their innovativeness vis-à-vis global peers**. Within their respective industries, however, most Indian respondents feel that the **level of innovation in their industry** is below that of global industry standards.

When asked to **rank Indian companies’ advantages vis-à-vis global multinationals** with regards to innovation in India, respondents identified as top advantages lower cost structures and a superior understanding of the local market in India. When the same question was posed with regard to **global multinationals and their advantages vis-à-vis Indian companies** in terms of innovating in India, respondents identified a company’s global brand or product and the technology it uses as the most important advantages.

Drawing on the diversity of companies pursuing innovation, we have identified five organization types useful in classifying innovating companies in India.

### 1. Transnational innovators

Multinationals innovating in India do so in order to succeed in the Indian market or drive their global innovation agenda, or both. While the majority of India’s 900-plus multinational R&D centers began as offshore engineering support centers, many have gradually matured toward product stewardship.

### 2. Corporate titans

Corporate titans are large established and leading Indian companies that acknowledge the need for innovation in order to succeed in global markets. They therefore invest significantly in R&D and personnel/talent development and feature established innovation processes. Subject to intense competition, corporate titans are aware of the importance of investing in innovation – both in financial terms and by establishing innovation platforms and processes.

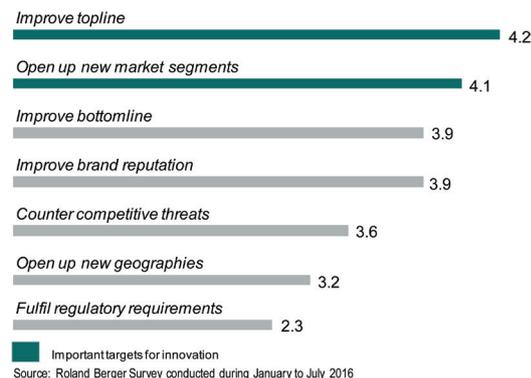
### 3. Smart spartans

As champions of frugal innovation, smart spartans are mid-to large-sized organizations that successfully tap into new market segments through cost-effective, high-quality and functional innovations.

Smart spartans are generally “pulled” by the market rather than “pushed” by technology. Working with limited resources, they develop products and services attuned to customers’ needs at a predetermined price. They carefully consider every aspect of a product from maintenance

## Key business drivers of innovation

[1 = not important, 5 = very important]



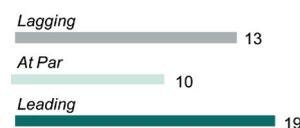
## Self-rating of innovation vis-à-vis peers

Number of interviewees

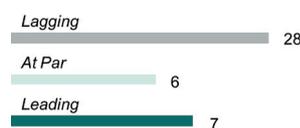
### Company’s innovativeness in comparison to Indian peers



### Company’s innovativeness in comparison to global peers



### Current level of innovation in industry in India vs. global



Legend: Important targets for innovation (Score ≥ 3.9)

Source: Roland Berger Survey conducted during January to July 2016

requirements to durability and ease of use and often rely on structured, stage-gate and time-bound processes for innovation. Smart spartans include both companies that create products and those whose service offering and/or business models are underpinned by frugal principles. Multinationals have also begun developing frugal innovations in India for their businesses in emerging as well as developed markets. This kind of “reverse innovation”<sup>14</sup> is gaining traction among several multinationals seeking to adopt a differentiated strategy for developed markets.

#### 4. Meteoric mavericks

Meteoric mavericks are India’s start-ups. With 4,200 start-ups, India features the third-largest start-up ecosystem globally<sup>15</sup> and is home to ten unicorns (i.e., start-ups valued at USD 1 billion or more within ten years of being founded).<sup>16,17</sup> These firms are largely concentrated in Bangalore, Gurgaon, Delhi National Capital Region (Delhi NCR)<sup>18</sup> and Mumbai, although cities like Chennai, Hyderabad and Pune also figure prominently here.

Most Indian start-ups are service-focused and work in (hyperlocal) e-Commerce, enterprise software and consumer service areas in the business-to-consumer (B2C) market. A growing number, however, are active in areas such as augmented reality, the internet of things (IoT) and robotics. E-commerce enablers working on big data, logistics and supply chain issues are also on the rise. These mavericks typically feature lean teams, can effectively leverage technology, emphasize customer needs, understand the importance of speed-to-market, and aim to disrupt conventional business models. Unlike larger and more established Indian firms and multinationals, mavericks typically do not separate vertical innovation.

#### 5. Relentless researchers

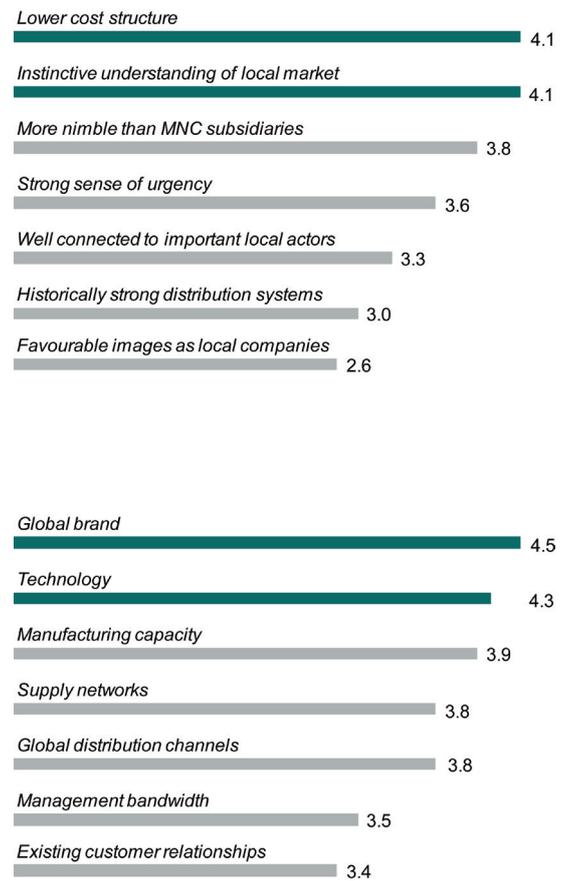
Relentless researchers refers to those public and private educational and research institutions that have been at the forefront of public research in India. The quality of public research in India has suffered from comparatively low levels of R&D spending as a share of GDP. India (1%) spends less than the United States (2.8%), Germany (2.9%), Japan (3.4%), South Korea (3.6%) and China (2%).

Despite low investment levels, India boasts institutions delivering quality research. These include the Indian Institute of Science (IISc), Indian Institute of Technology (IIT), and the Indian Institute of Science and Educational Research (IISER). Successful public research institutions include the Indian Space Research Organization (ISRO), Indian Council for Medical Research and laboratories operated by the Council for Scientific and Industrial Research (CSIR).

In our study, we have come across a number of multinationals that have chosen to leverage India purely as a market or manufacturing base and who consciously do not pursue innovation in the country. Conducting R&D in India is a value proposition requiring a thorough understanding of local environments, and not all companies have the appetite to do so.

### Ranking innovation advantages

[1= not important, 5= very important]



■ Important advantages

Source: Roland Berger Survey conducted during January to July 2016

# INFLUENCING FACTORS

## A. Internal influencing factors

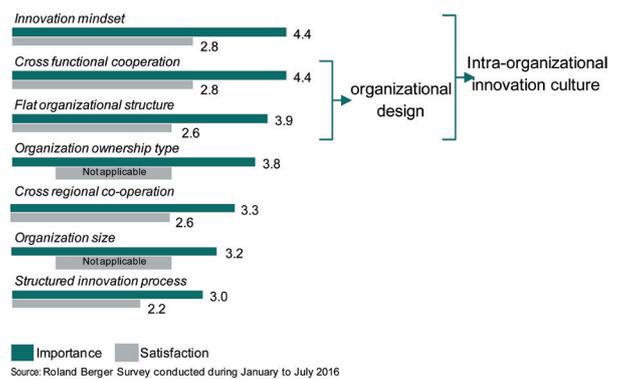
We asked interviewees to weigh in on specific **internal innovation drivers** in India, and to describe their level of satisfaction with each. These internal drivers include the components that shape companies' innovation mindsets, such as attitudes regarding innovation (fear of failure, willingness to take risks, etc.), organizational designs (e.g., flat or hierarchical, or degree of support for cross-functional cooperation), ownership types, sizes and innovation processes. Our results indicate that companies' internal innovation cultures and the presence of cross-functional cooperation were perceived as being the most significant internal factors influencing innovation. Notably, interviewees also reported less than moderate satisfaction on both these counts.

## B. External influencing factors

In addition to the internal influencing factors, we also surveyed companies on the importance of **external influencing factors** on a company's ability to innovate. Survey results indicate that talent, availability of capital and an entrepreneurial culture are very important for innovation (average rating of importance > 4.5). Close collaboration between industry and academia, a strong and enforced intellectual-property rights (IPR) regime, and ease of doing business are also considered to be important external factors influencing innovation (average rating of importance > 4.0).

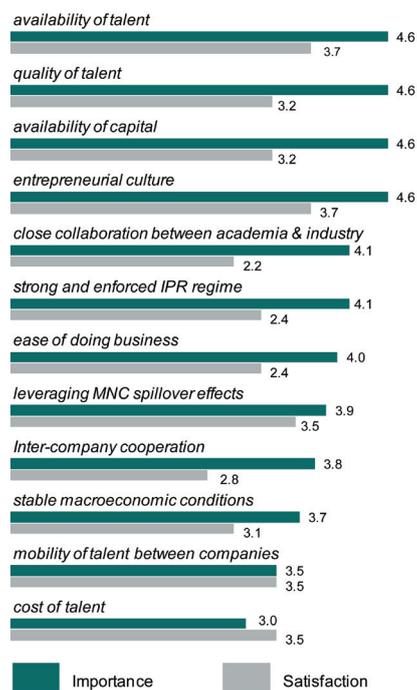
### Ratings for importance of and satisfaction with internal influencing factors in India

[1 = not important/ not satisfied, 5 = very important/ very satisfied]



### Ratings for importance of and satisfaction with external influencing factors in India

[1 = not important/ not satisfied, 5 = very important/ very satisfied]



# FUTURE PROJECTIONS

In this section, we ask: “What will India’s innovation landscape look in 2030?” Our analysis of trends and uncertainties regarding influencing factors for innovation highlighted seven factors critical to innovation, whose future is uncertain. These include quality and availability of talent, innovation mindset, organizational design, availability of capital, industry-academia linkages, entrepreneurial culture, and ease of doing business.

Clustering these seven factors allowed us to identify two key dimensions: entrepreneurial organizations and an attractive innovation ecosystem. While the first dimension, entrepreneurial organizations, refers to the critical but uncertain factors necessary to construct innovation-oriented enterprises, the second dimension, ecosystem attractiveness, refers to the external environment, including the role played by external state actors (local, state, and central government) and non-state actors (such as banks, venture capital/private equity institutions (VCPEs), and academic and research organizations, incubators/accelerators, etc.) in the innovation ecosystem.

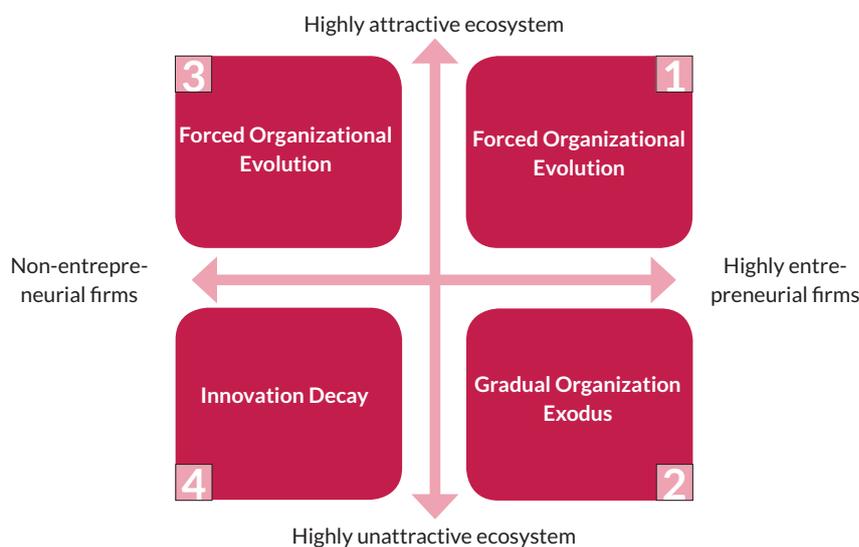
Based on the two dimensions outlined above, we identify **four potential future scenarios** relating to innovation in India. These are not designed to be exhaustive, but instead provide a starting point for

analyzing potential outcomes in India, and for determining how the country might seek the most desirable outcome.

Scenario planning typically works with extremes. In our assessment, both the extremely negative (innovation decay) and extremely positive (era of innovation) scenarios are unlikely to come about in the next 15 years.

India is currently characterized by one small set of entrepreneurial organizations and a larger group of relatively less entrepreneurial organizations. The level of ecosystem attractiveness differs by industry; however, we believe the overall ecosystem is moderately attractive. Multiple initiatives are currently aimed at strengthening the innovation ecosystem, but significant challenges remain (see Section III). This could pan out in two ways. If the various government initiatives in this area bear fruit, we believe the ecosystem will improve and entrepreneurial organizations will become even more innovative. Less-entrepreneurial players will be forced to innovate or perish. Conversely, if these initiatives have little effect or are not taken seriously, the ecosystem will stagnate. Entrepreneurial organizations will continue to operate in India in order to benefit from the large market, but may choose to innovate elsewhere. Non-entrepreneurial organizations will continue to ignore innovation, playing a low-value-added game and largely competing on cost.

## Scenarios based on the two dimensions



Source: Roland Berger

### Four Future Scenarios

- 1** In an extremely attractive ecosystem and with highly entrepreneurial organizations, innovation would flourish
- 2** Entrepreneurial organizations in an unattractive ecosystem would reduce innovation focus and some may leave the country for more supportive ecosystems
- 3** In an attractive ecosystem, which breeds healthy competition, even non-enterprising firms would be forced to ‘innovate or perish’
- 4** In an unattractive ecosystem and unenterprising firms, innovation would decay

# IMPLICATIONS FOR GERMANY

## A. Introduction

Through our study, we have observed that even in the context of innovation, India plays the role of a **customer**, a **competitor**, a **collaborator**, a **talent-hub resource** and an **ecosystem** for Germany.

## B. Customer

India is already a large customer for and importer of German high-tech innovation. It imports heavy engineering equipment, precision engineering equipment and automotive equipment (including vehicles and automotive parts).<sup>19</sup> German companies understand the importance of doing business in India. According to the Indo-German Chamber of Commerce, nearly 1,600 German companies are registered in India

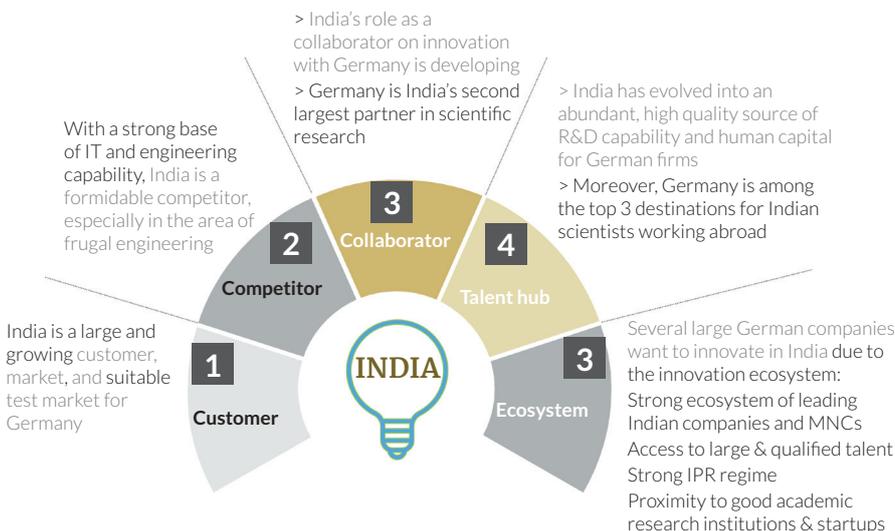
**Opportunities and threats for Germany:** India presents two major opportunities for German innovators. First, it is a large, stable, heterogeneous and growing market for German companies. Moreover, several of Germany's key export categories show underpenetration in India (e.g., vehicles, precision equipment). Second, emerging economies are expected to comprise 63% of world GDP by 2030.<sup>20</sup> As the second-largest emerging market in the world,<sup>21</sup> India offers

an ideal test market for German companies seeking to enter emerging markets. India is and will remain a highly price-sensitive market. However, a new set of product and service offerings may be needed that goes beyond lower price points, extending also to Indians' different design, feature and functional needs. Competition from other multinationals is also likely to intensify over time.

## C. Competitor

Medium-sized and large Indian companies are showing growing success in international markets. This is particularly true in areas such as the engineering and automotive industries, where India has successfully produced a number of hidden champions such as Bajaj, Bharat Forge and Motherson Sumi. These are increasingly beating their global competitors in foreign markets. Companies succeeding internationally are doing so through a carefully developed value proposition, meticulous focus on operational excellence and frugal engineering, and where required, strategic acquisitions of foreign companies providing them with technology and market access. While some have chosen to go global to seek international market opportunities, others such as Bajaj have done so to counter challenges in the domestic market.<sup>22</sup>

## Implications of innovation in India for Germany



**Opportunities and threats for Germany:** India's role as a competitor provides German firms with two significant opportunities. First, the frugal-engineering prowess of India's hidden champions could hold key lessons for German competitors. Second, given that a number of these Indian firms are willing to conduct joint operations or enter merger and acquisition (M&A) relationships, German companies could be natural partners. Moreover, since these Indian companies typically offer products and services at a different pricepoint and with a different value proposition than do German companies, they could provide complementary offerings to German-produced products and services.

#### D. Collaborator

Germany is India's second-largest partner in the area of scientific research. However, the reverse is not true. In fact, although India has seen greater gains since 2008 than any other BRICS (Brazil, Russia, India, China, South Africa) nation with regard to German research-collaboration funding, the German government still invests significantly more in China and Russia. Our interviews revealed that joint funding from the Indian and German governments is often sporadic and unsystematic. Respondents believe that funds are not a problem on the Indian side, and that the Department of Science and Technology is open to increasing funding. Execution is the primary problem, due to complex and lengthy bureaucratic processes. Rather than spending time fighting this system, researchers often focus on simpler work with purely local institutions instead. For their part, Germans show limited understanding of the Indian academic and research system, as well as a lack of trust in the capability and commitment levels of their Indian counterparts.<sup>23</sup>

**Opportunities and threats for Germany:** Mutual interests offer fruitful collaboration opportunities between India and Germany (e.g., frugal innovation, software/hardware complementarities). German academic and research institutions could also capitalize on India's relatively weaker performance in this area to attract high-quality Indian talent and collaborate with Indian companies on focused applied-research projects.

#### E. Talent hub

Like other transnational innovators, a number of large German multinationals have set up R&D centers in India. Once regarded largely as a cost-arbitrage opportunity, India has today become a critical and integrated part of these multinationals' global innovation networks. Executives in German companies, both Indian and otherwise, recognize the high quality of Indian talent, and say this justifies engaging in R&D in the country. While specialized talent can be hard to find, they say India's labor force is energetic, capable, young, enthusiastic and flexible.

**Opportunities and threats for Germany:** Germany faces an imminent labor shortage. India offers a huge pool of talent available at a competitive cost. Moreover, employees offer specialized skillsets (IT services, process chemistry, etc.) that are in short supply in Germany. However, German

policymakers must avoid contributing to a loss of skills at home. Experts note the dangers in outsourcing junior-level jobs to emerging markets, by eliminating entry-level positions for home-market workers who might otherwise grow into critical high-skill positions.<sup>24</sup>

#### F. Ecosystem

Many large German companies have chosen to innovate in India due to the ecosystem advantages provided by certain Indian cities. Beyond high-quality human resources, certain Indian cities offer vibrant and heterogeneous markets with multiple customer segments ranging from the ultra-premium to bottom-of-the-pyramid, proximity and access to other innovative multinationals, a large and growing start-up ecosystem, a growing industry-academia collaborative community, and access to research institutions. Interviewees find that cities like Bangalore, Mumbai, Pune and Delhi-NCR, where several German companies have manufacturing and R&D centers, offer unique collaboration and co-innovation opportunities. Other German companies are focused on start-up communities in cities like Bangalore. Various models for these interactions exist, from informal meetings at conferences to formal incubation collaborations, technology licensing and even acqui-hiring.

**Opportunities and threats for Germany:** Ecosystem advantages in cities like Bangalore let German companies innovate in an environment difficult to replicate in Germany. By operating locally, German research institutions pursuing new and exciting areas of research (computer science and engineering, biotechnology, etc.) could benefit from such ecosystems. In an extreme scenario, German companies and start-ups seeking advantages unavailable in Germany might site a significant part of their innovation activities in India, resulting in a loss of some jobs.

# RECOMMENDATIONS

Drawing on the aforementioned effects innovation in India has on Germany, we have outlined a set of high-priority recommendations that would enable both countries to capitalize on the growing momentum of innovation in India. We also identify a number of possible areas for collaboration that would allow the two countries to develop a synergistic innovation partnership.

## A. Recommendations for India

In previous sections, we identified India's innovation-performance shortcomings. To advance, it must: (1) develop and strengthen the innovation-driven intra-organizational culture within Indian companies, (2) improve the country's human-capital quality, and (3) improve research-output quality and strengthen industry-academia linkages. We believe the most efficient way forward is to focus on the many government and private initiatives already underway, rather than embarking on additional ones. Our recommendations are organized by the three main stakeholders in India's innovation ecosystem – companies, academic and research bodies, and government.

### 1. Companies / industry associations

#### Foster an innovation-driven intra-organizational culture

Innovation-driven intra-organizational culture is the most important internal factor driving innovation. While some large companies have set up formal systems to drive both top-down and bottom-up innovation, most Indian companies have not. Thus, we believe Indian companies should (1) take proactive steps to build internal cultures of innovation, and (2) create or modify organizational structures, systems and processes so as to foster and cultivate these cultures. Such strategies must be led from the top executive ranks, and should foster "intrapreneurship" by supporting and rewarding innovative employees. This culture should be supported by organizational and human-resources processes that promote innovation and support the firm's R&D strategy.

#### Build bridges with important stake-holders in the ecosystem

Companies cannot innovate in a vacuum. They need to access the latest research, interact with cutting-edge start-ups, and collaborate with competitors and suppliers. In India, industry-academic collaboration and pre-competitive research collaboration are both weak. We thus recommend

that companies engage with the external environment in four distinct ways:

- Develop strong linkages with academia. Companies should identify the specific areas in which they need support from academia or research institutions and suitable partner institutions. Companies and academia could also test limited-run mobility programs for MA and PhD candidates, engage in semi-formal activities such as student challenges and competitions, and strengthen interaction with faculty,
- Increase engagement with the start-up ecosystem. This will help companies keep abreast of the latest technologies and trends, and collaborate on new topics. Formal models of engagement may include mentoring start-ups within a corporate incubation program, licensing their technology, or acquiring them for their technology or talent.
- Increase the intensity of inter-company cooperation. This is particularly important for pre-competitive research topics affecting multiple firms. A project such as xEV One, which has established an electric vehicles supply chain, can be leveraged.
- Become active participants in and supporters of government initiatives. This may mean providing constructive feedback on new policies, advising the government on topics such as innovation, proposing topics for academic research, developing curriculum for industry-specific degrees and skills, and so on.

### 2. Academic and research institutions

Indian academic and research institutions play a vital role in the innovation ecosystem. However, we find that Indian academic and research bodies have three crucial areas in which progress is needed. First, they must improve educational outcomes so that the quality of talent improves; second, they must actively work toward becoming world-class research institutions; and third, they must strengthen links with Indian industry.

## Overview of recommendations for India, Germany and Indo-German collaboration

1

### Recommendations for India

#### Companies/ Industry

- Foster an innovation-driven intra-organizational culture
- Build bridges with important stakeholders in the ecosystem

#### Academia/ research bodies

- Improve educational outcomes and develop talent that is innovation-ready
- Aspire and work towards becoming a world-class research institution
- Foster strong linkages with industry

#### Government

- Support academic institutions in developing top talent
- Strengthen public research institutions
- Leverage global best practices to drive better industry-academia collaboration

2

### Recommendations for Germany

#### Companies/Industry

- View India as more than a marketplace and leverage India's R&D capability
- Leverage and learn from India's competitive advantage: frugal mindset

#### Academia/ research bodies

- Capitalize on India's weak research outputs and industry-academia linkages to collaborate with Indian companies

#### Government

- Increase availability of highly skilled labour to retain status as high-technology innovator
- Strengthen internationalization strategy with increased scope of collaboration with developing countries, such as India

3

### Recommendations for Indo-German collaboration

- Explore and leverage the complementary demographic profiles of both countries
- Drive industry-academia linkages between India and Germany
- Develop a project-specific inter-industry consortium between the two countries
- Develop a bilateral start-up exchange/ collaboration portal

#### Improve educational outcomes so as to develop talent that is innovation-ready

- Despite the large pool of students entering the workforce every year, employability statistics are quite poor. In light of this, institutions should:
- Undertake a systematic review of their performance, identify shortcomings and execute a roadmap that is focused exclusively on developing quality education outcomes, including employability.
- Support administrators in modifying curriculum and implementing new pedagogical approaches. Institutions should work with administrators to review and subsequently modify the curriculum and evaluation requirements for undergraduate and post-graduate degrees. Graduating students should be trained to question conventional knowledge and apply critical reasoning to solve real-world problems. Moreover, universities should institute more discussion-based class formats, as well as interactive methods such as role playing, simulations and experiments. For instance, one of India's leading engineering institutions, BITS-Pilani, has joined with German company Festo Didactic to bring its "Experience Lab" practical-learning system to the BITS-Pilani campus. This lab will combine hardware training materials and software simulations to recreate a realistic manufacturing environment right on campus. If successful, this could be co-sponsored by the Atal Innovation Mission and replicated across the country.
- Develop continuing education coursework. India has limited continuing-education and lifelong-learning opportunities. Academic institutions should leverage government initiatives in this area, strengthen continuing-education programs, and tune them to the needs of industry.

#### Work toward becoming world-class research institutions

A vibrant research infrastructure – from “blue-sky” research to industrial R&D -- is imperative for innovation. Pockets of excellence do exist in the Indian research and academic worlds. However, one consistent message in our interviews was that applied research in particular is weak. In addressing this issue, we identify three courses of action for institutions:

- Improve the quality of doctoral and post-doctoral programs. One possible way of achieving this is to offer joint doctoral programs with international institutions. For example, RWTH Aachen recently partnered with the Indian Institute of Technology, Madras, to set up a joint PhD program with funding from both the Indian and the German governments. If successful, such collaborations should be expanded across the country.

- Establish a supporting infrastructure and develop a technology commercialization strategy. Institutions should develop a comprehensive strategy with regards to intellectual property management. Moreover, applied research institutions should review Technology Transfer Offices (TTOs), if applicable, and benchmark their own performance to those of equivalent offices in other countries. Once a comparison is available, institutions can identify their “gap to benchmark” and actively work to minimize these gaps. Over time, institutions should target greater self-sufficiency through collaborative research, contract research services and technology licensing agreements. This would create an incentive to develop and commercialize high-quality research that industry can absorb.

#### Foster strong links with industry

Indian academic and research institutions will not achieve world-class standing until they are able to collaborate successfully with industry partners. To do this, a number of changes in current industry-academia collaboration models must be made.

- Develop industry liaison office within the institution. Applied-research institutions should introduce a dedicated cell to liaise with companies on research collaborations. This cell should work closely with technology-transfer offices, and can support research teams in defining the scope, nature and expected outcome of the collaboration.
- Create “professor of practice” positions. These faculty members with industry experience could help align academic research interests with industry expectations, while communicating industry trends and needs to ensure institutional R&D output is market-ready. Research institutions should also support faculty mobility into and back from industry, thus facilitating cross-learning and collaboration.
- Develop customized collaboration models with specific industry partners. Finally, academic and research institutions need to develop customized collaboration models with specific industry partners. Existing successful collaboration models on industrial R&D in India should be examined, leveraged and scaled. For instance, IIT Kanpur's collaboration with Boeing, which has been in place since 2008, could be studied and replicated in other industries by other institutions.

### 3. Government

In the past year, India's government has undertaken multiple policy initiatives aimed at improving the country's innovation ecosystem; the diligent execution of these initiatives is the next key step forward. Thus, our recommendations focus primarily on gaps in the current innovation-policy landscape. We believe the government should:

### Support academic institutions in develop-ing top talent

Two issues are of utmost priority in improving the quality of education outcomes:

- Facilitate performance-oriented culture at educational institutions: Working with state governments, the central government should sponsor a comprehensive assessment of each of the 700 universities in the country. The recently established National Institutional Ranking Framework rankings could be expanded for this purpose. The assessment should identify strengths and weaknesses, identify benchmarks, and assist institutions in developing an improvement plan that can be monitored and reviewed. Based on the findings of this assessment, policymakers should allocate more funding to academic and public research institutions. Policymakers should also modify teaching faculty and administrators' compensation structure in order to drive performance. The U.S. model of compensating teaching faculty for the academic year alone could incentivize faculty members to pursue research when courses are not in session.
  - Curriculum and pedagogical modifications: Public institutions such as the University Grants Commission and the All India Council for Technical Education should work with universities and colleges to modify curriculum and pedagogical styles. The goal should be to ensure they encourage interdisciplinary and cross-functional thinking, and meet industry expectations.
- Leverage global best practices, while also implementing novel approaches to strengthening the research ecosystem.
  - Actively support and drive cross-industry applied-research collaborations. While these are rare in India, there is ample precedent (e.g. Core-Group of Automotive Research (CAR)). More such consortia-based approaches should be tried in a variety of industries.
  - Develop research internationalization strategy. Countries such as Germany with state-of-the-art academic and research institutions offer a great learning opportunity for India. In this context, Indian policymakers should create a research-internationalization strategy, developing a clear and well-defined approach to achieving research-outcome goals by working with international partners. The government could propose alternative models of collaboration and help develop formal links with particularly advanced countries and institutions.

### Strengthen public research institutions

We believe the government should undertake four key interventions aimed at improving these education and research institutions:

- Develop a pilot program aimed at creating world-class institutions. The government should map the current research institution landscape, identify shortcomings and develop a customized blueprint for ten pilot institutions (three high performers, three medium performers, and four low performers). It should then create a customized milestone-based improvement plan for institutions, allocate public funding, and develop systems and processes to drive diligent execution. If successful, this can be replicated and scaled
- Formulate Bayh-Dole equivalent legislation suited to India's needs. While the impact of policies such as the Bayh-Dole Act have been pivotal in changing the landscape of industry-research collaboration in the United States, they may not apply as is in an Indian context. The government should also develop an Indian-appropriate research commercialization policy that is focused on creating adequate incentives for institutions, faculty members and researchers to conduct high-quality research. Policymakers should therefore be careful to address the specific weaknesses in the current system.

## B. Recommendations for Germany

India offers Germany (and other Western economies) diverse opportunities in the area of innovation. Below, we outline specific recommendations for German companies, academic and research institutions, and policymakers, all of which would enable them to capitalize on India's growing innovation momentum.

### 1. Companies

**View India as more than a market by leveraging India's R&D capability**

As a key, diverse emerging market, India is a natural location for German companies to develop, test, and launch innovative products and solutions for a variety of market segments. However, German companies with a sales or manufacturing presence in India should also consider an R&D presence in the country. In this case, a detailed R&D strategy for India, aligned with the company's global R&D strategy, would be necessary. Responsibilities given to the Indian R&D center could be increased over time. The center's employees should include local engineers and global talent in specialized areas. To ensure smooth functioning, executives should invest time and effort in building cultural affinity and professional respect between Indian and global R&D counterparts. Finally, the R&D center could take advantage of India's vibrant innovation ecosystem by collaborating with local start-ups, academic institutions and other multinational companies in the country. Examples such as Bosch, Siemens and SAP demonstrate how German companies can leverage the innovation ecosystem in India to create R&D engines that complement and even drive their global innovation agenda.

**Leverage and learn from India's competitive advantage: A frugal mindset**

German companies have much to gain from adopting frugal-innovation approaches, including access to new markets and segments. By adopting frugal-innovation approaches, companies can prioritize market pull over technology push, and focus on what is most important: the customer value proposition. This will be particularly important in developing products and services for emerging markets, and in preparing German firms for disruptive innovations from developing countries such as India or China. These products and services can be offered in India as a supplementary product line for different consumer segments, and exported to other budget-constrained emerging markets and price-sensitive developed-market niches. One way to do this would be for German companies to license frugal products from Indian companies and sell these in developed and other emerging markets.

## 2. Academic and research Institutions

**Capitalize on India's weak research outputs and industry-academia linkages in order to attract more Indian students and collaborate with Indian companies**

- Given the challenges present in India's higher education system, thousands of Indian students choose to pursue higher education abroad, preferring countries like the United States and the United Kingdom over Germany. German institutions, in conjunction with the German embassy, DAAD, and the DWIH should formulate a strategy to attract more Indian students
- Many Indian companies we interviewed lamented the lack of options for high-quality collaborations with Indian academic and research institutions. German institutions can capitalize on this opportunity by collaborating with Indian companies on research projects. The German House of Research and Innovation (DWIH), a consortium of German universities, research institutions and funding organizations, would be a natural middleman here, though it is not well-known in India. DWIH and the German embassy should therefore raise the institution's profile in India through a communications and marketing strategy.

## 3. Government

**Protect status as high-tech innovator by ensuring availability of highly skilled labor**

Demographic change in Germany threatens to produce shortages of high-skilled labor, thus placing the country's status as high-tech innovator at risk. For this reason, the government should formulate a skills roadmap in conjunction with its technology/innovation roadmap, with the aim of retaining and developing innovation-related skills. The country should also develop targeted immigration policies for highly skilled labor, particularly in areas where Germany faces skills shortages (e.g., computer science and software development, metal engineering and welding technology, automotive engineering, and power engineering).

**Strengthen internationalization strategy by increasing the scope of collaboration with developing countries such as India**

As new emerging-market competitors grow stronger, Germany should intensify nontraditional and new types of innovation focused on these markets. In this regard, Indo-German collaboration is still weaker than that with some other BRICS economies. Thus, Germany should identify areas in which it can deepen collaboration with India in the area of innovation. German policymakers should begin this exercise by identifying strengths within the Indian innovation ecosystem as well as potential areas for fruitful collaboration.

## C. Recommendations for Indo-German collaboration

### Explore and leverage the countries' complementary demographic profiles

Both India and Germany have a significant amount to gain from collaborating in the area of human capital. Germany needs young, skilled employees, while India needs access to specialized manpower, help with improving education outcomes and ultimately jobs for the millions of young citizens entering the workforce in the coming decades. With these imperatives in mind, policymakers from India and Germany should set up a comprehensive joint skills-exchange and skills-building initiative. This would require coordination between governments, academic institutions and firms in the two countries. On the German side, this would involve government institutions such as the Federal Ministry of Labor and Social Affairs (BMAS) and the Federal Ministry of Education and Research (BMBF). On the Indian side, this would involve the Ministry of Human Resource Development (MoHRD), the Ministry of Labor and Employment, the University Grants Commission (UGC) and the All India Council for Technical Education (AICTE).

Both governments would need to identify skills shortages and identify complementarities in their countries (e.g., India has an abundance of software engineers, while Germany has ample data scientists). Both governments would identify institutions producing graduates in these fields, and work to harmonize curriculum and skills standards in high-priority areas. A government-funded internet portal could allow companies to search for students based on current human-capital needs, enabling students to be placed in either country as needed.

This type of collaboration could be a game-changer for India and Germany. Both countries would gain access to needed workers. Companies would benefit from having the right employees to drive innovation. Moreover, Indian academic institutions could learn from German institutions and improve their educational outcomes.

### Support industry-academia links between India and Germany

While German academic and research institutions have an opportunity to forge promising research collaborations with large Indian companies, Indian policymakers want Indian institutions involved as well. We believe the Indian government should thus facilitate and support the development of Indo-German industry-academia collaborations. The Department of Science and Technology (DST) could fund and spearhead this support, with the Indo-German Science and Technology Center (IGSTC) driving implementation. Handled correctly, this could create tremendous learning opportunities for Indian research institutions, and strengthen industry research capabilities.

### Develop project-specific inter-industry Indo-German consortia

We recommend the establishment of an Indo-German Project Group (IGPG) to drive specific inter-industry projects across the two countries. Here, projects that leveraged the varied strengths of each country would be identified and selected, with a project-specific multi-stakeholder team established to manage them.

For example, Germany's Industry 4.0 initiative could be facilitated by an IGPG. Large German companies and large Indian IT companies working on related topics could be brought on board as "corporate champions." Academic and research institutions would pursue related applied-research and analytical work. The project group would identify the appropriate scope of the collaboration in consultation with the implementing agency, developing a plan and distributing tasks among members.

### Develop a bilateral start-up portal

Start-ups in the two countries could benefit from co-innovation, particularly in areas requiring cross-industry and functional skills. An exchange-oriented portal could also serve as a valuable platform for start-ups looking to launch operations in the other country.

Incubators from Germany and India could exchange information about their respective cohorts. A simple online platform can be set up to facilitate the sharing of information from each participating incubator and its cohort.

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