A research university with world-class capacity, often called a world-class university, is regarded as a central part of any academic system and is imperative to developing a nation’s competitiveness in the global knowledge economy. The Chinese government (in this chapter, China, or Chinese, refers to mainland China), with no exception, has stated its goal to develop a tertiary education system of international stature with a number of research universities and research centers of excellence. In response to this policy agenda and Shanghai’s strategic plans, Shanghai Jiao Tong University (SJTU), a leading Chinese university, is dedicated to achieving a quality standard that transcends national borders and to building itself into a world-class research and higher education institution. This chapter explores how SJTU has developed in the past 10 years in the context of the growing imperatives of the globalized knowledge economy and national policy directives.
National Perspectives and History

The development of world-class research universities has been a dream of the Chinese people that can be traced to the end of the 19th century, when a few of the earliest Chinese universities were established to promote higher education and to develop the nation. The specific goal to build up globally prominent universities has been strongly advocated over the past 10 years in China. The Chinese government adopted that goal as a national policy priority in 1998, and success is considered plausible in several regions of the country. First, the higher education expansion in the past 20 years has produced a great quantity of highly skilled workers. However, only one-tenth of the engineering graduates are qualified to work in multinational companies, according to the *McKinsey Quarterly* (Lauder, Brown, and Ashton 2008). Thus, China is unable to compete in higher-value industries. In that sense, research universities can develop knowledge and train talent to compete in the global knowledge economy (Wang 2008). Second, knowledge is the most important factor in developing a nation’s competitiveness in the era of the global knowledge economy. According to *The Global Competitiveness Report 2009–2010* (Schwab 2009), China, in general, showed progress in its economic development prospects; however, the report indicated that improvement was needed in the areas of higher education training, technological readiness, financial market sophistication, and innovation. Improvement, particularly of the competitiveness pillar of innovation, will depend on the role of research universities in creating and managing knowledge. Third, from the perspective of higher education development, China currently has more doctoral students enrolled in its universities than anywhere in the world. Despite the significant size by international standards, the quality of graduate education in China is still in doubt. The development of a number of world-class research universities can further enhance the overall quality of graduate education in the country. With this goal in mind, the government has launched a group of specific national initiatives, including the 211 Project and the 985 Project.

In 1995, the Ministry of Education and the Ministry of Finance issued a document called “The ‘211 Project’ Planning.” The 211 Project aims at developing 100 universities by the early 21st century that will take a leading position in the country’s economic and social development and in international competition. This national initiative focuses mainly on four aspects of development: disciplinary and interdisciplinary programs, digital campuses, faculty, and university infrastructure. The central govern-
ment, local governments, and selected universities themselves invested Y 36.83 billion (about US$5.44 billion)—Y 19.61 billion (about US$2.90 billion) in the first phase of the project (1996–2000) and Y 17.22 billion (about US$2.54 billion) in the second phase (2002–07). The total support from the central government was Y 7.84 billion (about US$1.16 billion). For the period 1996–2007, 45 percent of the total financial support was invested in disciplinary development, 29 percent in infrastructure development, 19 percent in digital campus development, and 7 percent in faculty development (Ministerial Office of 211 Project 2007). Currently, the 211 Project is in its third phase.

To further enhance the public funds for higher education, the government launched the 985 Project. That project again reflects the government’s goal and efforts to develop a tertiary education system of international stature. On May 4, 1998, President Jiang Zemin declared that “universities should play a critical role in implementing the strategy of invigorating the country through science, technology and education,” and “China should have several world-class universities of international standard.” To put this idea into practice, the Ministry of Education (1998) issued “The Action Plan for Education Revitalization for the 21st Century” and developed the 985 Project to establish a number of research universities and key research centers of excellence.

The 985 Project has thus far supported 39 selected universities, with financial investment from both the central government and the local government. The project has been implemented in two phases. The first phase ran from 1999 to 2001, and the second from 2004 to 2007. As stated in the accompanying policy document, nine of these universities, considered the “Chinese Ivy League,” were on the top of the list and were designated to be developed into “world-class” universities.¹ The remaining 30 institutions were expected to become “world-known” universities (that is, they would have a slightly lower level of achievement but would maintain an international reputation) (Ministry of Education 2008). The total financial support from the central government created Y 14.0 billion (about US$2.07 billion) and Y 18.9 billion (about US$2.79 billion), respectively, in these two phases. More than half of the central government funding in the 985 Project was invested in the top nine universities.

The 985 Project has provided the participating institutions with governance autonomy to improve their national and international competitiveness and to narrow the gap in academic achievement, research performance, and science innovation with other leading research
universities in the world (Liu, Liu, et al. 2003). Reforms have been carried out to develop the universities’ governance, in terms of administration, management, and staff capacity. Teaching and research have been improved. For example, the participating institutions focus on enhancing their specialized subject areas and on developing their capacity to meet world-class standards. Key national research bases for humanities and the social sciences and major national science and engineering laboratories were established to enhance future research. The top nine universities have also drastically increased the number and quality of their international publications. In turn, the top nine institutions have greatly improved their world rank. These experiences and achievements reached in the first two 985 Project phases are critical for the realization of further development in the third phase. More detailed data and cases in relation to SJTU will be examined later in the chapter.

In general, implementation of the 211 Project and the 985 Project has had significant effects on the development of higher education in China and of higher skills. The projects have created a culture of excellence and have built an awareness of international competition and competitiveness in Chinese universities. The selected universities have played an increasingly critical role, both in rejuvenating higher education as a whole and in implementing socioeconomic reform in China. Their development offers the opportunity for an open discussion to improve higher education quality and explore potential routes to build research universities in China.

**Overview of SJTU and Its Practices**

Founded in 1896, SJTU is one of the oldest universities in China. The Ministry of Education of China and the Shanghai municipal government jointly operate the university. It is one of the top five universities in China and one of the top two universities in the city of Shanghai, according to the recent major national rankings, and was selected as one of the top nine universities in the first phase of the 985 Project.

From the early to mid-20th century, SJTU was an engineering-focused institute, specializing in transportation, post and telecommunications, print technologies, and national security and defense. Nurturing top engineering talents, SJTU was known as “the Eastern MIT” in the 1930s. In 1956, it was significantly rearranged when the central government decided to transfer a large number of faculty members to Xi’an to build another top engineering school in Shaanxi Province, in northwest China.
Following this rearrangement, the university was officially named Shanghai Jiao Tong University. During the 1960s and 1970s, SJTU was affiliated to the Commission of Science, Technology and Industry for National Defense, developing relevant research and human resources in national defense. After a period of stagnation during the Cultural Revolution, the university was directly subordinated to the Ministry of Education in 1982. Since the 1980s, SJTU has been conducting a series of reforms and development efforts in governance, teaching and research, and infrastructure. Its subject areas have been rebuilt and expanded, and it currently boasts 21 academic schools and departments and 65 subject areas covering economics, law, the arts, social sciences, natural sciences, engineering, agriculture, medicine, and management. The university supports 60 undergraduate programs, 152 master’s programs, and 93 doctoral programs. At present, it has about 18,500 undergraduate students, 11,326 master’s students, 4,576 doctoral students, and more than 10,000 professional students. SJTU has 3,130 full-time teaching and research staff members, 65 percent of whom have a PhD.

In 1996, during its centennial, SJTU put forward a “three-step” plan to develop into a world-class research university by the mid-21st century. Since then, the university has been continuously creating and modifying a series of institutional strategic plans. The individual schools and departments were also required to create their specific developmental programs. The university denoted 2004 as “the year of strategy planning” and produced a policy for 2010 that focused on the medium- and long-term development of the university to become a comprehensive, research-oriented, internationalized higher education institution. The steps toward achieving world-class status include laying a solid foundation for SJTU’s further development into a research university by 2010, “breaking into” the top 100 ranking of universities by 2020, and achieving its overall world-class status and being well-positioned in the top 100 by 2050. Since 1998, SJTU has progressively developed in the areas of disciplinary development, teaching and research, science innovation, faculty quality, and financial resources. The following sections provide detailed analysis and evaluation of SJTU’s practices toward becoming a research university with world-class capacity.

**Strategic Plans and Goals**

At the institutional level, the establishment of a world-class research university requires strong leadership, a vision of the institution’s mission
and goals, and a clearly articulated procedure to translate the vision into concrete programs and targets (Salmi 2009). These steps play a critical role in commanding and guiding SJTU’s development. The university first proposed its mission and goals in 1996 and has designed and undertaken strategic planning accordingly. The Office of Strategic Planning, established in early 1999, is responsible for directing the institution’s line of development and policies. It was the first Office of Strategic Planning established among leading universities in China.

Trajectories of Ten-Year Planning

In early 1998, the Shanghai municipal government issued a report that clearly stated the goal of building and developing one or two universities with international stature in Shanghai to enhance the city’s global competitiveness. SJTU has been perceived as one of the top two universities in Shanghai; however, university leaders were concerned about its relatively poor academic performance, which might threaten its status among other higher education institutions. More than 30 leading professors in each of SJTU’s schools and departments were gathered to provide constructive suggestions to improve this situation. After three rounds of discussions, they proposed ideas to guide SJTU’s progress toward becoming a world-class university. The 985 Project, developed by the central government in May 1998, further strengthened SJTU’s determination to reform. The Office of Policy Studies was established in January 1999 and was made a specialized department responsible for planning the university’s development. Following the administrative structural reform, the Office of Policy Studies was renamed the Office of Strategic Planning in September 1999. Since then, the office integrates accountability, evaluation, and institutional research to outline direction for and to provide essential support to university leaders and other university divisions (a) to implement SJTU’s mission of building a university with a capacity for world-class research and education and (b) to improve the university’s programs and services.

The efforts were implemented on two levels in STJU. At the university level, the office benchmarked SJTU with its domestic peers, such as Fudan University, Nankai University, Peking University, and Tsinghua University. A range of performance indicators was identified at the university level, including subject areas, faculty structure, student capacity, research-funding investment, quality and quantity of publications, citation index, and other factors. At the second level, all departments and schools were required to analyze their own status quo and to set up their
own policies and performance indicators based on the university’s mission and goals. By doing so, each department and school clarified its responsibilities.

In 2004, the university concentrated on carrying out and modifying its institutional actions. This exercise encouraged SJTU to identify its status among universities in China and in the world, to define its developmental goals for the next five years (2005–10), and to seek paths and approaches to achieve these goals. The resulting “Strategic Plan for 2005–2010” was approved by the University Council, a management and administrative unit in SJTU (Li, Liu, et al. 2005). Five articulated strategies to translate the university’s mission and goals into a definitive process were constructed. The first concept is to develop the university capacity through improving the quality of faculty. The university aims to rapidly increase the number of internationally competitive faculty members and to improve the quality of managerial and technical staff members. SJTU strives to build a pool of leading scholars. The second concept is to strengthen the fundamental sciences by putting new approaches into place. SJTU seeks to employ scholars who formerly held leadership positions, to adopt a performance evaluation system, and to set up natural science foundations. Third, the university encourages interdisciplinary research in different subject areas. In response to the needs of national development and the cutting-edge sciences, SJTU intends to integrate various resources, restructure research organization, and create an interdisciplinary academic atmosphere. The fourth concept is to promote the institution’s internationalization. The university strives to improve its governance (a) by introducing advanced concepts and ideas from abroad and from highly talented personnel with international backgrounds, (b) by attracting international experts and those with doctoral degrees from world-class universities, (c) by encouraging the faculty to actively engage in international academic organizations and to participate in international collaborations, (d) by further developing international education for overseas students to China, and (e) by enhancing international collaboration and exchange programs to broaden students’ horizons. Finally, the university actively collaborates with the government, other Chinese universities, research organizations, and industries and seeks and integrates diversified public resources to serve the demands for socioeconomic development in Shanghai and in China.

After 10 years of such practices, SJTU has made progress. For example, compared with its performance in 1998, its teaching and research currently cover a wider range of subjects, which have allowed SJTU to
transition from an engineering-focused institution to a comprehensive university. The number of high-quality published papers written by SJTU staff members and students has increased tremendously, from 113 in 1997 to 2,331 in 2008 for SCI (Science Citation Index) publications, from 364 to 2,748 for Engineering Index publications, and from 2 to 59 for SSCI (Social Science Citation Index) publications. In terms of its profile and academic performance, SJTU regained its leading position in the Chinese higher education system.

At the beginning of 2008, the university was highly aware that the next five years, from 2008 to 2013, would be a crucial transition period. A new round of planning was begun after assessing the implementation of the Strategic Plan for 2005–2010. Eventually, the Strategic Plan for 2013 was drafted by the Office of Strategic Planning and approved by the University Council.

To carry out the plan and to enhance the quality of SJTU’s profile and academic performance to meet the world standard, the office benchmarked and evaluated the university’s performance based on its international counterparts. The performance indicators cover seven aspects: university, school, and department scale (for example, the total number of teaching and research staff members, undergraduate students, and postgraduate students), talent capacity building (for example, the proportion of international students, visiting scholars, and courses taught in a bilingual approach), leading academics (for example, the number of highly cited authors, editors for recognized international journals, and Chinese Science Academy members), internationalization of teaching and research staff (for example, the proportion of staff with PhD degrees from overseas institutions and with degrees from world-class universities, foreign staff, and the number of international conferences held in the school), research funding (for example, the amount of research funding from government-funded projects and the volume of international research collaboration), research achievements (the number of journal articles published in *Nature and Science*, the high-citation indicators, and the number of patent applications), and disciplinary development (for example, the number of key disciplines and of key national laboratories and research centers accredited with national and international recognition). As mentioned earlier, each department and school was required to create its own goals and performance indicators in the departmental strategic planning—a task related to its benchmarking and evaluation exercise. This exercise will be analyzed in detail in the section titled “Governance Structure and Management Reform.”
Elements of Strategic Planning and Challenges

George Keller (2006) identifies a range of elements of good strategic planning. Universities and colleges need to emphasize the policy of strong management and clear purposes for development, focus on cost and revenue seeking, adopt flexible strategies, widen their network for “clustering,” and look beyond strategic actions while avoiding too vast a structural change. These elements can also be seen in the development of SJTU’s visions and policies.

Strong management has been advocated in SJTU. The university leaders play a principal role in the planning process and have organized an expert group that forms a strong management team. The university organizes seminars, conferences, and workshops with both university policy makers and university faculty members for their opinion and revises the plans continuously. The enactment process combines strong leadership with faculty input and involvement and unifies different ideas, both top-down and bottom-up suggestions.

SJTU’s “three-step” goal also shows clear purpose, a planned sequence, and great flexibility. With carefully defined university goals and missions, a range of purposes and performance indicators are identified at both the university and the faculty levels. Time is an important factor in the activities of the aspiring world-class university (Salmi 2009). SJTU realizes that developing a culture of excellence is not a one-time exercise. The university’s mission and plans have sought an appropriate sequence of interventions and careful balance among the various targets. Steps have been taken to build world-class subject areas, departments, institutions, and then the university. The plans provide a solid foundation and sound operation measures to carry out the second phase of the 985 Project, playing a guiding role in SJTU’s strategy by providing a basic direction for the university’s development.

Another element can be described as “clustering” (Keller 2006)—that is, using and combining various supporting elements and resources to move toward excellence in STJU’s case. For example, the university invited experts from both inside and outside the university to design the procedures and policies. The internal expert panel consists of those with hands-on experience in managing the university: university leaders, directors of major management divisions, and deans of schools and departments. The external panel includes members from the China International Engineering Consulting Corporation. The external experts were expected to have an independent and critical view to analyze the university’s situations and to offer constructive suggestions and measures.
Finally, the program of action in SJTU has been highly cost-conscious. Funding has been carefully planned and allocated to different departments, institutes, and projects.

In spite of the university’s progressive development, SJTU also shares some challenges and problems with other universities in China. It is difficult to optimize the connection between current planning and unforeseeable changes in the future, because higher education, along with the society itself, is under rapid development. These transformations involve thinking about the future without predicting it or changes, which forms a potential challenge (Dobbins n.d.). To reach the desired future, the scheme must adhere to the university’s long-term goals and ensure adequate space for future development and for flexible modification if necessary. From the government’s perspective, few governance organizations or departments coordinate and organize the detailed tactics in Chinese higher education institutions. The relevant governmental department only proposes that universities implement the planning and, in reality, offers little guidance and requirements on how to implement such planning. Another possible restraint of these essential activities in SJTU or Chinese higher education is that little relevant literature or research is available on the value, methodology, procedures, and implementation of these policies. Likewise, little experience has been drawn from overseas counterparts.

**Governance Structure and Management Reform**

Strong leadership facilitates the development of a research university. Furthermore, implementation of strategic planning relies on effective governance and management systems of the university.

The governance structure of Chinese universities usually comprises administrative and academic units. The general management system adopted by universities can be summarized as the president taking charge of the university under the leadership of the University Council (Xi 2005; Li 2007). The organizational structure of SJTU comprises the president; Party secretary, whose function (except for Party affairs) is supposed to be equivalent to the chairman of a university board in Western countries; and deans of schools, departments, and research institutes and centers; as well as directors of administration divisions.

The university president is the legal representative of the university and the ultimate symbol of executive power. The president is usually appointed by the government or is elected by the academic community
and subsequently approved by authorities. This appointment system might prevent the university from selecting the most suitable leaders for its development (Zhao and Zhou 2006). In response to this situation, SJTU allows vice presidents and the president to share the authority and responsibilities for implementing policies and decisions made by the University Council regarding teaching, research, administration, and other issues.

**The Academic Council**

The power structures and boundaries of Chinese universities are not as clear as those of Western universities. More often than not, in the West, the academic council (for example, faculty senates), as the academic authority, generally plays a key role in the university management. The university president, as the council president, coordinates the administrative and academic power and implements the council’s decisions. At Chinese universities, academic power is usually superseded by administrative authority. From the university’s perspective, such an arrangement might promote efficient decision making and policy implementation.

To strengthen academic decision making, SJTU established its Academic Council in December 2008. The council aims to fully develop the roles of teaching and research staff, to strengthen academic management, to improve academic regulations, to enhance teaching and research quality, and to support SJTU’s development as a research university (Dong 2008). The Academic Council comprises four subject divisions—humanities and social sciences, physical sciences, engineering science, and life and medical sciences. The duties of the Academic Council include reviewing various policies regarding institutional development, creating academic standards, and consulting on major academic issues (Dong 2008).

**Benchmarking and Evaluation**

To maintain and strengthen its rapid development, SJTU realizes that it must review the university’s performance in a global dimension; that is, all aspects of university performance in SJTU—such as faculty quality, research excellence, and talent cultivation—should be evaluated and compared by international standards. This benchmarking approach organizes the overall goal of the university into specific performance indicators and, ultimately, enables the university to define its current position, to have clear goals and directions for future development, and to design measures accordingly. SJTU has carried out medium- and long-term department and school evaluation since 2007 (Liu, Yang, et al. 2008).
The first evaluation was conducted in the Department of Physics and the Department of Mathematics.

The evaluation exercise was to be conducted in three stages. Stage one was self-evaluation by each department. Departments prepared reports and materials on department indicators and their academic development, including academic environment, the international reputation of its subject areas, representative doctoral dissertations in the past five years, and other aspects. The reports were also to reflect the department's research and teaching capacity, compared to its counterparts, both at home and abroad. The departments were asked to predict their potential development in the future. In stage two, experts read the reports. Feedback was provided in stage three. The experts presented the evaluation results to the university management officials. According to the experts' feedback, each department and school planned their improvement and implemented new measures after approval by the university. The benchmarking and evaluation process allowed the departments to assess their current situation, compared to the national and international counterparts, and, in turn, to analyze their own strengths and weakness.

The evaluation process has had a significant effect on SJTU and on its departments and schools. The process has inspired changes and development in the university. First, the university has adopted the "international standard" as benchmarking for future evaluation. Although the notion of developing a world-class university was raised several years ago, few departments and schools can clearly define such a university. This medium- and long-term evaluation process has offered insight to understanding the concepts and ideologies. Second, the concept that "quality is most important" is reinforced. When analyzing the evaluation documents, SJTU puts great emphasis on quality indicators, such as world-famous professors, high-level research achievements, and influence of publications, while giving less significance to the quantity of published papers and of research funds. In addition, each department and school can list only five scientific research projects and their achievements in the self-evaluation report. In other words, the experts make judgments based on the representative research achievements. By doing so, faculty members are expected to focus on quality improvement and originality in their future research work. Third, for science departments in particular, the evaluation helps to form a clear understanding of the nature, orientation, and contribution of various fields of science. Through the evaluation process, faculty members have realized that fundamental sciences can play a significant role in enhancing undergraduate education and improving the
Campus Development

Campus development can be regarded as another aspect of the management reform in SJTU. At present, SJTU has five campuses in Shanghai—the Fahuazhen Road, Minhang, Qibao, South Chongqing Road, and Xuhui campuses. Initially, the main campus was located in the Xuhui district, one of the business and commercial centers in Shanghai. During the 1980s, space shortages and high-management costs in Xuhui prompted the university to begin investing heavily in the development of the Minhang campus, which is about 20 kilometers from Xuhui. After significant expansion during the 1990s, the Minhang campus became the main university campus in the early 21st century. The campus has also been equipped with advanced educational resources and facilities.

This campus restructuring laid a solid infrastructure base for adapting the university’s strategic development goals, improving teaching and research quality, and meeting the expanding enrollment (Zhou 2001). The campus development has also allowed for the integration of educational resources. For example, the School of Electronic, Information and Electrical Engineering had been scattered in five separate offices around the Xuhui campus, which inhibited the development of integrative and efficient management structures. In Minhang, the new building houses all those departments, facilitating internal management and communication and allowing the departments to share resources, to develop interdisciplinary research, and to pursue a coordinated external relations strategy. Also, the location of the Minhang campus facilitates university-industry cooperation. For example, SJTU has expanded its collaboration with the Zizhu Science-Based Industrial Park, which is located just south of the Minhang campus. This park includes the research and development centers of Intel, ST Microelectronics, Microsoft, and other high-tech companies.

Improvement of Faculty Quality

Since the late 1990s, various measures have been implemented in SJTU to improve faculty quality. Before 1998, SJTU had 1,753 teaching and research staff members, of whom only 25 percent had a professorship and only 15 percent had a PhD degree. The university has a series of programs to recruit academically talented scholars, including Chair Professors
Program, Distinguished Professors Program, Distinguished Researchers Program, and the Morning Star Program for young scholars. More specifically, faculty development has been conducted in four aspects: employment policies, promotion schemes, expert recruitment, and global recruitment.

SJTU has gradually strengthened the requirements and criteria for selecting faculty members since the 1990s. All academic staff members first employed by SJTU after 2000 are required to have a doctoral degree or the highest degree in the field. In addition, since January 1, 2010, the university has encouraged its departments and schools to employ staff with PhD degrees from research universities abroad or with overseas work experience. However, such focus on an overseas degree restrains the opportunities for elite applicants with only Chinese degrees. This recruiting policy can also undermine the value of Chinese higher education degrees.

Compared to previous policies, a new professorship promotion program (adopted since 2003) has set up two major differences regarding promotion and hiring practices. Rather than simply being promoted (on the basis of work experience and academic qualifications) to a higher rank, internal candidates must compete with external ones for higher positions. Since 2003, both internal and external applicants, at home and abroad, have been offered equal opportunities to compete for professorships and associate professorships. In addition, the program of professor promotion stipulates that applicants can apply for the same position (professor or associate professor) only once every two years, for a maximum of three times.

The university is actively engaged in attracting academic talent and experts, such as Changjiang Scholars, distinguished professors, and distinguished researchers. The university also promotes the Morning Star Program to encourage and attract young scholars. In addition, the Green Passage system provides a fast and prompt mechanism to respond to and deal with such applications. This system helps to quickly resolve issues—such as salary negotiation, welfare, and living expenses—that would have taken much longer by traditional procedures. After implementing this policy, for example, the university recruited about 70 scholars through the Green Passage system in 2008.

SJTU clearly stated within its strategic plan the goal to further develop global recruitment by end-2003. It first published about 400 vacancies on the Internet, including positions for 170 professors and 229 associate professors and 20 technical positions. Altogether, 961 applications were submitted.
received. By end-2004, vacancies involving 87 full professors and 210 associate professors were filled. More than half of those hired had studied or taught abroad for one year or more. It is worth noting that, by following the principle of “selecting the best,” SJTU prefers to leave vacancies unfilled rather than to fill them with inadequately skilled staff (Xiong 2004).

The recruitment measures discussed above have effectively improved the quality of faculty. First, the number of faculty members has satisfied the university’s need as it develops. At present, there are over 2,900 full-time faculty members, including about 700 professors and 1,200 associate professors, and the ratio of students to teachers is about 15 to 1 (Zhang 2008).

Second, the competency of faculty members has improved. In terms of qualifications, 85.4 percent of faculty members have master’s degrees and 64.4 percent have PhD degrees. In terms of special titles, SJTU has 33 academicians who are members of the Chinese Academy of Sciences and the Chinese Academy of Engineering, 72 professors and chair professors who are Changjiang Scholars, and 57 recipients of the National Outstanding Youth Fund. These high-level talents have contributed to the development of research excellence in SJTU.

Third, the number of university faculty members with international credentials has significantly increased. For example, the percentage of faculty members holding PhD degrees from foreign universities has increased from 5 percent in 2004 to 12 percent in 2008, and most faculty members have studied or taught abroad.

Despite the achievement of attracting high-quality faculty, the university realizes challenges and difficulties lie in such recruitment. Various recruitment measures and programs have been implemented to cater to the university’s demand for rapid development. However, such human resource management reform is relatively new in SJTU’s practice, with no previous lessons to draw upon. Policy adjustment and readjustment are required to respond promptly to issues such as working contracts, living environment, and other housing requirements (including the Shanghai housing registration system6). From the perspective of faculty members, financial remuneration might enable the university to attract qualified faculty. However, for the sake of economic benefits, conflicts can exist or be triggered among various groups. For example, conflicts may arise between overseas returnees and the domestically trained staff, as well as between recent returnees and those who repatriated many years ago (Liu 2010). How the university can help overseas returnee
scholars to efficiently build up their research network in Chinese academia remains another concern (SJTU 2010). There is little literature or experience to rely on in dealing with these challenges. The university and its Human Resources Division realize that further research, discussion, and communication with faculty members are necessary (SJTU 2010).

The university aims to develop a world-class faculty by 2020, with a group of academicians and talented young people who are in great demand for national strategic development and who participate in international cutting-edge research of science and technology. More specifically, it will continue to adjust and improve its faculty structure, with an estimated target of 3,400 full-time teachers, more than one-third of whom are at the world-class level. The university will continue to focus on attracting highly talented individuals, with an estimated target of 200 academicians who are members of the Chinese Academy of Sciences and the Chinese Academy of Engineering, 400 distinguished professors, and 800 distinguished researchers.

Encouragement of Academic Discipline Development and Research Excellence

SJTU aims at developing into a comprehensive research university that covers 12 disciplinary fields: natural sciences, engineering, medicine, management, law, economics, agriculture, social sciences, humanities, education, history, and military studies. To further promote quality education and consolidate university capacity, the university has been continuously developing its academic discipline focus and structure and encouraging its research excellence.

Development of Academic Disciplines

Throughout SJTU’s history, the university has focused on science and technology subjects. To strengthen its academic dimension, SJTU has taken various approaches to develop different subject areas.

With governmental support, the university promoted mergers with an agriculture university and a medical university in the region in 1999 and 2005, respectively, with the explicit goal of evolving into a larger and more comprehensive research university and enriching its academic disciplines. These mergers enable the participating institutions to share teaching and research resources, consolidate academic capacity, and improve their international prestigious reputation. Challenges that arise when undertaking a
merger include conflicting needs and interests and clashing academic cultures (Salmi 2009). However, SJTU has greater chances for success because the push for mergers is occurring within the context of the participating institutions’ common goal to create the world-class academic culture and transformation of vision, which in turn brings about internal coherence. In addition, SJTU has ensured relatively independent management in the other two institutions.

Since 2007, the university has proposed new goals and strategies for the development of its academic disciplines. The methods include sustaining the eminence of its flagship departments and their disciplinary development, strengthening its basic disciplinary programs and departments, providing its feature disciplines with special provisions, bolstering underperforming departments and their disciplinary development, and encouraging interdisciplinary research. The university has particularly focused on the strategy of bolstering underperforming departments and their disciplinary development, such as social sciences subjects.

Relatively weak development of social science disciplines has become a bottleneck problem that prevents science and technology institutions from joining SJTU to develop into a comprehensive university. In addition, the majority of the top management staff has a science and technology background. To some extent, this characteristic is favorable for the development of the science disciplines (for example, in terms of teaching and research resource allocation). However, it also restricts students from gaining a more comprehensive education (Ma and Chen 2005). Under these circumstances, the Social Sciences Administration Office was set up in 2002 to develop and manage social sciences disciplines, to organize research-funding applications for social sciences subjects, to advance academic culture, and to coordinate the journal publications. The office proposes specific principles to develop social sciences–related disciplines—that is, strengthening the basic and special role of social sciences in SJTU’s disciplinary development, introducing leading professors from China and abroad in the social sciences fields to build research capacity, promoting diversified research to serve the societal needs, and developing international partnerships with institutions around the world to learn from its counterparts.

With these policies and strategies, the academic disciplinary structure has been expanded and enriched and its quality has been improved. In the National Evaluation of Academic Disciplines, SJTU has 6 disciplines ranked among the national top 3 and 11 disciplines ranked among the top 10.
**Encouragement of Research Excellence**

SJTU encourages its faculty to conduct research at an international level. The university strives to integrate research achievements with the development of key enterprises, to work closely in the development of future industries, and to aid in the construction of an innovation system in China. The university is also engaged in the advanced study of international issues and advises the government in policy making. Through knowledge transfer, the university endeavors to solve scientific and technological issues in industry development and to inspire the research and talent development of the university. Specifically, the university has adopted four main options—rewarding international publications, supporting research of an international standard, encouraging applied research and technology transfer, and using research resources for talent development to enhance its research excellence.

**Rewarding international publication.** Publication in internationally published journals and books has been significant in the evaluation of research excellence in China. SJTU also has proposed policies and regulations to improve the quality of papers published. First, a policy to reward papers indexed in SCI was issued in 1999. A reward of Y10,000 (about US$1,480) is offered for each SCI paper, of which 90 percent funds further research and 10 percent is a financial reward for the researcher. Second, the Graduate School of SJTU issued a policy that requires all doctoral students in science and engineering to publish internationally. Thus, students pursuing a PhD in sciences must publish at least one SCI paper, and students pursuing a PhD in engineering must publish at least one SCI paper or one paper in English indexed in the Engineering Index, before they may apply for a doctoral degree. Moreover, the policy states clearly that only a published paper with the student’s name as the first author can be counted as one full paper. Further papers cannot be counted if the student is the third or latter author. This policy has subsequently been adopted by other departments and schools. Third, the university has focused on the quality of the published papers, rather than the quantity. For example, the number of SCI papers increased to 2,331 in 2007, reaching similar standards as some top 100 world-class universities. The stature of publications also increased to some extent, but still lagged those of other world-class universities (Zheng 2008). Great emphasis has been placed on developing high-quality and innovative research to inspire further development in specific subject areas as well as at the university in general. To encourage quality publications and
improve their international influence, in 2007 SJTU introduced a new reward and evaluation system for papers. The new system decreases the reward for SCI and Engineering Index papers of average quality (Y 1,000 [about US$148] for each SCI paper and Y 800 [about US$120] for each Engineering Index paper), while high-quality papers with more influence are rewarded as before (SJTU 2006).

**Encouraging applied research and technology transfer.** The university encourages research achievements and technology transfer and provides advice on governmental policy making and local economic development. It encourages faculty members to commercialize their patents through its establishment of a technology transfer center, creation of a patent information platform, and permission for the faculty to invest personally and benefit from this commercialized investment. Technology transfer has brought many economic benefits and promotes the development of future technologies. With the support of the 985 Project throughout the decade, the team members of a research and development project based on a high-definition television functional prototype system have contributed significantly to that technological development in China.

In addition, SJTU emphasizes the development of social science research. As a result, the university consults with the government and local organizations regarding regional and community socioeconomic development. For example, the Graduate School of Education of SJTU has conducted a series of influential government consultations on building world-class universities and developing science and technology policy. Since 2003, the school has published the Academic Ranking of World Universities annually, which has received wide recognition from the international community (SJTU 2008).

**Using research resources for talent development.** SJTU has strived to enhance its research resources by greatly increasing the level of research funding, collaborating with industry and other research institutions, and promoting higher education and research standards at undergraduate and graduate levels. These approaches have been highly recommended by experts from the Ministry of Education.

The university has established experimental programs and courses for undergraduate education and professional education with high-quality resources and facilities. Additionally, research has been integrated into teaching and learning. The university developed 400 comprehensive and innovative courses, accounting for 85 percent of the total number of the
experimental courses. It has also increased its investment in the teaching of experimental programs and implements Participation in Research Program projects and innovative research projects for students. As a result, students’ innovation skills have constantly improved, and they have shown their talents in science and technology competitions. In 2010, an SJTU student team won the world championship in the ACM (Association for Computing Machinery) International Collegiate Programming Contest.

STJU takes advantage of university-industry research collaboration in postgraduate education. This university-industry partnership, a relatively new development in Chinese higher education, provides crucial support to improve university development and to build a world-class university (Ma 2005). The long-term goal of these partnerships is to improve the quality of postgraduate education by integrating theory into practice. University-industry research collaboration enables students to develop their innovation skills and to gain hands-on experience (Shen et al. 2009). SJTU has established several university-industry research collaboration programs. Supported by Zizhu Science-Based Industrial Park and other research-based enterprises, the university is further developing its postgraduate education programs. Students are offered internship opportunities on important projects run by the enterprises. At the same time, experienced engineers in industry are invited to teach and supervise postgraduate students at SJTU.

For example, since 2004 SJTU has been developing its partnership with the Shanghai Baoshan Iron and Steel Company. Experts from the company are invited to supervise graduate students, and the company’s technology staff is actively engaged in teaching and helping students. In the past five years, this collaborative program has trained 79 master’s degree students and 13 doctoral students, and 50 experts have participated in teaching and supervising. According to the SJTU’s self-evaluative report in 2009, an increasing number of students have chosen to study with experts from industry (SJTU 2009).

This education and training model has been affirmed by the Ministry of Education and the Shanghai Education Commission and was selected as part of the 2003–2005 Graduate Education Innovation Plan. The local government has advocated developing this model at other universities across Shanghai.

Promotion of Internationalization Strategies

A university can transform into a research university by using internationalization strategies effectively (Salmi 2009). SJTU has worked extensively
to provide training of innovative talents with international competitiveness and to establish an international-standard higher education system with advanced education concepts. Specifically, the internationalization strategies are designed in relation to students, faculty, research, and programs. The policies regarding faculty and research development have been discussed earlier. The following analysis will focus on the aspects of students and programs.

**Bilingual Teaching and Learning**

Bilingual education has been advocated in SJTU since 1998. It is intended to improve students’ English-language skills as well as their Chinese-language skills. From 1998 to 2005, about 135 bilingual courses were offered to 11,000 students by 132 teachers. These bilingual courses represented approximately 10 percent of the disciplinary courses offered by SJTU. This proportion increased to 15 percent by 2010 (SJTU Team for GEE 2006). Also, special financial support is offered for bilingual courses. For example, each new bilingual course will receive total support funding of ¥5,000–¥8,000 (about US$740–US$1,180). In addition, SJTU students are required to take a minimum of 16 credits of English-language courses (SJTU 2007). However, little research has been conducted on the effectiveness of the delivery of bilingual courses in the university. It would be useful to investigate how staff members deliver bilingual teaching and how students experience such teaching and thus to explore any gap between the policy orientation and its implementation.

**Summer Schools, Exchange Students, and Internships**

To broaden the international experience of its students, the university offers a series of programs that encourage and support students at all levels to study in and visit foreign nations.

At the undergraduate level, the university offers various study tours and helps elite students participate in degree programs abroad and in semester-long study-exchange programs, three-month overseas internships, and summer training programs with foreign universities. SJTU hopes to provide various opportunities for students to travel the world and experience different cultures. The university believes that such international opportunities will enrich the study and work experience of students, making them more internationally competitive. Up to 2008, 19.4 percent of SJTU undergraduate students participated in those study tours. By 2010, the number had increased to 25 percent.” According to the university’s strategic plans, the number is expected to increase to
50 percent by 2020 (SJTU 2007). In addition, for those students who might not be able to afford such study opportunities, the university has offered scholarships since 2008. This is SJTU’s first financial support in China to help undergraduate students with financial difficulties study abroad (SJTU Educational Affairs Office 2009).

SJTU is the first Chinese university to be awarded the International Association for the Exchange of Students for Technical Experience (IAESTE) Scholarship for Overseas Internship. The IAESTE scholarship program offers grants to junior and senior undergraduate students as well as to postgraduate students in the fields of chemical engineering, chemistry, materials, master of business administration, and financial management (SJTU Educational Affairs Office 2007).

At the doctoral level, the university encourages students pursuing a PhD to visit and study at world-class universities to engage in cutting-edge research, to enhance their research capacity, and to improve their international competitiveness (SJTU Graduate School 2007). Selected students will be granted scholarships by SJTU—including tuition fees, travel costs, and living expenses—and will be jointly monitored by their supervisors in SJTU and abroad. Currently, 15 percent of SJTU’s doctoral students have had such experience.

According to research conducted by SJTU’s Graduate School of Education, students who studied abroad were satisfied and shared positive feedback on their international experience and its influence on their university (Yang et al. 2008). In 2008, 46.3 percent of these students perceived their international experience as a great opportunity for learning cutting-edge knowledge in their field, compared with only 7.4 percent of students who claimed no influence at all; 47.9 percent of students strongly believed they improved their language abilities through the programs, compared with only 5.3 percent who did not agree; 41.5 percent of students were highly aware of their enhanced confidence as a result of the activities, compared with 7.4 percent of students who did not feel the same. Also, 39.9 percent of students found consideration for other cultures.

**Dual Degree Programs and Joint Institutes**

SJTU is actively engaged in collaborating with internationally prestigious universities by forming dual degree programs and joint institutes. Exploring and using optimal educational resources, the university aims to learn from other research universities with world-class standards, to draw reference to those institutions’ governance and management, to experience
their curriculum design, and to develop a high-skilled workforce with international competitiveness.

The dual degree programs include SJTU’s collaboration with the Berlin Technical University, École Centrale (Lille, Lyon, Marseille, Nantes, and Paris), École des Mines de Nantes (France), Georgia Institute of Technology, and University of Michigan. In 2007, SJTU also cooperated with the Massachusetts Institute of Technology to launch the China Leaders for Manufacturing program (Tong 2008). In China, it is the first and the only degree program at the graduate level for training the next generation of leaders for manufacturing industries (SJTU Team for GEE 2006).

SJTU encourages its departments and schools to collaborate with overseas universities and institutions. Under this policy, a few joint institutes have been built. For example, an agreement to reconstruct SJTU’s School of Mechanical Engineering in collaboration with the University of Michigan was signed in August 2000. The project aimed at further developing the School of Mechanical Engineering into a world-famous institute. A “4+2+3” model (four-year undergraduate, two-year master’s degree, and three-year doctoral programs) was proposed in the agreement. In 2006, the two universities set up the University of Michigan–Shanghai Jiao Tong University Joint Institute, which has been a successful collaboration between a Chinese and a world-class university (SJTU 2009).

In addition, other joint institutes have been built. For example, the Sino-US Environmental Law Teaching and Research Center, in collaboration with Pace University, intends to build long-term academic exchanges with other elite universities. The collaboration between Columbia University and SJTU’s School of International and Public Affairs has developed their long-term strategic partnership to train master of public administration personnel highly demanded in the era of globalization (Du 2008).

SJTU’s internationalization strategies have also extended overseas. The university’s master of business administration programs have been conducted in cooperation with educational institutions in Singapore for 14 years, yielding more than 400 graduates. In 2002, SJTU was approved by the Ministry of Education to set up its overseas campus in Singapore. It is the first overseas university campus established by a Chinese university. At the same time, SJTU is the ninth university with which the Singaporean government would like to build up global collaboration.

**Meanings of Internationalization**

In summary, the internationalization strategy has been integrated into all aspects of SJTU’s development, including activities and programs in
students’ capacity building, discipline development, curriculum design, teaching and research resources, and governance and management. In the past, the internationalization strategy focused on a wide range of only import-oriented activities. But SJTU now aims at developing an in-depth mode of internationalization, with both import-oriented and export-oriented activities and programs. For the university’s development, the internationalization policy suggests drawing reference from other world-class universities’ experience, integrating different concepts of university governance and management, introducing international standards to improve quality in all aspects, and raising awareness of global competition and of cultural diversity among staff members and students.

Diversification of Financial Resources

Like other state universities in China, SJTU’s funding comes from diverse resources—government funding, research income, tuition fees, university-run enterprises, and donations from both individuals and social organizations.

Both central and local governments allocate regular educational funding to national universities based on the number of students (Liu 2009). SJTU’s regular educational funding is allocated mainly by the central government.

Selected as one of the key participating universities, SJTU has been awarded extra funding by the 211 Project and the 985 Project. Funding from the 211 Project targets three main areas—improvement of institutional research capacity, development of key disciplinary areas, and development of digital campus and infrastructure. The 985 Project funding supports university activities in the following major areas: research capacity building, infrastructure and campus development, talent recruitment and faculty development, and international collaboration. Within the central government funding, 25 percent has been invested in faculty development, 60 percent in research capacity development, 5 percent in undergraduate and postgraduate teaching, 5 percent in digital campus development, and 5 percent in international collaboration.

Research income is another funding source for SJTU. Research is largely supported by government agencies and the industrial sector for development of the university’s research capacity. Since the reform of cost-sharing in the higher education sector, tuition fees have been introduced. They now account for a significant proportion of total university revenue. Donations and other sources of private support to SJTU have
also become a significant source of university revenue. Many of SJTU’s new buildings have been financed with donations from alumni or social celebrities. Furthermore, the Beijing Zizhu Pharmaceutical Co., Ltd., a private business enterprise, has offered the university about ¥1 billion in financial support. This amount is the largest single donation to a university by a private business enterprise in China.

The total budget of SJTU has more than quadrupled in the past 10 years. For a typical year, SJTU’s revenue comprises 20 percent regular funding from the government; 20 percent special funding from government initiatives, such as the 985 Project and the 211 Project; 30 percent research income; 20 percent tuition fees; and 10 percent other resources, including donations and income from university-run enterprises.

Conclusion

Constructing research universities is a thought-provoking and time- and resource-consuming endeavor for any institution in any country (Shi 2009). There is no universal formula for developing such universities (Salmi 2009). SJTU has turned its particular conditions into opportunities for the establishment of a research university at an international standard and has made significant progress in many aspects.

The university has changed its management style, from traditional administration to strategic management. This modification enables SJTU to envision the most worthwhile future, to create a bold vision of mission and goals, and, accordingly, to design a series of procedures as blueprints for daily activities. The university takes into account the external environment as well as SJTU’s organizational capabilities, overall purposes, and development direction and integrates different management activities, such as medium- and long-term performance evaluation of schools and departments, diversification of financial resources, and innovative employment policies.

The focus of SJTU’s development has shifted from domestic to international standards and from domestic to international competition. Recognizing the gap between SJTU and international elite universities, SJTU has encouraged its schools and departments to benchmark their performance with that of their international counterparts, to evaluate their performance by international indicators and standards, to foster research to engage in the international academic world, and to recruit globally for faculty with internationally recognized credentials to strengthen its human resources. These tactics enable SJTU to examine
any differences with other research universities and to establish clear targets to close these gaps.

The emphasis of SJTU’s development has changed from quantity oriented to quality oriented and from infrastructure building to enhancement of teaching, learning, and research. For example, SJTU now encourages and rewards faculty members and students for quality papers published in top international journals in relevant fields, whereas the university previously encouraged and rewarded them simply for the number of their papers appearing in international publications.

Despite its progress, SJTU’s desire to further develop and to achieve its goal of becoming a research university involves a long road ahead. SJTU needs to focus on establishing the long-term global vision of a world-class research university, supported by specific short-term goals, needs, and perspectives. Another challenge is to transform SJTU’s organizational culture into a true quality culture, instead of an indicator- or ranking-oriented approach. Although achieving particular rankings is mentioned in the university vision, development needs to focus on improving the quality of education, research, and services.

Notes

1. These top nine universities, selected in the beginning of phase one of the 985 Project, are Fudan University, Harbin Institute of Technology, Nanjing University, Peking University, SJTU, Tsinghua University, University of Science and Technology of China, Xi’an Jiaotong University, and Zhejiang University.

2. For papers written by these nine universities’ staff members and students that were published internationally, the average number indexed in the Thomson Scientific Database increased to 2,400 in 2008, 10 times more than in 1999. The performance of staff members and students has also improved significantly, in terms of highly cited researchers and published papers in Nature and Science.

3. For example, according to the Academic Ranking of World Universities (SJTU 2008), the number of Chinese universities in the top 300 increased from 0 in 2000 to 6 in 2008, and the number of Chinese universities in the top 500 increased from 4 to 18 in the same period.

4. These journals are indexed by the Social Sciences Citation Index, the Science Citation Index Expanded, and the Arts & Humanities Citation Index.

5. Most of the Party secretaries, in practice, are directly involved in the university’s daily management and administration. In some cases, they act like copresidents.
6. The housing registration system is a residency permit system. All individuals must be registered as residents of a particular city, town, or village. Through this registration system, they have access to services such as health care and schooling.

7. According to SJTU’s documents and information, its flagship departments include engineering, life sciences, and economics and management; its basic discipline is natural sciences; and its feature departments include law, agriculture, social sciences, and humanities. The social sciences and humanities departments are considered relatively underperforming in SJTU’s disciplinary development; however, these departments have a range of specialized disciplines and thus play an important role in SJTU’s development into a world-class research university.

References


