On Transformation of Development Mode of University Science and Technology Under Economic “New Normal”

Tao Lin & Naihua Gu
Jinan University, Guangzhou, Guangdong, China

ABSTRACT: A periodic load balancing method is proposed according to the load imbalance of network server in a clustered system of high concurrency. It is divided into different load periods based on the load condition of server node. Corresponding load balancing strategy is adopted for each period that the strategy of fast select is used in the period of small load while the server node with stable response time is first adopted in the period of large load. Periodic load strategy avoids the load imbalance caused by the single load strategy. It can be known from the experimental comparison that the improved periodic load balancing strategy is superior to the load balancing strategy of weighted least connection.

Keywords: economic “New Normal”; university science and technology; transformation

1  INTERPRETATION OF THE ECONOMIC “NEW NORMAL”

The financial crisis has left a more complicated international economy as well as increasing periodical problems to China. This has pushed the country into the “New Normal”, which has installed a shift from the previous high-speed growth to the medium-high of about 7%\(^1\), as the rate of the 12\(^{th}\) Five-Year Plan. It is endogenous in nature. The global factors and crisis has triggered a series of economic changes, but what has brought up the New Normal has rooted deeply waiting to be dug out.

The fundamental changes of population structure shall be considered as the first element attributed to the New Normal. The absolute number and proportion of laboring population aging from 15 to 59 have been declining since 2012. The dependency ratio of population was picked up again after a fall. During the 13\(^{th}\) Five-Year Plan, according to the result of population prediction of UN, the work force between 15 and 59 years old will continue to fall as the consistent down-

\(^{1}\)World Bank (2012) predicted that the potential growth rate of China’s economy from 2016 to 2020 will be around 7%. Liu Shijin and Zhang Junkuo et al (2011) noted that it would meet a drop by 6.5%-7.3% around 2015. Cai Fang and Lu Yang (2012) saw that the potential growth rate of China’s GDP would decrease to 6.08% from 2016 to 2020.
ward as in the 12th one. The absolute number will be cut down by around 80,000 to 750,000, where the drop will be 0.93%. Given the limited labor supply and the wearing-off rural labor, the capital returns are diminishing and ROI (return on investment) significantly decreasing. It is foreseeable that China will go through a deceleration of economic growth.

The second reason for the New Normal is that the service-oriented economic structure is coming into shape. Having fulfilled the basic necessities of life, both urban and rural residents are further invigorating their needs for culture cultivation, entertainment, healthcare, and leisure activities. The tertiary industry has expanded its proportion in the structure to a larger share than the secondary industry suffered from lower labor productivity. Clusters of higher quality workforce are recruited to the advanced industrialized processes, while a great quantity of inferior labor is dislodged to the service sectors where informal employment is ubiquitous. This has resulted in a passive expansion of tertiary industry and a relatively lower productivity so that the economic slowdown is inevitable.

It is unsustainable for export-oriented economy to participate in international division of labor with low cost. As a developing country, China has proved its advantage in surplus labor sufficiency and other low-ended competitive edge caused by incomplete pricing. With the economic transformation, low-priced production factors are losing its position. The industrial structure needs to readjust itself in the evolved framework. It is obliged to focus on improving the economic welfare both at home and abroad to build a new industry based on fairness and openness in the near future.

The focus on domestic economy in the years to come is to seize growth rate stabilization, structure adjustment and risk prevention. The major countermeasures for them are: continuous advance for adjustment of economic structure and industrial transformation and upgrading by boosting modern service industry, optimizing advanced, especially high-end manufacturing industry. The twin is considered as two “driving wheels” of the new development pattern. The second approach is to propel the development of east-

<table>
<thead>
<tr>
<th>Beijing</th>
<th>Tianjin</th>
<th>Hebei</th>
<th>Shanxi</th>
<th>Inner Mongolia</th>
<th>Liaoning</th>
<th>Jilin</th>
<th>Heilongjiang</th>
<th>Shanghai</th>
<th>Jiangsu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>0.89</td>
<td>0.81</td>
<td>0.87</td>
<td>0.70</td>
<td>1.07</td>
<td>0.89</td>
<td>0.77</td>
<td>0.87</td>
<td>0.86</td>
</tr>
<tr>
<td>1995</td>
<td>0.77</td>
<td>0.76</td>
<td>0.61</td>
<td>0.58</td>
<td>1.00</td>
<td>0.67</td>
<td>0.62</td>
<td>0.80</td>
<td>0.53</td>
</tr>
<tr>
<td>2000</td>
<td>0.62</td>
<td>0.60</td>
<td>0.48</td>
<td>0.47</td>
<td>0.73</td>
<td>0.40</td>
<td>0.37</td>
<td>0.53</td>
<td>0.51</td>
</tr>
<tr>
<td>2005</td>
<td>0.41</td>
<td>0.46</td>
<td>0.56</td>
<td>0.42</td>
<td>0.54</td>
<td>0.33</td>
<td>0.29</td>
<td>0.46</td>
<td>0.34</td>
</tr>
<tr>
<td>2010</td>
<td>0.35</td>
<td>0.35</td>
<td>0.55</td>
<td>0.34</td>
<td>0.39</td>
<td>0.24</td>
<td>0.27</td>
<td>0.35</td>
<td>0.32</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>Anhui</td>
<td>Fujian</td>
<td>Jiangxi</td>
<td>Shanghai</td>
<td>Henan</td>
<td>Hebei</td>
<td>Hunan</td>
<td>Guangdong</td>
<td>Guangxi</td>
</tr>
<tr>
<td>1999</td>
<td>0.77</td>
<td>0.60</td>
<td>0.75</td>
<td>1.09</td>
<td>0.70</td>
<td>0.85</td>
<td>0.66</td>
<td>0.85</td>
<td>0.62</td>
</tr>
<tr>
<td>1995</td>
<td>0.36</td>
<td>0.47</td>
<td>0.43</td>
<td>0.52</td>
<td>0.47</td>
<td>0.51</td>
<td>0.39</td>
<td>0.41</td>
<td>0.41</td>
</tr>
<tr>
<td>2000</td>
<td>0.27</td>
<td>0.39</td>
<td>0.39</td>
<td>0.35</td>
<td>0.37</td>
<td>0.48</td>
<td>0.26</td>
<td>0.33</td>
<td>0.38</td>
</tr>
<tr>
<td>2005</td>
<td>0.34</td>
<td>0.48</td>
<td>0.39</td>
<td>0.36</td>
<td>0.32</td>
<td>0.42</td>
<td>0.24</td>
<td>0.31</td>
<td>0.34</td>
</tr>
<tr>
<td>2010</td>
<td>0.39</td>
<td>0.42</td>
<td>0.38</td>
<td>0.36</td>
<td>0.31</td>
<td>0.41</td>
<td>0.28</td>
<td>0.28</td>
<td>0.33</td>
</tr>
<tr>
<td>Hainan</td>
<td>Sichuan</td>
<td>Guizhou</td>
<td>Yunnan</td>
<td>Shaanxi</td>
<td>Gansu</td>
<td>Qinghai</td>
<td>Ningxia</td>
<td>Xinjiang</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>1.00</td>
<td>0.63</td>
<td>0.51</td>
<td>0.51</td>
<td>0.80</td>
<td>0.66</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
</tr>
<tr>
<td>1995</td>
<td>0.40</td>
<td>0.46</td>
<td>0.39</td>
<td>0.41</td>
<td>0.51</td>
<td>0.61</td>
<td>0.66</td>
<td>0.73</td>
<td>0.76</td>
</tr>
<tr>
<td>2000</td>
<td>0.32</td>
<td>0.39</td>
<td>0.23</td>
<td>0.36</td>
<td>0.32</td>
<td>0.53</td>
<td>0.40</td>
<td>0.67</td>
<td>0.56</td>
</tr>
<tr>
<td>2005</td>
<td>0.25</td>
<td>0.35</td>
<td>0.18</td>
<td>0.36</td>
<td>0.27</td>
<td>0.49</td>
<td>0.31</td>
<td>0.55</td>
<td>0.46</td>
</tr>
<tr>
<td>2010</td>
<td>0.22</td>
<td>0.29</td>
<td>0.18</td>
<td>0.33</td>
<td>0.32</td>
<td>0.43</td>
<td>0.31</td>
<td>0.44</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Note: set the labor productivity of tertiary industry as 1. Source: Frontier Research of China’s Economic Growth
ern, western, northern regions and Pearl River Delta of Guangdong Province to a coordinated state.

2 CHALLENGES OF TRANSFORMATION OF UNIVERSITY SCI-TECH DEVELOPMENT MODE UNDER ECONOMIC “NEW NORMAL”

After 30 years of rapid progress, China is now entering a new phase where the economy is cooling down and transforming. New Normal is not only a development concept, but a far-reaching strategy. Under this circumstance, China’s higher education, be it passive or active development, has already got the hang of the New Normal. At the moment, China’s university sci-tech development mode is being challenged by the following aspects:

1. Challenges over improvement of talents’ ability have been presented, as the international scientific research is becoming intense, and the fourth international revolution is in the ascendant. Nowadays, competition on science and technology as well as innovation has moved from technical skills to basic research. The focus is getting closer to talents, knowledge and scientific innovation mechanism. In this global arena, the developed players have been trying to retain their dominance while the developing side is striving for catching up or even going beyond. Expanding human resource has become a major leverage around the world, where every country is working to the bone to play the leading role. More investments in basic scientific research should also be implemented to promote sci-tech industry and accumulate initial innovation capacity. As for universities themselves, it’s their duty to lift the ability of cultivating quality talents with solid foundation, more employment opportunities, and scientific and humanity attainment. These personnel are required to combine practice with a creative mind in order to meet a new trend of higher education fueled by socio-economic development since the reform and opening-up. They are also a directive for a reform of cultivation mode for qualified personnel.

2. Since the requirement of acceleration of transforming economic development mode is going urgent, the main task at present is to enhance the capacity to solve major scientific problems and capture key technologies. China has become the second largest economy with its growth rate over 10% for more than three decades since the reform and opening-up. The economic progress, however, is handicapped in many aspects including unevenness, uncoordinated and unsustainable development. Optimization and upgrading are hence needed. With respect to science evolution and innovation, there are three questions remained to be answered, and they are basic accumulation deficiency of scientific research, which is ill-established and demand more introduction from other countries. Therefore, the basic issues are still illegible and the sci-tech industry remains at the lower end of the whole sector. The added-value can be enhanced with this knot being figured out. At that time, the industry chain will be sound and good and can bring out a better transcript. Besides, to get out of the dilemma of the sci-tech industry is to match the industrial scientific research with corresponding equipment. The advancement of both technology and equipment is a creed for upgrading the industrial structure and a cradle for nurturing new industry chains. The last focus that should be put emphasis on is sustainable development. As is known to all, abundant of natural resources are needed to support China’s modernization and urbanization, but limited space and resources have become a bottleneck for a further move. High efficiency of resource utilization and recycling are pivots for that. A bigger breakthrough in the fields like energy, resource, material, biology, geonomy and environs under the principle of Scientific Outlook on Development should be made. The way universities and colleges choose to improve their problem-solving ability on major science and technology to sustain economic and industrial progress shall be regarded as an urgent mission.

3. How to tackle with the major problems of national strategic development in building national innovation mechanism is also a challenge laid upon. China has confirmed the lead of the national system of innovation on scientific research in the 18th National Congress of CPC, demanding to take the enterprise as the main body, the market as guidance, and the industry-university-research cooperation as a technical system. It is also necessary to improve the system of knowledge innovation by consolidating basic research, frontier fields and technology for public welfare, so as to enhance the capacity of research and achievement transformation and to seize the commanding height. Universities in China are a cornucopia of talents and creativity, which require a combination of science and higher education to collect the think tank as a strong support for the country. Development of disciplines and the organic integration of inter-disciplines are the issues China should look into. Exchanges over multiple subjects are inevitable to construct a spacious platform for all-round scientific research and innovation.

4. At present, China needs to develop the higher education with a higher research level. China has gone through elite education, and the higher one has become a household name. Its development mode has turned from scale expansion to improvement of core competence. With the change of population structure comes the stable source of students longing for attending universities and colleges. It is imminent to lift the quality of higher education to live up to build a moderately-prosperous society in an all-round way and deepen the reform on mechanisms. Universities and colleges are bridgeheads of talents and technology ready to satisfy China’s strategic needs. Nevertheless, the homogenization of higher education has given an
5. Speeding up the development of university science and technology has been a major concern of China’s education departments as the constantly deepening reform on sci-tech system. 

Opinions of the CPC Central Committee and the State Council on Deepening Reform on Science and Technology Mechanism and Accelerating the Construction of State Innovation System issued in the mid 2012 has provided a definite direction for deploying national innovation practice. Reform on science and technology must not be disjointed with economic development and favorable policy support on the condition that enterprise shall be the subject of innovation work. In the meantime, it is believed that it is high time to make substantial progress in reforming management system, of which policy-making should embody creative thinking, the evaluation and organization system as well as personnel management system should reflect efficiency and scientificity. The Opinions has put an emphasis on reform initiative of mechanism in research institutes and universities, hoping that they will be a powerful engine of science in the course of economic construction. If handled properly, the confronted problems will be turned into opportunities for China’s target of being an innovative country. Parallel to the development of research in universities and colleges, the education community has reached a consensus that the standards of R&D of universities will have a huge impact on talent cultivation, technology innovation and comprehensive national strength. China ought to take the domestic institutions to a right way, and on the contrary, universities should keep up with the time and reap the benefits of incessant innovation.

3 ON ACTIVE ADAPTATION TO ECONOMIC
NEW NORMAL BY TRANSFORMING THE
SCI-TECH DEVELOPMENT MODE OF UNIVERSITIES

As the Report of the 18th CPC National Congress proposed to “deepen the reform on science and technology system”, university’s work on science and technology should take institutional and mechanism reform as a powerful impetus to marry science and education, technology and economy. It would contribute to a better innovation capacity and quality of higher education before the innovation-drive development is well under way.

(1) A holistic adjustment of concepts/evaluation system of R&D and science and education is an ideal option. Three major changes will be realized if the reform and coordination is well conducted:

(a) The quantity-oriented result must be put aside but to highlight the problem-oriented approach in the evaluation system, through which the incentive and restraining effect are able to facilitate scientists in universities to move their eyes to scientific research at the national and world level, and even launch R&D events in different industries to combat difficulties of key areas. By doing so, the outcome would be translated into constant streams of real productive forces, solving the frontier issues while promoting industry productivity and innovation development.

(b) Acceleration of the development of R&D system from the focus on the accumulation of quantity to quality-oriented upgrade is a necessity. Quality shall take the place of the previous quantity-directed mechanism where prizes and the number of research papers published count. Classified evaluation and elastic open assessment are needed, along with deliberate consideration of standards, the approaches addressed and academic factors.

19
(c) Boosting the cooperation of science and education should demand an immediate attention. The bygone approach was short of intensiveness and openness. Emancipation of mind and willingness to take a try are dual skills that universities should master. Other innovation-related subjects can be bond to universities to invigorate the capital, technology and information and maximize the advantage of talent, discipline and scientific research. The reform on science and education mechanism is a time-taking mission. Therefore, problem-finding and solving ability shall be prioritized with corresponding exploration and exchange until a consensus is achieved.

(2) Universities should take on the task of sci-tech expansion, by which the leading industries and local economic demand are supposed to “reach out” to each other. Strategies on sci-tech proposed by universities should conform with the relevant sectors, so as the internal innovation development with the international platform.

(a) Indigenous research capacity is the wherewithal for the further development of universities that would seize the opportunity to meet the demand of the country and the southern region. The cutting-edge issues should embrace forward-looking prospect, while the basic and universal researches involving regional economy and social development and public welfare need to motivate a potential to yield anticipating outcomes. At the same time, talent is a spur for both discipline and industry and further fulfills the indicators of China’s modernization.

(b) For basic science and cutting-edge disciplines, it is a must to feature the perspicacity in making strategy. For projects without limits, inter-disciplinary communication will be a winning tool to improve the overall performance and bring forth new ideas into reality. The demand-driven research, particularly, shall be carried out based on the national or provincial strategy. If this top-level design collapses, the university-industry chain will be broken. In the foreseeable future, the number one priority is to create a synthesis combing key disciplines and sci-tech innovation platforms until a host of disciplines are able to enjoy a global reputation, along with preponderant disciplines that are closely connected with the national or regional requirements, so that a pack of high-level universities that are pionerig in China and famous in the world will be brought out.

(c) Strengthening the competence of the core industries and establishing special projects to enhance science and technology suggest a trend of technology and roadmap of the industry chain. Only by setting a base can the crew be trained and promoted. On the other hand, enterprises still remain their dominance in the market economy, looking out to apply a new method to the products by accelerating the R&D cycle and cutting down the throughput time.

(3) In the face of the three “main battle fields” of economic construction—poverty alleviation, project investment and industrial development, it is crucial for universities and colleges in Guangdong to make a change. With the national strategy processing and the economic transforming in the Province, knowledge and technology innovation have become one of the assets for the socioeconomic development.

(a) Deploy pertinent R&D plan to address the highlighted problems of socioeconomic development. Fostering new growth points of emerging industry by core R&D and new business model should be taken into account. Such industries as high-end electronic information technology, new energy vehicles, LED, biotechnology, high-end equipment manufacturing, green tech and advanced materials are attached great importance on at the provincial level. For the time being, possessing critical tech and standards with proprietary intellectual property rights is a way to raise indigenous innovation and industrial technology to a significant level. For modern manufacturing, it aims at promoting enterprise management, intelligent workshop, high-end complete processing equipment, generic technology, intelligent robot and 3D printing, striving to go intelligent, green and service-oriented. With the technological bugbears springing up, the top priority is to shake off the frontier difficulties in structural, functional, electronic and nano materials and the traditional industries like steel, nonferrous metals, petrochemical, textile, light industry and construction materials. At the bigger picture, population health, resources and environment and public security are also essential parts to be focused on by implementing air pollution control, soil conservation, water resource protection, supervision on medical apparatus and devices, prevention and control of major disease and safeguard of food. For another, a systematical solution to new-type urbanization and smart city will be enlisted in the agenda for the future development.

(b) Central to the development of higher education, an improved resource allocation of sci-tech innovation and reform on “Three Evaluations”—evaluation of scientific research projects, talent and institution is of rising essence. Consolidation of regional resource is a prerequisite for the building of key laboratories, engineering centers, demonstration sites, international innovation platforms and professional institutes in universities. Disciplinary and industrial cluster system should be united to make a durable anchor for both basic and mainstay industries, as well as emerging industries and subjects which suit people’s livelihood. The engineering majors shall earn more values than other disciplines among the community. Geographically, an orderly distribution of higher education (universities and colleges) mega center and vocational education zones will reflect a better improvement. Universities in the Pearl River Delta are obliged to take a bold step to pioneer the exchange and cooperation to the outside world. Domestically, universities in the eastern, western and northern regions should be backed with full efforts. Moreover, the “Three Evalu-
ations”, if properly regulated in time, cycle and method, can be referred to propel the major projects for talent development, which will be appropriately classified and operated. From the perspective of researchers, it is vital to define a specific salary and incentive system that innovation performance and contribution will be balanced.

ACKNOWLEDGEMENT

A Research on Higher Education Strategic Planning of Science and Technology for the 13th Five-Year Plan, a major item authorized by Department of Education of Guangdong Province (No. 34315001).

REFERENCES