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The Strategic Change of Industry-Featured Universities in China in the Process of Marketization: A Case Study of China University of Geosciences

Zuwang Chu*
China University of Geosciences, Wuhan, China

Zhaorui Wang
China University of Geosciences, Wuhan, China

Xing Gao
China University of Geosciences, Wuhan, China

Abstract

The 1970s witnessed the deepening of marketization because of the introduction of reform and opening up in China. Profound changes were observed in the ties among Chinese industry-featured universities, government competent authorities and the market. Faced with ever-evolving environment, China University of Geosciences (CUG) managed to transform itself from a single-discipline-group geological college to a multidisciplinary university with geological disciplines as its major feature, with integrated development of multiple disciplines. Drawing on the Second Curve Theory, this research presents a case study on CUG, with the strategic change concepts, practices, accomplishment and effects in various stages of its transformative development comprehensively covered and analyzed, making an attempt at summarizing

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*Corresponding author
E-mail: chuzw@cug.edu.cn

features and implications of its strategic change. Findings of this research reveal that being adept at grasping well the timing for university change, establishing clearly-defined shared vision, developing the system of school running concepts and strategic planning, stressing management on strategic process and clearly identifying roles among leaders at all level, prove to be pivotal to the strategic change of CUG. The strategic change analysis framework of university transformative development could further add insights to theoretic discoveries in this field, and experience could be provided to transformative development of Chinese universities, and even those in other countries in the world.

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Introduction

The intensification of globalization, rapid development of science and technology and the emergency of competition prompt the transformation and development of universities (Muluneh & Gedifew, 2018). Strategy is one of the elements of university transformative development (Wu, 2021). As a forward-looking and systematic way of thinking and conducts, strategic management provides a set of holistic and long-term guidance framework of action for the transformative development of universities, achieving their survival and development (Kotten, 1997; Temple, 2011). Therefore, amid fierce competition, if universities, with limited resources, were to achieve

transformative development, strategic change should be facilitated and effective strategic planning and management should be conducted (Keller, 1983; Dill, 1999; Peterson, 1999; Duderstadt, 2000).

From the perspective of process, strategic change is the change of the form, nature and state of the organization's strategy in order to adapt to the changes of the external environment (Van de Ven & Poole, 1995). The strategic change of universities is affected by internal and external influencing factors (Brown, 2013). External factors include macro environmental changes, market preference and development direction, level of competition and so on (Keller, 1983). Internal influencing factors refer to leader's demographic characteristics and personality (Herrmann & Nadkarni, 2014), loosely-coupled organizational structure and unique academic culture (Mehari, 2016) and the divergence among stakeholders (Shattock, 2003) as a result of the highly-consultative nature of university decision-making and operation (Kirkpatrick & Ackroyd, 2003). Amid higher education marketization, reduced government financial support and the driving of knowledge economy facilitated the diversification of university funding structure. At the same time, closer ties were forged between universities and industry. In the context of globalization of higher education, the flowing of higher education resources globally put the university education resources at the hands of global market forces. All universities, as such, must participate in the global competition (Zhou, 2020). Therefore, scientific and effective management of it is necessary for universities strategic changes (Mehari, 2016) and comprehensive grasp of concept and practice of strategic change, still represent critical issues in the transformative development of universities.

Centering on university strategic change, theoretical studies were conducted in procedural issues, internal and external influencing

*Corresponding author
E-mail: chuzw@cug.edu.cn

factors and implementation pathways of strategic change (Bie, 2015; Liu, 2006; Zhou, 2020). Some studies focused on transformed universities or those in transition, generating discussion on various elements of the strategic change of those universities, such as policy-making, governance model, knowledge management, leading groups, performance, etc. (Block & Khvatova, 2017; Shattock,2003；Herrmann & Nadkarni, 2014). In reality, in the globe, transformative development experience is formed among universities that have accomplished transformation or those still undergoing such process (Wang & Zhang, 2012; Wu, 2021). In Chinese context, the reform and opening up in 1978 gradually reshaped China from a nation with planned economic system to one with market-oriented economic system. The marketization of higher education in China picked up its pace, fueling market competition faced by Chinese universities. Universities that develop by adapting themselves to China's planned economic system, especially those industry-featured universities - a kind of universities with prominent single subject characteristics and close ties with industries - also tried to strive for new transformative development through strategic reforms, with their own experience accumulated. Overall, a great deal of valuable studies was conducted on university strategic change, but there is still work to be done in reviewing experience, analyzing cases and understanding the processes, achievements and impact of these strategic changes. Also, few studies have addressed the issue of university transformative development in China. This study, therefore, aims to develop an analysis framework looking into strategic changes of the transformative development of universities. By adopting such a framework, this paper, with CUG as a case for study, aims to analyze its strategic change concepts and practices in the process of its transformative development. This research can potentially enrich the international theoretic discourse on

university transformative development, as well as generate reference for other universities in the pursuit of effective pathways to transform, by exploring the effects, features, and implications.

Theoretical Framework

The Second Curve Theory describes the development process of an organization or individual (Handy, 2015; Morrison, 1996), which provides a theoretical basis for this study. Based on this theory, the first curve represents the life cycle experienced by enterprises in carrying out traditional business in a familiar environment, and the second curve is the new life cycle where complete transformation is launched by enterprises in the face of radical changes in new technologies, new consumers, and new marketplaces in the future (Morrison, 1996). The focuses of this theory include, firstly, the process of organizational or personal development is the process of continuous alternating development of the two curves; additionally, decision-makers of enterprises should never stop looking for better strategies; thirdly, the key to success lies in "sensing and grasping changes"; last but not least, at the point where two curves alternates, abrupt change in enterprises objectives is experienced, representing fundamental changes taken place (Liu, 2002). According to the Second Curve Theory, timely changes are critical for organizations to achieve their sustainable development. Therefore, in order to achieve sustainable development, when the first curve of the organization is still in the rising stage, it is time to initiative its second curve, which means doing the right thing at the right time. In doing so, organizations need realize transformative development through innovation and reforms (Handy, 2015).

This research expands the application of the Second Curve Theory to university development research. Due to the fact that it takes

*Corresponding author
E-mail: chuzw@cug.edu.cn

a long period of time to finish the making of university education products and to form universities' core competitiveness, for this reason, the development of the second curve of universities features a gradual change; the second curve development of enterprises, quite differently, exhibiting a pattern of mutation. The first curve of the university is the life cycle of the discipline and specialty structure, level and overall core competitiveness. They are formed as a result of adaptation to the development environment in the past. The first curve has experienced the stages of development, growth, maturity and decline; and the second curve of the university is a brand-new life cycle in which discipline and specialty structure is continuously optimized and the overall core competitiveness constantly improved, while facing up to the changing social environment and future development trend. Its development model is diversified with more international school running vision. Whether a university could successfully move from the first curve to the second one is subject not only to the starting time of its strategic change, but is also decided by the outcome and effects of its strategic change. In that successful strategic change could result in stronger competitiveness of universities, thus propelling the transformative development of the universities (Liu, 2002).

According to the Second Curve Theory, the strategic change of university transformative development could be understood as the process in which universities move from the first curve to the second curve, and three stages constitute such process: input, change and output (Figure 1). The stage of input features external and internal influencing factors acting on the university, the buildup of momentum for universities to initiate its change from the first curve. External influencing factors include marketization, popularization of higher education, government adjustment and regulation and so on, whereas

internal influencing factors include the school running concepts, faculty development, school running conditions and so on. The stage of Change is the period where universities formulate strategic concepts and implement strategic practices after demands for strategic change are emerged. Strategic concepts entail the development concepts and goals, strategic planning and so on. Strategic practices include discipline structure adjustment, faculty development, students' cultivation, governance system reform, internationalization, improved school running conditions and so on. Then comes the stage of Output, where the accomplishments and effects of university strategic change show, or the period where competitiveness of university is improved. By experiencing three stages of Input, Change and Output, universities accomplish their transformative development from the first curve development to the second curve development (Zhou, 2013).

Based on the above introduction and literature review, this paper aims to analyze the following aspects based on the case of China University of Geosciences (CUG). 1) What is the development history of strategic changes of industry-featured universities taken China University of Geosciences as a case? 2) What are the achievements and effects of strategic changes of industry-featured universities taken CUG as a case? 3) What are the features and implications of strategic changes of industry-featured universities taken CUG as a case?

*Corresponding author
E-mail: chuzw@cug.edu.cn

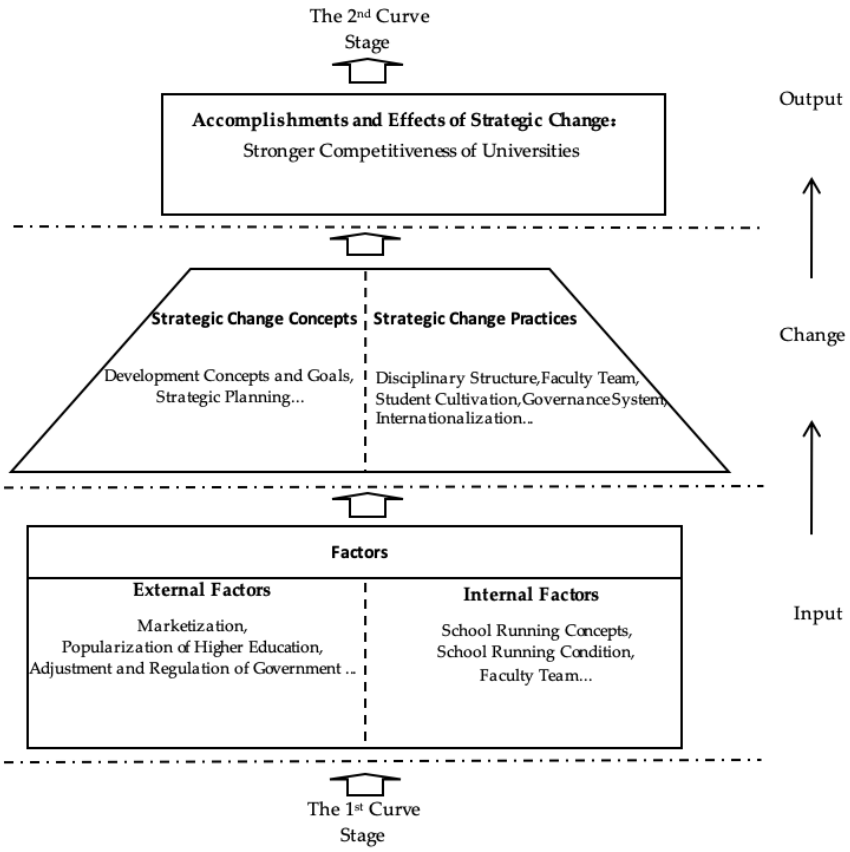

Figure 1. The Strategic Change Analysis Framework of University Transformative Development

Analysis Method

Based on this analysis framework, this study adopts the method of case analysis taking China University of Geosciences as a case of study while discussing Chinese industry-featured universities. CUG, as a university whose disciplinary structure are restricted only in field of geological exploration, and whose university running

mainly caters to demands of industrial development in China, before reform took place, represents a typical example. In that, by taking strong measures and launching strategic changes at an early time, significant effects were observed, including the forming of multidisciplinary structure and enabling its graduates employed in all sectors of the society. Though an in-depth analysis of related documents and archives, including university history materials, outlining its history, development background and major events (CUG, 2012); and strategic planning text, introducing its development goals and measures (CUG, 2016, 2021) ; as well as its Statistical Yearbooks, informing the changing number of students, teachers, disciplines and its condition of infrastructure construction over the years (e.g. CUG, 2019), in an effort to analyze the course of CUG's strategic change in its transformative development under the background of marketization.

Key information from relevant documents is organized into four parts: influencing factors, concepts, practices and effects of CUG's strategic change. As shown in Figure 2, firstly, the development history of strategic changes of CUG (RO1), including the internal and external influencing factors shaping CUG's development at different stages of its transformation towards the second curve, such as the marketization trend in China, the popularization of higher education and so on, are discussed. Meanwhile, based on various types of document and texts of CUG, concepts and practices of its strategic changes in different stages are analyzed. Secondly, based on the CUG Statistcal Yearbook, the achievements and effects scored by CUG (RO2) while transforming from the first curve to the second one is reviewed, with particular focus on those related to its enhanced overall competitiveness. Finally, the features and implications of the transformative development of CUG

*Corresponding author
E-mail: chuzw@cug.edu.cn

(RO3) are summarized, based on document analysis and correspondent author's 37 years' working experience and 17 years' experience in strategic management.

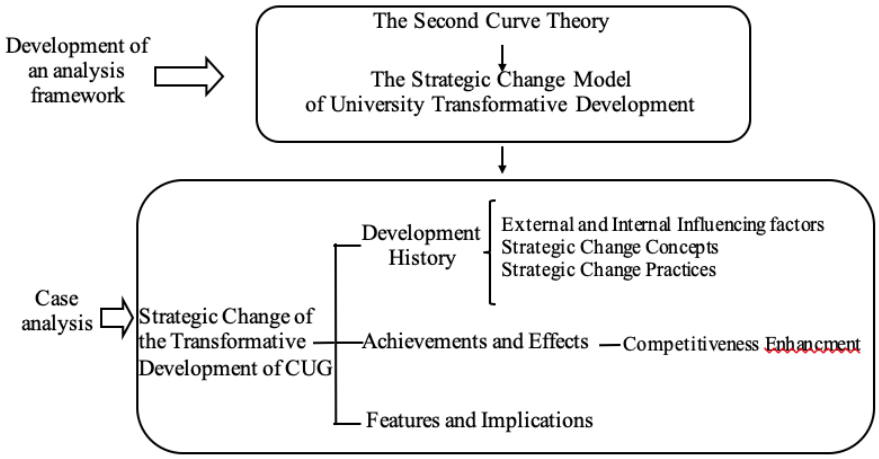

Figure 2. Analysis Method

Case Analysis Findings

The development History of Strategic Changes of CUG: Influencing Factors, Concepts and Practices (RO1)

Industry-featured universities in China could be traced back to the year of 1952, when a group of specialized colleges, with particular focus on the cultivation of talents and teachers contributing to national industrial development, were successively established or reorganized by the new China. For the purpose of meeting urgent demands for large numbers of specialized technical talents for economic and social construction. Industry-featured universities, by referring to the system

and institution of the Soviet Union, were built and developed into universities involving many fields such as agriculture, forestry, water conservancy and geology, as well as professional institutions of higher learning. In the early stage of their development, their size of student enrollment was relatively small, with distinctive single-discipline-group features. Their school running behaviors were subjected to the centralized leadership and management of relevant competent government authorities, with graduates uniformly distributed by authorities too, fully reflecting features of the socialist planned economy system.

The reform and opening up in China saw the growing demands for professionals, hence, industry-featured universities gradually enjoyed higher level of autonomy in self-management. Thus, their school-running pattern became increasingly more market-oriented, with their services orientation of student cultivation, scientific research and so on expanded from industries to the whole society. However, previous advantages in resources and policies from competent authorities became less prominent amid marketization. On the other hand, their limited service-orientation of social sectors after decades-long development, led to obvious lack of competitiveness. Faced with mounting challenges, it become inevitable for industry-featured universities to choose between remaining traditional pattern, and, alternatively, developing its second curve, by actively blazing new trails through exploring new pathways leading to transformative development, in pursuit of upgrading their core competitiveness amid market competition. After implementing the student enrollment expansion policy among colleges and universities in 1998, China embraced an era of higher education popularization since 2002. At the same time, "211 Project" (1995), "985 Project" (1998), "Double First-

*Corresponding author
E-mail: chuzw@cug.edu.cn

Class" (2016) and other higher education initiatives in China, aimed for quality enhancement, were promoted in acceleration, with a string of industry-featured universities selected as national key construction projects. Hence, new opportunities and challenges to further deepen their transformative development were encountered, adding momentum to their practices of active strategic change.

CUG, founded in 1952, an industry-featured university under the administration of the Ministry of Land and Resources, was initially a single-discipline-group university with major disciplinary and specialty focus on geological exploration. It was known as one of the national key universities wielding high-level impacts in the field of geological exploration research. The graduates' employment was all arranged uniformly by the Ministry of Geology and Mineral Resources, such employment system was later replaced by independent job hunting since 2000. Since 1978, in the process of the gradual government deregulation and marketization of universities, through strategic change, CUG successfully transformed from being a single-discipline-group geological college to a multidisciplinary university with geological disciplines as the main feature, with integrated development in multiple disciplines. It has undergone a 4-stage process of transformative development (Hao & Wang, 2012). In the following part, a detailed analysis of the influencing factors, concepts and practices during CUG's transformation from the 1st curve period to the 2nd curve period will be presented.

The Recovery Development of the 1st Curve Period of the CUG (1978-1985)

In 1978, Chinese government's shift of focus to socialist modernization created a stable external environment, generating opportunities for CUG's recovery development, after the "Cultural

Revolution" took a toll on its development. Actively initiating school running restoration, it has accelerated the reconstruction of the campus in Wuhan, prioritizing teaching reform and education quality improvement.

After the optimization of school-running conditions, in 1983, CUG put forward the strategic goal of growing itself into a "modern, open and international" university with prestige both at home and abroad (CUG, 2012).

In terms of discipline structure, in addition to restoring original majors, with geosciences, science and engineering being the main body, CUG newly set up 8 specialties of strong market demands including computer, economic, management and so on. In terms of discipline level improvement, faculties and students participated in pilot programs that integrate teaching, research and production. Meanwhile, the graduate education system was optimized and the graduate enrollment was gradually scaled up. The scope of international exchanges and cooperation was expanded, ties were forged with the United Kingdom, the United States, Federal Republic of Germany and other countries and regions (CUG, 2012).

Several-years-efforts saw the basic transformation of CUG as a single-discipline-group university of science and technology, with discipline level restored and promoted. However, employment and scientific research were mainly targeted at the geological industry, and the vitality of independent school running was to be improved.

The Germination Stage of the 2nd Curve of CUG (1985-2000)

Firstly, the government gradually granted universities greater autonomy in school running, and the system of student paying tuition fees and graduates' independent job-seeking was gradually

*Corresponding author
E-mail: chuzw@cug.edu.cn

established. Universities began to participate in the competition of enrollment market and employment market; moreover, the market demands for geological graduates were getting saturated. Third, the conservative school-running concepts limited their understanding on how to build a high-level university in a market-oriented environment. The doctoral-degree-holding rate among faculties was low and there were limited number of high-level faculties. Another grave concern was that the geological graduates, encountered difficulties in job hunting as a result of incapable of satisfying new capability requirement for undertaking geological work. CUG's first curve development faced the declining stage, and the second curve development must be initiated.

In 1987, the strategic goal of CUG was further identified, which is to develop itself into a comprehensive university of geosciences catering to the overall social sectors; and to grow into a modern, open and international university in earth sciences (CUG, 2012).

Advantages of geological disciplines were further consolidated. Applied disciplines were vigorously developed, new disciplines were established, and discipline structure was optimized. One the other hand, reforms were carried out to improve the discipline construction level. In-service teachers were supported with fund to obtain master and Ph.D. degrees abroad; outstanding young and middle-aged teachers were evaluated and progressed in tailor-made ways. Also, practices-based teaching was reinforced for undergraduate and graduate education; institutional reform was carried out by fulfilling the principle of simplification and efficiency, endeavoring to promote its discipline development (CUG, 2012).

After the strategic change, a discipline and specialty landscape, with geoscience as its major feature, science and engineering discipline

as the backbone, and coordinated development among multiple disciplines of science, engineering, culture and management, took shape. The core competitiveness of CUG was enhanced, student cultivation ways became more diversified, and the scientific research and social services grew further aligned with demands of social development. However, the school running concepts of CUG were narrow in vision and measures for strategic change were not forward-looking and systematic enough.

The Second Curve Development Stage of CUG (2001-2018)

Entering the 21st century, the marketization in China was accelerated. In 2000, in terms of higher education management system, rather than being affiliated to the Ministry of Geology and Mineral Resources to being under the direct administration of the Ministry of Education amid higher education system adjustment.

Firstly, greater autonomy of universities and the deepened market-oriented reform fueled the competition. *The Outline of National Medium-and-Long Term Education Reform and Development Plan (2010-2020) (2010)* and the *Work Plan for Streamlining Administration, Delegating Power and Improving Regulation while Transforming Government Functions (2015)* and other documents were successively issued in China, with the school running autonomy among universities continuously enhanced. This meant that other colleges and universities could also set up geological specialties, intensifying the market competition. Second, the rapid popularization of higher education has brought opportunities and challenges to CUG's development. CUG could get more tuition income through more student enrollment. The expansion of the enrollment scale would drive up the number of specialties, which would then generate new drivers to disciplines and specialties growth. Meanwhile, diversified educational needs required

*Corresponding author
E-mail: chuzw@cug.edu.cn

CUG's provision of adequate school running resources and cultivate higher-quality talents. Third, clear school-running requirements were put forward by the government, which is education quality enhancement and running a university that satisfies all. Since 2001, China released a series of documents to improve the quality of higher education, such as "*Undergraduate Teaching Quality and Teaching Reform Project in Universities*" (2011). And the government also promulgated a series of professional standards and evaluation standards, fueling pressure and reform impetus for CUG.

In 2004, CUG initially identified its phased goal as "building a First-Class University in earth sciences and growing into a high-level university with coordinated multidisciplinary development" and the long-term goal of "building a world-class university in geosciences" (CUG, 2012). In 2011, it further refined the goal into a "three-step" development strategy. The 1st-step (2020) was to achieve the phased strategic goal of basically growing into a First-Class University in earth sciences as well as a high-level university of coordinated multidisciplinary development. And the 2nd-step (2021-2030) was to become a well-known research university at home and abroad. And its 3rd-step (2031-2052) was to basically realize the long-term strategic goal of developing itself into a world-class university in the field of geosciences. In 2015, further elaboration was made in its phased goals and tasks of the "three-step" development strategy (CUG, 2016).

Firstly, it strengthened the organization and leadership of discipline construction, and built a dynamic layered and classified management system for its discipline and specialty development. Those advantageous disciplines of geosciences were supported with key financial support in an effort to accomplish expansive growth and strengthen their competitiveness by working at discipline frontiers.

With respect to non-geological disciplines, strategic planning task force for engineering and liberal arts disciplinary progress were established successively. Policies were improved for prompting the construction level of engineering, liberal arts and basic disciplines.

Moreover, concepts and measures for each discipline and specialty construction were further clarified. In 2014, the discipline development concept was formed in CUG: making our characteristics more distinctive, meeting mainstream requirements, striving for transformation, and nurturing a disciplinary ecosystem with positive interplay among and coordinated development in all disciplines. The "five-in-one" discipline specialty construction mode was identified: coordinating faculties development, discipline research, platform construction, student cultivation and international cooperation and exchange. Under such guidance, five-year development plans of each discipline and specialty were formulated, with construction measures refined.

Besides, competition mechanism was put in place and discipline structure was optimized. CUG prioritized tasks of urgency and significance, and efforts were made to downsize the disciplines, with a new discipline development and management mechanism, featured with the integration of competitive discipline evaluation and the increase of both input and rewards, implemented. Discipline self-evaluation was conducted since 2014, highlighting diagnostic evaluation in the pursuit of higher quality in discipline and specialty construction.

Fourthly, faculty and university internationalization were promoted as a strategy to advance university development. Talents were invited from both home and abroad in CUG since 2009. Meanwhile, classified evaluation, and ability-and-output-centered

*Corresponding author
E-mail: chuzw@cug.edu.cn

principle in faculty performance management were standardized as faculty competition mechanism. Moreover, the salary level of faculties was raised several times. Faculties were also encouraged to study abroad. In 2012, CUG led the founding of International University Consortium in Earth Sciences (IUCES). The setting up of such a long-term, sustainable and stable cooperation mechanism promoted joint sci-technical research on major issues in geosciences, and established a joint training mechanism for students, further expanding CUG's international vision in school running.

Fifthly, interdisciplinary education and education quality were highlighted and promoted. General education for lower-grade undergraduates was carried out and professional education was included for higher grades. After the first academic year, optional modules could be selected by students; a change of majors was also allowed. At the same time, the major-and-minor program encouraged students' pursuit of interdisciplinary knowledge, attempting to improve their comprehensive qualities.

Sixthly, CUG Promoted the rule of law and optimized its governance structure. 2015 witnessed the release of *The Constitution of CUG* for the first time. And CUG optimized and standardized the governance structure featured with leadership from the Party Committee, university affairs governance by the President, academic affairs governance by professors and implementing democratic participation. And rules and regulations of CUG were revised and perfected under the guidance of the constitution.

Seventhly, CUG built a new campus and broke new grounds in optimizing school-running conditions. With limited resources, as a result of school-running scale expansion, it set about building a new campus since 2011 and the construction was completed in 2019. The

new campus, equipped with modern teaching, scientific research facilities and living conditions, covers a construction area of 573,400 square meters, accommodating more than 10,000 students from 5 colleges and 2 national scientific research platforms, escorting the transformative development of CUG.

Comprehensive analysis revealed that in 2018, CUG achieved its first goal ahead of schedule, meaning that its discipline ecosystem -- all disciplines are mutually supportive, and advantageous discipline leading the field -- has basically taken shape, and its core competitiveness was continuously enhanced. The second curve ushered in its growth stage, but weak links still loomed large. For example, strategic scientists with international vision were limited in number, faculties' overall capabilities to undertake key scientific tasks were to be enhanced. There were still room for progress regarding its integrated development of various disciplines, specialties, and internal governance mechanism, so as to enhance school running vitality.

The Maturing of the Second Curve Period of CUG (From 2018 to Now)

First, the high-quality economy development in China has greater thirst for innovative and outstanding talents. Thus, Chinese universities need to play a fundamental and core role in such process.

Second, for contemporary Chinese universities, serving the national ecological civilization development strategy and seeking harmonious coexistence of humanity and nature represent their responsibilities of the time and their value pursuit. Third, the competition among universities becomes intensified, as a result of the "Double First-Class" higher education program implemented by the Chinese government and the a more developed market economic system. It is a strategic measure for Chinese universities to further

*Corresponding author
E-mail: chuzw@cug.edu.cn

reform on their education mode and governance system to adapt to the landscape of competition and accelerated transformation.

For CUG, after 21 months of in-depth studies, extensive discussion, consensus building and collective decision-making, the *Strategic Plan of Building a World-renowned Research University in Earth Sciences a Beautiful China & a Habitable Earth: Towards 2030* was formulated and released at the end of 2019 (CUG, 2021). Taking "building a beautiful China and a habitable earth" as the strategic theme of its future reform and development not only reflects CUG's advantages in earth sciences, but also reflects its value pursuit of "promoting the harmonious coexistence of mankind and nature". The plan further specified its next-decade development goal -- building an international well-known research university in the field of earth sciences by 2030. The main indicators of university running will include approaching or attaining level of world-renowned research universities. And earth sciences in CUG is expected to be positioned among those tops of the world, with all disciplines reaching higher standards and striving to be first-class disciplines. And it is to become a university with excellent education, scientific research, culture and management. The plan further specified 4 action principles, 5 strategic priorities and strategic guarantees, outlining the action roadmap for the high-quality development of CUG in the next decade.

A new round of deepened reform was initiated in CUG, aiming at meeting major social demands and finding solutions for bottleneck issues restricting its development. Further reform tasks for the next 2-3 years were identified, in discipline and specialty reform, student cultivation reform, governance capacity building, resource management and information technologies application. Secondly, the *Management Measures for the Construction of First-class Undergraduate*

Specialties was developed, in an effort to promote the progress of all undergraduate majors in targeted ways. Consistent explorations were made to establish a new student cultivation mode, in which cutting-edge technologies were the driving force and students were expected to harness future technologies. Students were expected to meet vigorous academic standard; reforms took place in student evaluation; student growth and honor system was improved, with the aim of promoting the all-round development of students; third, systematic scientific research training was conducted, the student cultivation mechanism of integrated production and education was strengthened. Interchange among disciplines and interdisciplinary talents cultivation were advanced, and postgraduate training mode was optimized; fourth, continuous efforts were made to enhance internal management, with particular efforts made to promote human resources development including faculties, administrative staff and logistics staff. Supervision and inspection were conducted in key management areas such as finance and assets, for efficiency improvement in asset allocation. Measures were taken to optimize the selection, training and assessment systems for faculties, leaders and managerial staff at all levels, striving to pursue higher quality among faculties.

The Overall Achievements and Effects of Strategic Change amid CUG's Transformative Development (RO2)

More than 3-decades transformative development has contributed to a boost in CUG's overall competitiveness, reflecting 3 major trends of sound development: its vision has been shifted from being domestic-oriented to outward-looking, and the awareness of competition has been greatly enhanced among faculties. Second, the focus of disciplines and specialties development has been shifted from

*Corresponding author
E-mail: chuzw@cug.edu.cn

increasing the number of degree programs and expanding student enrollment scale to striving for connotative construction and high-quality development. Third, the goal of development level has been transformed from emphasizing the output index of quantity to highlighting high-level faculties and improving education and teaching quality. Transformative development from the first curve development to the second curve one was preliminarily completed, and results of the strategic change were as follows:

The discipline structure of CUG has changed from what previously dominated by geology-related disciplines to a multi-disciplinary one of coordinated development with earth sciences as its major feature. In 1985, disciplines and specialties were mainly limited in field of geology, with about 4 first-level doctoral programs and 5 first-level master programs. After 35 years of development, as for the end of 2020, there were 16 first-level doctoral programs (including 4 doctoral programs in Humanities and Social Sciences), 34 first-level master programs covering 8 categories of science, engineering, economics, management, education, law, literature and art. The number of students has increased from 4,340 in September 1985 (including 515 graduate students and 54 doctoral students) to 30,239 by the end of 2020 (including 18,080 undergraduate students, 9,302 master's students, 1,916 doctoral students and 941 international students).

The discipline and specialty level at CUG were progressed consistently. Those competitive and advantageous disciplines since the past, such as geology, geological resources and geological engineering, were still ranked top in all previous national discipline evaluations. Through international comparison of major index, it showed that as of July 2021, 7 discipline fields of CUG including

Geoscience, engineering, environmental ecology, social science, material science, chemistry, computer science has entered the top 1% of ESI, with rankings continuously improved. Among them, geoscience and engineering have entered the top 1 ‰ in the globe.

The faculty profile of CUG was constantly optimized. In 1985, less than 10% of faculties had master's degree or above, and 79% of full-time faculties had doctor's degree as of 2020. The recruiting, training and evaluation system of high-level faculties were continuously improved, and the number of high-level, international and discipline leaders with interdisciplinary background grow significantly and young academic backbone teams were established, among which 5 were selected as Clarivate (formerly Thomson Reuters) "highly-cited scientists", 9 were selected as Elsevier "highly-cited scholars", and 61 were selected as ESI highly cited authors.

CUG's overall competitiveness and impacts continuously grew stronger. Since 2016, CUG was ranked 301st to 400th in the world universities academic ranking list released by Shanghai Soft Science (ARWU) over the years. Since 2017, CUG was ranked between 601st-800th in the world based on the THE World Universities Ranking list released over the years.

Features and Implications of Strategic changes in CUG (RO3)

The development of CUG in recent 40 years could be reckoned as the epitome of rapid development of higher education in China. Industry-featured universities in China are the "transplanted products" results from the higher education system of the Soviet Union. In order to address the challenges came along with deepened marketization and higher education reform, and to seek solutions of its current development problems and identify future goals, tireless

*Corresponding author
E-mail: chuzw@cug.edu.cn

efforts are made by industry-featured universities to explore their transformation, leaving us all with valuable lessons and experience regarding strategic change to reflect on. This study attempts to analyze and summarize features and implications of the transformative development of a single-discipline-group industry-featured university in a developing country, emerged and evolved in a planned economy era. CUG accomplished the transformation into a moderately-comprehensive multidisciplinary university with international vision and international impacts. This study therefore could enrich the development model of higher education in the world. It also could provide reference for universities in the world with relatively low school running level as a result of not meeting demands of social development. Therefore, this research would be worthy of attention or participation of each scholar dedicated to the higher education studies.

Features of Strategic Changes in CUG

Mandatory institutional change and induced institutional change coexist. Since the mid-1980s, reform on the university management system, student enrollment system and graduate employment system were implemented by the Chinese government. Professional evaluation and discipline evaluation were also carried out in full swing, so that strategic changes were in progress in a mandatory manner. In the process of gaining greater school running autonomy, CUG actively mobilized the enthusiasm of all parties. The gradual growth of enthusiasm and creativity among leaders of schools and departments as well as among scholars further stimulated and reinforced the awareness to change among senior leaders in CUG.

The strategic change of CUG is proactive, forward-looking and consistent. In the early 1980s, senior leaders of CUG realized the importance of changing the traditional first curve development mode,

with a single discipline group and specialties in geological discipline. They believed that without shaking off the first curve mode by developing new second curve, CUG would face backwardness and elimination. Successive leaders of CUG always adhere to scientific concept to guide the change. Whether it is the strategic goal in the early stage of change, or the "two-step" development strategy proposed in 2004 or the "three-step" development strategy proposed in 2011, consistent connotation was reflected throughout. The development goals were continuously deepened in a way that effectively guiding practice of reform in all aspects of work.

The strategic change in CUG follows a holistic view, took place in several stages, with flexibility in execution. The practice of change focuses on improving discipline competitiveness as the core, which involved both the discipline structure adjustment at the university level and the growth of various disciplines at colleges and departments levels. Different stages of the second curve development witnessed the shift of focus on the practice of strategic change in CUG. For example, the scale-speed-oriented discipline growth in the germination stage, gave way to the discipline growth mode of quality-efficiency-oriented in the development stage, fully reflecting the flexibility in its strategic change practices.

Experience of Strategic Changes in CUG

Historical footprint of any universities revealed that key factors that mold who they are from past to now, include practices throughout their strategic change, the devotion and contribution of “actors” at all levels from all functional areas.

The above analysis, together with the experience and reflections of correspondence author of this article, could contribute to

*Corresponding author
E-mail: chuzw@cug.edu.cn

a comprehensive reflection on strategic change in CUG, which could be presented as follows:

1) Being adept at grasping the opportunity of change

Practices adopted by leaders of universities towards the second development curve were subject to certain risks, such as the conflicts between various interest groups, the decline of school running quality or the falling of output over a period of time and so on. This required university president to timely grasp opportunities for its transformative development. These opportunities might occur when the school running mode or management system adopted in the development of the first curve was no longer applicable, or when the germination of the second curve was clearly recognized (Liu, 2002). When faced with critical opportunities for strategic change, several terms of CUG presidents took the lead in in-depth investigation and researches through various channels, including organizing middle-level cadres for seminars, inviting domestic and foreign experts to deliver consultative reports on university development, soliciting advices from faculties students and other staff. Their studies and consultation focused on areas of national strategic demands, discipline development trends, teaching and scientific research, the relationship between dominant disciplines and other newly built ones, as well as on the ways of balancing priorities and other issues. Exchange of opinions facilitated consensus reaching, which were translated to strategic decisions and implementation measures, promoting the strategic change of university development.

2) Establishing a clear shared vision, developing concepts and value system on school running

Kakabadse et al. (1998) believe that the creation of vision will bring together the organization's institution, intention and goal for a long time, and vision could and has been used as a way for the organization to revive and consolidate its presence, as well as means to shift the market focus and direction. For universities, its reform is essentially the transformation and innovation of their school running concepts. A clear vision that is of historical coherence and developmental momentum can contribute to university development. The process of vision creation is expected to harmonize the top-down leadership and bottom-up interaction; to be process of continuous learning and innovation. In the process of strategic change, CUG takes "gaining people's satisfaction" as the criteria for realizing school running values; reckons the "pursuit of excellence" as the ideal pursuit of school running and regards adhering to first-Class standards with international vision as the basic principle of promoting the reform and development. Through continuous exploration, school running concepts of its unique features become more systematic: firstly, students cultivation goals of CUG--being committed to cultivating talents of excellence “with lofty morality, solid foundation, profound expertise, and who pursue the unity of knowing and doing”; its motto--"striving to remain plain-living, truth-seeking and being pragmatic"; school running value system--"seeking the harmonious development of mankind and nature“; academic spirit--"embracing independent thinking, dedication to rigorous scholarship and bold exploration and pursuit of excellence". Shared vision could be effective in improving the efficiency and capabilities in leadership, facilitating the reaching of consensus in a way of promoting the effective strategic change of CUG.

*Corresponding author
E-mail: chuzw@cug.edu.cn

3) Building a strategic planning system and strengthening strategic process management

The planning system, composed of the university's overall development plans, targeted plans, as well as those at school and department levels, is the foundation of university's transformative development. Development plans at different levels specified the development goals, tasks and strategic measures of various undertakings. The formulation of a strategic plan represents the first step for its development strategy implementation. Without effective execution, the blueprint may only be a matter of paperwork. Therefore, the breaking down of the overall development plan into specific development indexes and tasks, reinforcing the supervision, inspection and feedback on the execution of its development planning system, are pivotal in reinforcing its strategic process management. Some disciplines and specialties of weak foundation and bleak prospect were suspended, so as to be fully focused on discipline construction.

4) Specifying the roles of leaders at all levels

High level leaders are the core of university reform. They should make strategic decisions and realize transformational leadership and full communication (Wu, 2005), for the purpose of uniting all members of the university towards the shared goal by including them in the decision-making process. All previous senior leaders of CUG are "never content with the status quo and never evade changes". They always overcome the fear of difficulties, emancipate their mind, get rid of stereotypes and behavioral inertia, striving to become the planners, practitioners and driving force of the transformative development of CUG. Middle-level leaders are the executors of university strategic change. Excellent middle-level leaders

and high-level leaders could generate greater power through integration (Wu & Li, 2007). And therefore, in the process of strategic change, middle-level leaders are expected to be self-motivated and creative in their work and support the development of faculties. At the same time, they are expected to formulate strategic plans that are in line with the actual development condition of schools and departments, in accordance with strategic goals developed by high-level leaders. And therefore, middle-level leaders could play an active role in achieving excellence at lower levels by integrating internal resources and strengths, and by prioritizing strategic focus. They could contribute to the alignment of tasks of various departments with overall transformative development goals of the university.

Discussion and Conclusion

By taking CUG as an example, this study looks into the development history, achievements and features of the strategic changes of the transformative development of industry-featured universities in China under the background of marketization, with implications summarized, in an attempt to provide reference for the strategic change of similar universities in China and other countries.

Discussions related to the ROs

RO1 focused on the development history of CUG's strategic change. In this part, the course of CUG's strategic change is reviewed and analyzed, which could be organized into 4 historical stages, through examining related historical documents and strategic planning documents. Both internal and external influencing factors of its development in each historical stage are explored. It is found that external influencing factors include the government's macro-control, market-oriented reform and the popularization of higher education,

*Corresponding author
E-mail: chuzw@cug.edu.cn

while the school-running philosophies and conditions, and faculties quality of CUG constitutes its internal factors. Shaped by various factors, CUG has adopted corresponding strategic concepts and measures, initiating systematic changes in aspectes of strategic development goals, discipline structure, faculties, student cultivation, governance system and international exchanges and cooperation.

RO2 analyze the achievements and effects of CUG's strategic change. In doing so, CUG's statistical yearbooks are examined. This study approaches the overall achievements and effects from aspects of discipline structure, discipline and specialty level, faculty profile, overall competitiveness and impacts, and find that CUG has experienced progress in all above aspects. And CUG has initially realized a transformation from the 1st curve stage to the 2nd curve stage -- the transformative development from a single-discipline college to a multi-discipline one, with geological discipline as its dominant feature and coordinated development of multiple disciplines.

RO3 is to summarize the features and implications of CUG's strategic change. Firstly, it is found that both mandatory institutional changes and induced institutional changes have been experienced by CUG. Being proactive, forward-looking and consistent in actions represent CUG's distinctive features of CUG's strategic change concepts; and its strategic change practices are distinctive of being holistic-thinking, flexible and taking staged approaches. Moreover, on such basis, drawn from correspondence author's rich experience and reflections, CUG's strategic changes experience were summarized, including being adept at grasping opportunities for strategic changes, establishing clear common visions, developing sound school-running philosophy systems, building strategic planning systems,

strengthening strategic process management, and defining roles of leaders of all levels.

Limitations and Future Research

This study has a few limitations. The study only focused on and explored CUG as a case study. The analysis framework of strategic change of university transformative development the strategic change could function as referential support for future university strategic change management. However, other similar Chinese universities have not been systematically investigated. Despite the fact that the strategic change of CUG is of representativeness among all industry-featured universities in China, this paper represents the output of only the initial phase of our research. In the future, we will continue our observation and reflections on CUG's development. Meanwhile, comparative studies among similar universities both home and abroad are advised to be conducted, endeavoring to enrich theoretical discussions on university strategic changes, and to generate renewed interpretation and theoretic innovation for the modernization of world higher education.

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*Corresponding author
E-mail: chuzw@cug.edu.cn

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*Corresponding author
E-mail: chuzw@cug.edu.cn

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About the authors:

Zuwang Chu, Ph.D., a professor of Institute of Education and doctoral supervisor at China University of Geosciences. Professor Chu is Council Member of China Association of Higher Education, Council Member of Chinese Society of Educational Development Strategy, and Voting Member of National Association of Student Personnel Administrators. His academic interests are in higher education

administration and student affairs administration, and he has recently focused on higher education governance and university leadership.
E-mail: chuzw@cug.edu.cn

Authorship credit details: Conceptualization-ideas- formulation or evolution of overarching research goals and aims, methodology development or design of methodology; creation of models, writing-critical review and editing, supervision- oversight and leadership responsibility for the research activity planning and execution, project administration-management and coordination responsibility for the research activity planning and execution.

Zhaorui Wang is a PHD candidate majoring in Public Administration at the school of Public Administration of China University of Geosciences, China. She has participated in several research projects both at national and provincial level related to higher education. In more recent work, her research interests mainly focus on university governance, academic leadership, higher education comparative studies and etc.

E-mail: wzr@cug.edu.cn

Authorship credit details: Conceptualization- ideas, methodology -development or design of methodology, creation of models, investigation- data/evidence collection, writing -original draft preparation.

Xing Gao is a PHD candidate majoring in Public Administration at the school of Public Administration, as well as a lecturer at the school of foreign languages of China University of Geosciences, China. She has participated extensively in research projects at national and provincial

*Corresponding author
E-mail: chuzw@cug.edu.cn

level in fields of higher education management. Her research interests mainly lies in higher education comparative studies and education leadership, and etc.
E-mail: gaoxingclaire@hotmail.com

Authorship credit details: Conceptualization- ideas, writing-presentation of the published work, review and editing.