

Transformability of Universities is Directed by Repositioning After Evaluations: Introduction to a SMTIE Model

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Abstract—In the 21th century, university is a knowledge factory for teachers and scholars to perform education and research, and a translation media of science to technology. Universities are emerged to transform that is directed by repositioning after evaluation. University policy makers are missioned to reposition their universities for the 21th century market. Foreseeing transformation from education/research to entrepreneurial due to market demand, policy makers are suggested to adopt Mintzberg's strategic planning principle for repositioning, CIPP and BSC models for internal evaluation, SWOT and Porter's 5 force analysis for internal and external evaluation to relocate the positions of universities. The indicators for self- and internal evaluation and repositioning may follow CUA and Californian systems. A SMTIE model for university positioning is proposed. Using Taiwan as a local case study, it is suggested that public universities would be merged to "multiversity" and private universities would transform to "entrepreneurial" or becoming "omniversity" according to the evaluation based on SMITE model.

I. INTRODUCTION

A. History of university model

In the 21th century, universities are not only knowledge factories for teachers and scholars to perform education and research, and also translation media of science to technology. In the history, university models had been transformed along with the ages. The Medieval universities, represented by the first universities in Europe (University of Bologna, University of Paris, and University of Oxford, are "scholar teaching model" and the curriculum were dominated by religion. In 19th century, German (Humboldtian) university model, represented by Humboldt University of Berlin, was risen with principle of co-inhering research and teaching and has become a model for the research universities of the United States and all over the world. The central dogma of Humboldtian model is research-oriented teaching and knowledge transfer from research to academic [1, 2]. This model directed universities to focus on science and research in 19th and 20th centuries. University of Oxford and University of Cambridge represented a "British traditional teaching/ research model (Oxbridge model)". After Industrial Revolution, Robbins Report recommended expansion of universities and transformation of "colleges of advanced technology" to universities. A "Robbin's-principle model" opened the doors for qualified students with abilities to attend [3].

B. Triple-helix concept and university transformation

For the practice of university transformation, a "triple

helix" concept of NIH-industry and academic world was firstly proposed by Lowe [4]. A plausible "triple helix coevolution" theory of university-industry-government had been lately proposed by Etzkowitz and Leydesdorff [5-8]. Historically in the Western world, the role of universities had been changed from "education-centered" to "research-centered". The university transformation cases in USA during World War II were obviously driven by the government to fulfill the requirements of government during war time and had successful spin-off cases such as the rise-up of silicon valley [9]. The industries such as Monsanto Inc. had also fulfilled the similar mission during Vietnam War time. In USA, government performed a driven force for transformation of the missions of universities and universities. In the 21th century, China raised in the Eastern world had started to immerse enormous resources and urged to over surpass the economic power of Western world. Chinese governments, including central and local, and focused universities, such as successful transformed universities in Beijing and Sheng-Jun areas had become the models of government-driven evolution of universities with global name [10]. In both Western and Eastern models, the roles of government, industry and university have been performed intertwined. Government as policy maker and monitor, drove the transformation of universities. Industry as outdoor of global economy, played as the driven and requiring forces for university model to transform to innovative research productions from academics. Universities play the role as the suppliers of human power, technology supports and research products after model transformation [6]. University model in USA was affected by "Oxbridge model" in colonial age, Harvard College and Yale College were both founded in the early age, and represented an "American Truth Searching model" that was reflected by their school mottos. In the 19th century, American universities, mostly private schools, might be classified as "religious model" with the mission to be preparatory schools for students with professional planning [11]. In 20th century, public founded colleges and universities explosively grew in USA. Most of the schools might be classified as "education/ research model". The "elite university model" was also risen [12]. In 1960s, "Multiversity" rose up with main campus as the flagship to provide advanced programs. Social service, besides teaching and research, was one of the major functions of a "Multiversity". University as a regional lifelong learning institution, was also proposed as a model for merges of "sub-disciplinary" universities in the future [13, 14]. The concept of "Corporate university" was created by General

Motors Institute, then followed by General Electric and other prominent corporate universities including Charles Schwab University, Disney University, McDonald's Hamburger University, Apple University, Motorola University, Oracle University, University of Toyota with an "In-house education" as a "Corporate university model" in Northern America, Europe and Asia [15-18]. Clark [19] mentioned 5 elements including "a strengthened steering core"; "an expanded developmental periphery"; "a diversified funding base"; "a stimulated academic heartland"; and "an integrated entrepreneurial culture" for transformation to "Entrepreneurial university model". The transformation cases in Europe [20], in Asia [21], in UK [22, 23] were also reported.

In the 21th century, the missions of universities had been transformed not only from "education-centered" to "research-centered", however, to "industry-centered" even to "entrepreneurial-centered" has becoming the global trend and a driven force for a "fourth industry-revolution" [9]. As the revolution of college education system evolved to a triplex pattern-related, the roles of university are more than education and research.

C. World-ranking systems and university transformation

To evolve from academic to industry and to entrepreneurial, the strategy with core value is the main mission for universities to make with a correct vision for development and survival in the emerging environment especially the reduction trend of population as the recent issue in Asian countries. However, the assessment of transformability of university evolution may have been based on the outcomes of world-ranking systems in recent years. To fulfill the criteria for world-ranking systems, universities may have to follow the requirements and somehow losing the original spirit of a university. To fulfill the gap of a possible losing trend, applications of models used in the higher education and business fields are modified to help universities to reside their positions and to become the major factor for universities to step on the transformation in the market of education industry.

In this research, evaluation of universities based on world-ranking systems is discussed. A proposed "SMTIE" evaluation model based on the related models for university evaluation is introduced to assess the transformability of universities from academic to entrepreneurial. This paper is organized as follows: In the Background, we briefly review the world-ranking systems with their indicators for evaluation, to compare US pattern and Chinese pattern, and CIPP evaluation model [24] and balanced scorecard (BSC) methodology [25] for evaluation are also reviewed. In Research Method, the data sources are discussed. In Result and Discussion, the proposed modified self-evaluation model for internal and external evaluation based on the SWOT analysis [26], Porter's 5 competitive forces analysis [27], Mintzberg's 5P strategy planning [28], and Chinese business philosophy [29] is proposed to assess the transformability to

"corporative" or "entrepreneurial". In Conclusion, Major findings and management implication are provided. The limitations and further research is also discussed.

II. RESEARCH BACKGROUND

A. Global evaluation and ranking systems

The original purpose of ranking system was to evaluate university graduate programs in US based on peer reputations started in 1925 [30]. In 1983, US News started college rankings for undergraduate and graduate programs. In the 21th century, more than 26 ranking systems [31] [32] were raised in the world including well-known global ranking systems including ARWU, THE-QS, Leiden, HEEACT and others [32]. Since late 19th century, the ideal equalism for higher education rose up and changed the university model from "elite-focused" to "Community Colleges" in the United States and "Polytech University" in Europe. To pursuit the higher-quality students and to attract financial support from societies, the evaluation and ranking systems were then brought in to explore the competence of "Elite Universities". The customers including students, parents and policy makers may see the "values" of "ranked" universities by their "performance" and to judge for their investment [32].

B. Classification of universities in USA and China

According to the report of Carnegie Classification of Colleges in USA, universities were classified into 7 categories in USA before 2005 [33] and into 33 categories in 2011 [34]. In China, 10 index had been used to evaluate the performance of universities using an 8-star ranking system [35] issued by Erickson research institute (CUAA). It was suggested that universities are classified as "comprehensive and professional" systems. Comprehensive system includes "doctorate-granting", "master-granting" and "bachelor-granting" universities, and professional system focuses on "technological profession and license-directed" universities. University-industry cooperation and practical training are both required for these 2 systems [36]. Californian system in USA classified universities into UC, Cal State, and community college systems. UC system recruits 1/8 of the California high school graduates. Only 10 public UC universities grant doctorate degrees. Universities of Cal State system only grant master degrees. The main mission of community colleges is education without setting up research institutes. The academic credits are transferable to Cal State and UC system [36]. In China, CUAA applied self-assessment and national ranking evaluation. For national public evaluation system, ratio of faculty no/student no., budget management, grant income, industry-cooperation projects, research and teaching performances and other index are scored. The criteria and indicators for evaluation had brought different views from the scholars about the fairness of various ranking systems [37] [38] [39] [40].

C. University outcome evaluation

In the educational field, the “factory model” metaphor was proposed in 19th century for school education based on the industrial definition to see students as raw materials, teachers as high skilled technicians, and outcomes of the graduates as the qualified products [41]. Kliebard [42] proposed “school education as travel route” metaphor. In either of the model, the evaluation process would be carefully applied to draw the bests from various systems. Various evaluation models were proposed with different aspects. These models include “Goal-Based evaluation” that is based on knowledge flow, focused on the goals and objectives of the program, person or product [43, 44], “Cost-Based evaluation” is based on cost-benefit analysis for program operativity [45], “Legal model” is based on the evidence presented for panel recommendations [46], “Balanced Scorecard” that is based on performance outcomes for policy making [47].

Evaluation also includes “internal evaluation” that is to focus on the programs and projects related to organizational management, and “external evaluation” including informative or summative that are focused on program evaluation and for the benefits of external audience or decision-makers [44]. “Outcome evaluation” was designed to measure the effects or results of programs, target on “excellence”, assess in the fields of education and academic achievement, view varying points in programs, measured with analytical data to manage the resources, and to assure quality and accountability [41]. Before 1981, the concept of “outcome evaluation” has been applied by “outcome-based ranking” that was focused on the eminent persons who attended, graduated or taught at specific institutions along with reputational-ranking and undergraduate ranking systems. Since 1983, U.S. News & World Report (USNWR) started to provide education rankings based on reputational-ranking to help parents and students find the best fit school. For global ranking, ARWU system was based on comparison of China’s universities with international competitors for academic outcomes (started in 2003), and THEQS system (started in 2005) listed best colleges based on outcomes in teaching, research, knowledge transfer and international outlooks.

The key evaluation checklist consists 15 factors including description, client, background and context, resources, consumer, values, process, outcomes, generalizability (exportability, salability), costs, comparisons, significance, remediation, report and meta-evaluation [43].

D. Evaluation models and strategic planning

A simplified CIPP evaluation model was firstly designed by Ohio State University for department and research evaluation, and was then applied to educational accountability evaluation [24, 48-50]. The CIPP evaluation model was designed for service providers, such as policy boards, program and project staffs, directors of a variety of services, accreditation officials, school district superintendents, school principals, teachers, college and

university administrators, physicians, military leaders, and evaluation specialists. This CIPP model was also configured for internal, self- and external evaluation [51]. The CIPP’s core concepts are context, input, process and product evaluation. According to Stufflebeam’s description, context evaluations focus on needs, problems, and opportunities for defining goals and priorities and judging the significance of outcomes. Input evaluations focus alternative approaches to match needs for planning programs and allocating resources. Process evaluations focus on implementation of plans to guide activities and assist explaining outcomes. Product evaluations identify outcomes and to help keep the process on track and determine effectiveness [51]. A flowchart described the role of CIPP for effecting system improvement [51]. It was also applied for assessment of service-learning program [52].

The Balanced Scorecard was first presented by GE for individual performance evaluation. Norton and Kaplan introduced the Balanced Scorecard in 1992 and was adopted by s adopted by thousands of private, public, and nonprofit enterprises around the world [47, 53]. The BSC methodology had been applied in enterprise-based measurement [54], adapted in strategic assessment [55], and was applied in higher education evaluation [56] [57].

Benjamin & Carroll [58] proposed that universities had to “make major structural changes in their decision-making systems, reallocate scarce resources, and to pursue greater mission differentiation to streamline their services and better respond to the changing needs of their constituencies”. Based on the nature of strategy and strategy analysis [28] [59] [60], firm strategy Teece [61], SWOT [26], strategic planning model, Ansoff’s product market matrix [62], and Porter’s five forces model [63], Lerner [64] proposed “strategic planning process” for California State University system to face emerging environment changes such as decline in government funding, changing student demographics, and a need to compete with the emerging models of higher education. The strategic planning was built on blocks including vision and mission, gap analysis, benchmarking, emergent strategies, strategic issues, strategic programming, and strategic thinking [64]. This strategic planning was also applied for internationalization in higher education recently [65]. Lee and Ko [29] built BSC with SWOT analysis and implemented Sun Tzu’s art of business management strategy on QFD methodology.

For university evaluation systems, the focus of internal and external systems are not yet clearly identified. In this research, the criteria of internal evaluation by applications of CIPP and BSC models is discussed. The strategic assessment basing on SWOT, Porter’s five force model and Lerner’s process will be discussed and to search for more reasonable and acceptable indicators and better process for evaluation. Mintzberg’s 5P philosophy is applicable for self-evaluation and may be built with Chinese business philosophy for policy making and to become leading guide for position transformation.

III. RESEARCH METHODOLOGY

This study is a descriptive study through literature review of Western and Eastern university models. The evolutionary and transformational trends of university models are led and affected by their outcomes that had been evaluated by world ranking systems. The criteria and indicators of ranking systems are studied to find the gap of losing trend for university transformation. The CIPP model, BSC, strategic planning models are studied, and a modified evaluation model that is combined with Western and Eastern philosophy is proposed.

IV. RESULTS AND DISCUSSION

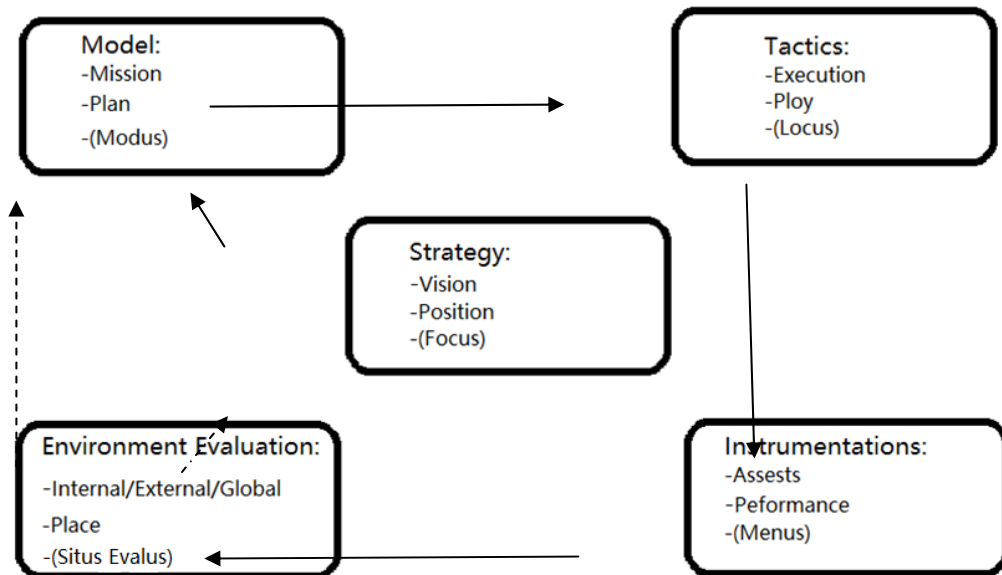
A. A "SMTIE" model

CIPP model and Ansoff matrix have been used for internal evaluation, BSC, SWOT and Porter's 5 competitive advantages analysis are useful models for both internal and outcome evaluation (Appendix 1-5). Before decision made for model application, Mintzberg's 5P strategic planning methodology is proposed to be applied for positioning of the universities based on setting up "core value" with "goals, plans, actions, and outcomes" as the principles for CIPP model. The "vision, mission and strategy" core as mentioned in BSC model is also applicable for positioning of universities. By applications of SWOT analysis, which has been used mostly in education systems, and Porter's 5 competitive advantages analysis for internal and external evaluations, universities are offered to have found the right status and direction for transformation. Based on Mintzberg's 5P strategic planning and Chinese business philosophy, a proposed modified SMTIE model is proposed as shown in Scheme 1. The strategy, business model (pattern, position,

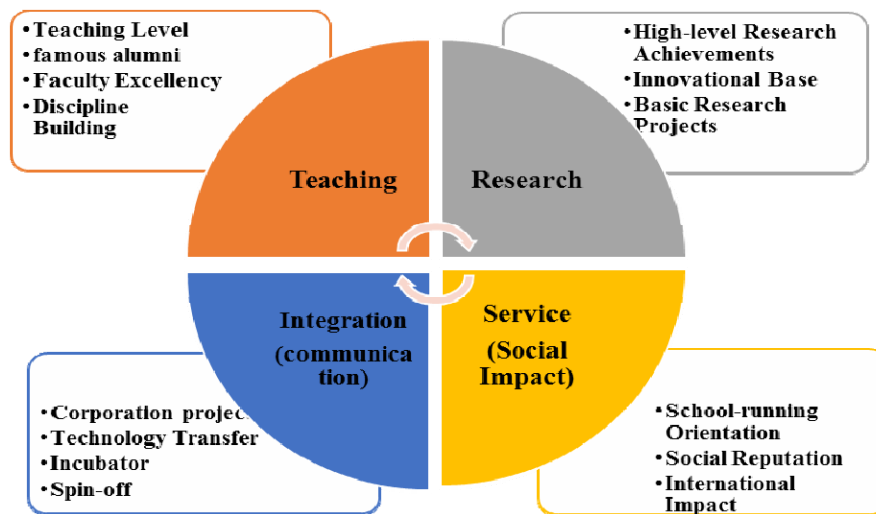
plan, and perspective) of universities

The university business strategy summarizes educational institute's values and priorities which is the central dogma of school and usually has been reflected on school mottos that is equally important with school mascot from students' view. University business plan comes with educational objectives based on its value and priorities. Classification (pattern) categorizes the position of university, and directs its vision and mission, than molds its administrative execution. The university policy makers and administrators (managers) must content strong mission and vision for the school business.

This model proposed that "Vision (Perspective)" is based on the "position" of university made by policy makers. Mission planning is after the vision with the perspective of an "Aim". "Ploys (execution)" is than to be planned after mission planning with objectives. Thus a "Pattern" of a university is modeled. A university business management flow is proposed as shown in a SMTIE model that "Strategy (core value centered)" with the respects of right "vision and position" directs set-up of university "Model (Methodology)" with the respects of executable "mission and plan". The "Tactics (ploys)" to execute of the university's mission according to the university "Model". "Instrumentations (system)" such as tangible/intangible "assets and performance" are the resources for execution. The place of a university is evaluated by "Environmental" factors including "internal, external and global issues", and thus to become driving forces for a university to adjust or transform its "Strategy" and/or "Model" to adapt the changing environment [66]. The university business management flow may also be simplified and as "Focus", "Modus", Locus", Menus" and "Situs Evalus" modified from the business models proposed previously for new technology-based firms [67].



Scheme 1. A proposed "SMTIE" model



Scheme 2. University evaluation criteria

B. Internal and external university evaluation systems in Eastern countries

The criteria of global evaluation and ranking systems are varied. Asian university ranking followed QS World University Rankings system. European Commission complies European university ranking. In USA, rankings have been conducted by magazines, newspapers, websites, or academics. The HEEACT ranking, ARWU ranking and THE-QS ranking systems are widely accepted for global university ranking [68]. The most accepted national CUAAs ranking system in China covered 33 indicators and 8-star marks for university evaluation. CUAAs system is rigorous and fits Eastern countries more. It is suggested that a modified CUAAs ranking system to be applied by Eastern universities for university internal evaluation and ranking. A university evaluation criteria with respects of teaching, research, service (social impacts) and integration (communication) is proposed as in Scheme 2.

C. Transformation of universities: case in Taiwan

As the university transformation history showed, the universities in Taiwan might have to be transformed according to the outcomes after self- and public- evaluation systems. The universities need to reform or transform through merging, entrepreneurialized or to be transformed into “multiversity” or “omniversity”. The public institutes to be classified into “Teaching”, “Research” and “Teaching/Research” universities. Institutes in the private sector to be merged to public systems or to transform to “Industrial” or “Entrepreneurial” universities in Taiwan. Industrial universities (transform from technology-oriented institutes) focus on technical training and license-pursuing directed teaching. Research-Industrial (transformed from science-technology-oriented institutes) focus on innovative technological research, technology transfer and spin-offs. Universities with ambiguous vision in private sector are pursuing transformation to entrepreneurial focus on value

creation, enterprise establishment and pluralistic operation by having an insight of business administration. In fact, private universities such as Yuan Ze University, I-Shou University, Chang Gung University, Dayeh University, Tatung University, and Asia University and others that have been run by enterprises have gradually been transformed to entrepreneurial (Multiversity) in Taiwan. It is also appalusive to see that Xin-Guo Management College has transformed to CTBC Financial Management College with great performance following a “Corporative university model” since 2015. In public sectors, the merging program had been proposed by Ministry of Education, Taiwan to search for not only the survival abilities in Taiwan, and also to seek to increase the international competitiveness and global impact in the future.

V. CONTRIBUTIONS AND IMPLICATIONS

This study proposed an “SMTIE” model for university positioning based on strategic planning and a university evaluation criteria for university self (internal)-evaluation based on CUAAs system. The public (external)-evaluation followed world-ranking systems. The outcomes of internal and external evaluations conclude the trend for university transformation. The case in Taiwan showed the necessity of the evolution of universities reflected by environmental changes. The business concepts were proposed to be applied for universities to follow for future survival and development. It implies that the business concepts are applicable for “educational industry”. The further in-depth studies will focus on “educational industry” analysis based on the principles, models, frameworks, and project managements of “business administration and management” that may contribute to policy makers (university presidents), managers (administrators), executors (research and teaching faculties), customers (students, parents, and others), and society (publics and government) to be closely intertwined and mingled to

increase global competence for universities, society and nation.

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