

SCIENCE AND TECHNOLOGY COMMISSION OF SHANGHAI MUNICIPALITY

China's commercial hub to lead scientific innovation

Shanghai has exciting plans for constructing a global centre to promote innovation in science and technology.

As China shifts from an investment and resource-driven economy to an innovation-driven growth model, science and technology are driving economic development. Like most countries, China is seeking to accelerate research innovation to gain an edge in today's increasingly competitive environment. Following the strategic plan for national development, Shanghai, one of China's most dynamic commercial hubs, is constructing a science and innovation centre to realize sustainable, knowledge-based development.

A coastal city situated at the mouth of the Yangtze River, Shanghai is a historical trading centre in China. In recent decades, it has developed into a global hub of finance, commerce and shipping. Shanghai is the biggest city in China with more than 24 million residents, and it has been leading China's economic development, achieving a total gross domestic product of more than 2.45 trillion RMB (US\$385 billion) in 2015.

However, Shanghai's economic growth has been slowing in recent years, as China makes an economic transition. In particular, following the global financial crisis in 2008, Shanghai's double-digit growth rate has ceased, and the gross domestic product (GDP) grew less than 7% in 2015. At the same time, Shanghai's demographic advantage is disappearing due to the ageing of its population, making it even more urgent to increase production rate through technological innovation.

Following an appeal by China's President Xi Jinping in May 2015, after a year



of research, Shanghai Municipal Government announced a two-stage plan for a global science and technology innovation centre. The first stage involves forming a basic framework for the centre by 2020, thereby laying a solid foundation for long-term development. The second stage is, in another decade, to build up core functions of an innovation hub, facilitating China's participation in global economic and science and technological cooperation and competition.

Shanghai stands out among Chinese cities if all the elements — R&D investment, research strength, attracting expertise, industrial infrastructure, financial capital, and economic, policy, and legal environment — are considered comprehensively. Shanghai's R&D input has been increasing: in 2014, it exceeded 3.6% of the city's GDP — nearly twice the national average. According to Nature Index, the research output of Shanghai's top ten institutions rivals that of Beijing's top ten. With a strong science and technology workforce, Shanghai hosts several key national projects, such as projects on the manufacture of gas turbines and aero engines, the development and launch of next-generation navigation satellites, and brain science and artificial intelligence. Backed by established state-owned en-

terprises that have harnessed advanced modern technologies, strong private companies are flourishing in Shanghai. Its open policies and newly established free-trade zone have induced more than 500 foreign enterprises to set up their headquarters in Shanghai, with nearly 400 foreign-funded R&D centres.

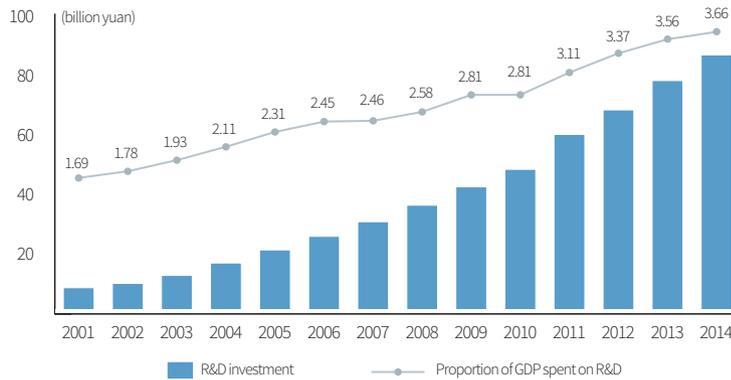
One of China's first state-level high-tech zones, Shanghai's Zhangjiang Hi-Tech Park, has attracted a large number of high-tech enterprises, including many foreign-funded R&D institutions, such as the Honeywell's R&D centre. Capitalizing on Zhangjiang's industrial base and technological resources, a comprehensive national science centre will be built there. Based on existing research strengths, focus areas will be on life science and biomedicine, integrated circuits, intelligent manufacturing and the Internet of Things.

The Shanghai Municipal Government is introducing institutional reforms and implementing policies to encourage mass entrepreneurship and innovation, facilitate research commercialization and attract talented scientists and entrepreneurs. Shanghai is already leading the dynamic development of the Yangtze River delta region — it is now ready to take a lead in national technological innovation endeavours.

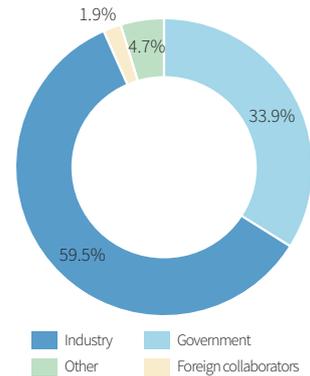
Science and Technology Landscape in Shanghai

A concentration on life sciences research, consistent increases in R&D investment and in technology-related transactions mark Shanghai's science and technology development.

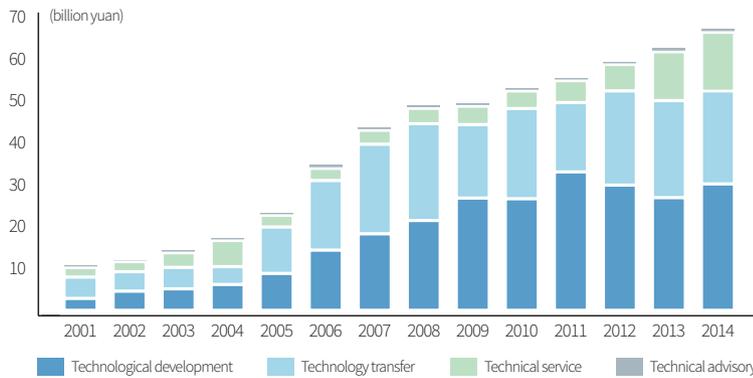
R&D Investment



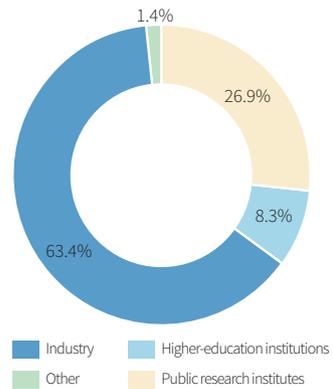
Sources of R&D, 2014



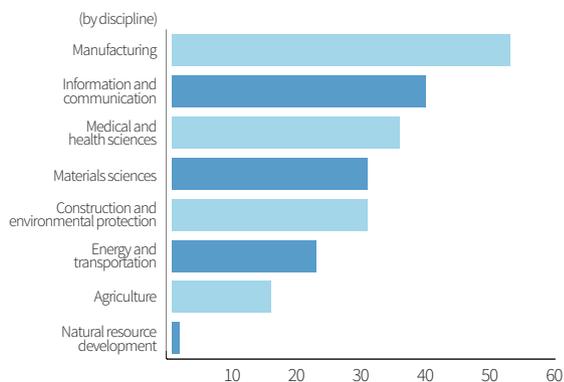
Amount of Technology Trading in 2014



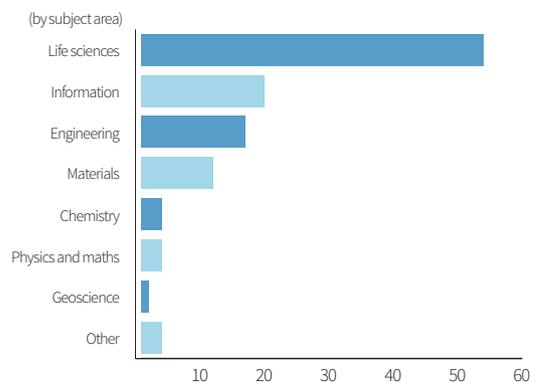
Spenders of R&D, 2014



Engineering Research Centres



Major Research Labs



Roadmap for the Shanghai Science and Technology Innovation Centre

Three key players discuss plans for transforming Shanghai into a global science and technology innovation centre and share their views on Shanghai's strengths and future challenges

Ziqi Shou: Director General of Science and Technology Commission of Shanghai Municipality

Xi Wang: Director General of Shanghai Institute of Microsystem and Information Technology (SIMIT), Chinese Academy of Sciences (CAS)

Jie Zhang: President of Shanghai Jiaotong University (SJTU)



Shou: In May 2014, Chinese President Xi Jinping visited Shanghai and encouraged Shanghai to build a science and technology innovation centre that will have a global influence. This is of national strategic importance. Today's economic competition is essentially a technological innovation race. Shanghai has one of the most comprehensive profiles of China's cities, with rich technological resources, strong technology transfer capabilities and a conducive economic environment with open policies. We are also creating a supportive ecosystem for innovation. We need to stimulate creativity and innovation vigour in the whole of society and adopt an innovation-driven development strategy to wrest the initiative in the new round of global technological competition.

Wang: I am glad that Shanghai Municipal Government is committed to developing the city into a science and technology innovation centre, which is bound to be a long-term process. It is important to institutionalize this development to ensure that policy making is sustainable and consistent. Among the many measures for institu-



tionalizing innovation, I think it is vital to implement policies to enhance the integration of capital and technologies. I hope the capital market can be mobilized to support research and development. We also need to recognize the risks involved and be tolerant of failures. Funders or investors need to be considerate of high-tech entrepreneurs, who are exploring innovative ideas

that are full of uncertainty. The government should introduce a mechanism for risk control in policy making, particularly when developing a high-tech innovation centre.

Shou: Indeed, constructing the innovation centre requires long-term, strategic planning. After conducting thorough investigations, Shanghai Municipal Government has laid out the objectives and major tasks. The focus will be to create a national science centre, build functional platforms for innovation, form clusters of high-tech innovation enterprises and encourage mass entrepreneurship and innovation. We have already formulated supporting policies relating to human resources, maker space, research commercialization, financial capital, intellectual property and so forth. These measures have yielded positive results.

Zhang: Shanghai has a unique advantage in that it attracts creative and talented people. We have more than 200,000 science and technology workers, 68 higher education institutions and dozens of national research institutes.



Our distinguished scientists and scholars are active in global academic exchange. But we need even more high-level experts to lead big science and interdisciplinary projects, particularly international-level leaders who can lead large teams in major international collaborative projects. The new visa and permanent-residency policies, with simplified administrative processes and relaxed requirements will certainly help to attract more overseas experts. Accompanying policies that assist incoming researchers with housing, medical and child education needs will make Shanghai a more competitive choice for top researchers. It is also crucial to refine our evaluation system to support the development of all sorts of talented people with technological innovation capabilities.

Wang: Shanghai is strong in the field of semiconductors. Its status as a financial centre, its solid industrial foundation and its rich economic resources give it an edge in this capital- and knowledge-intensive industry. Over a quarter of China's integrated circuit manufacturing is based in Shanghai. Having established the existing infrastructure, we can now focus on innovation. The Shanghai Industrial μ Technology Research Institute (SITRI) was founded by leveraging SIMIT's expertise in 'more than Moore' technologies, the established semiconductor industry and supportive policy environment.



The institute focuses on developing and commercializing more-than-Moore products. We are concentrating on developing chips that can be used in specific applications ranging from supercomputers and next-generation communication to smartphones and wearable devices.

Shou: Building a comprehensive national science centre in Zhangjiang is a key task in our two-step plan. Zhangjiang already hosts the over 1.2 billion RMB Shanghai Synchrotron Radiation Facility, the National Centre for Protein Science–Shanghai, the Shanghai Engineering Centre for Microsatellites, the Shanghai Science and Technology University, several Chinese Academy of Sciences institutes and other research centres. Taking Zhangjiang as the core, Shanghai will construct world-class infrastructure for big science and key technologies, promote integration of infrastructure building and cutting-edge interdisciplinary research, build cross-disciplinary and cross-domain collaborative innovation network, and explore new mechanisms to manage major scientific and technologic projects. The national government approved the scheme for the national science centre this February.

Zhang: The national science centre is not simply one site. It has a core area in Zhangjiang and also extends to other areas of Shanghai, with the goal of driving innovation by integrating the research power of Shanghai's higher education and research institutions. SJTU is actively participating in this effort. We are constructing the Tsung-Dao Lee Research Institute, focusing on frontier science, building a national lab on shipping and ocean engineering, establishing research stations on the site of the Shanghai Synchrotron Radiation Facility, planning infrastructure for key scientific projects, and promoting intelligent manufacturing and big data industry by upgrading the university's technology transfer services.

Shou: Functional platforms for innovation are essential for promoting collaborative innovation for the whole of society, reducing innovation and business start-up costs, and accelerating the realization of innovation values. While enhancing support to Shanghai Industrial Technology Institute, SITRI and National Eastern Tech-Transfer Centre, we will speed up the construction of platforms for graphene, materials genome, terahertz, quantum communication, biopharmaceuticals and precision

medicine. Furthermore, Shanghai municipality will promote the transformation and upgrading of public R&D service platforms.

Wang: It is really important to bridge fundamental research and technology commercialization, so that scientific research can fuel economic development. Good service platforms play a key role here. Based on collaboration between SIMIT, local government and enterprises, SITRI is essentially an incubator for high-tech technologies. We are grateful to the Shanghai Municipal Government for all the funding and policy support received. For me, the greatest support from the government has been the enhanced flexibility for fund allocation, which has allowed us to use funds more efficiently and attract more talented researchers. Moreover, allocating a larger share of profits from commercialized products to research teams has further motivated researchers to transform their technologies.

Shou: The solid foundation for building an innovation centre lies in a supportive environment in which people are encouraged to start up their own high-tech businesses and innovative ideas are fostered. We are developing maker space, providing and improving convenient services, and enhancing financial and fiscal support to gather all the elements needed for innovation, particularly, innovators from home and abroad. Currently, more than 450 related service agencies with various maker space and incubators have been set up. Also, a series of activities centred on technology

innovation and high-tech start-ups have been organized. We aim to invigorate more innovators with an open market, relaxed regulations and simplified administrative procedures, so as to accelerate socioeconomic development.

Zhang: Higher-education institutions play a key role in cultivating innovators. At SJTU, we place a lot of importance on teaching entrepreneurship and encouraging student creativity. We are among the first Chinese universities to establish an entrepreneurship institute, which provides students educational platforms and training courses on business development processes. The university also offers mentoring and financial support to students who are ready to start their own businesses, and this has resulted in several student-initiated start-ups being started. Moreover, we are implementing reforms to enhance the innovation capabilities of our faculty members, including an incentive system and refined faculty evaluation criteria. These efforts are also invigorating Shanghai's innovation environment.

