A feasibility study of funding university-owned enterprises to enhance industry-university collaboration in Taiwan

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ABSTRACT: Behind universal higher education, industry-university collaboration is encouraged by the government to boost the professors' research capacities to help companies to improve the technology level. The funding of industry-university collaboration is, thus, an inefficient use of university income. In analysing relevant laws, one finds that university fund investments could incubate university owned enterprises. With a technology transfer plan and capital investment, the university owned enterprise business model is a suitable approach for a modern university. The platform constructed by the technology transfer institution, an incubation centre or a science and technology park would further attract established cooperative enterprises and access to government subsidies, as well as the establishment of private universities. Combined with the major school functions of the incubator and the capital investment by the university funds, the university owned enterprise would help to increase the revenue of the university by the effective incubation of the incorporation.

INTRODUCTION

Because of the deregulation of higher education occurring since the 1990s, a significant number of new universities were established, and a wave of technical and vocational colleges have been restructured and renamed. The gross enrolment rate of same-age university students has reached the level of universal higher education. Universities have been affected by limited government educational resources and face unprecedented challenges, including public colleges implementing an endowment fund system to include a certain proportion of *self-financing payments*. This shows that the amount of government spending per student in public colleges and universities significantly declines as the number of students increases [1]. In response to government grant reductions each year, public schools must raise *self-financing payments* from donations, venue and facility operations, educational promotions, cooperative education and investment revenues, to improve the efficiency of fund allocations and further support the stability and expansion/development of higher education.

Under the pressure of these self-financing payments, senior university education policy leaders must have the ability to raise financial resources. In 2004, donations totalled over NT$224,080,000 for National Taiwan University (NTU), NT$394,450,000 for National Tsing Hua University (NTHU), and NT$18,740,000 for National Cheng Kung University (NCKU). In 2007 (up to October), NTU only received NT$80,801,000 in donations, NTHU received NT$73,220,000, and NCKU received NT$79,900,000 [2]. Clearly, universities listed in the *development plan for world class universities and research centres for excellence* can still improve in regards to the donation revenue expansion project.

In the context of investment income, funds are primarily allocated to term deposits. Ministry of Education statistical data show that until the end of 2007, only National Dong Hwa University and National Taiwan Normal University commissioned investment trust companies to invest their endowment funds to increase fund efficiency [2]. This further shows that university endowment funds manage idle funds in a conservative fashion. Taiwan's higher education policy leaders should take the initiative to raise funds. Furthermore, industry should replace government in aiding colleges as the university funding provider to stimulate the financial system and allocate capital in performance-enhancing operations to improve competitiveness [3].

Although industry and personal donations to universities are not common practice in Taiwan, universities can generate considerable effective cooperative education income if they apply their strengths to collaborate with industries. With their backgrounds of excellence and leadership authority, universities have recently been promoting a strong culture of industry-university cooperation to create and transfer knowledge. They hope to unite the research abilities of college and university professors with the resources of industry research and development (R&D) activities and to narrow the gap between students and corporate training. University professors' expert research abilities can create economic value and increase the national competitive advantage. In addition, professors' research can be expanded beyond pure theory

and develop the applicability and practicality of their research. These steps inevitably aid in strengthening industry R&D and can simultaneously increase university cooperative education revenue.

The government uses specific methods to prompt universities to earn cooperative education revenue. However, the industry-university fund programmes have a limited effective contribution to public university endowment funds because these programmes have time limits and exclusivity. In addition, excluding management fees, other funds cannot be spent on school expenses, whereas the contributions from technology transfers and patent licensing are relatively large. With technology transfers and patent licensing as the primary focuses, the government expects universities to become the core helix. If universities wish to cultivate expertise and technology and ensure stable technology transfers or patent licensing in endowment funds, they should consider the investment channels for the endowment funds, invest university funds into university spin-off companies, and pair technology shares with capital investments to grasp university-owned enterprise model management rights.

In the People's Republic of China (PRC), industries founded or co-founded by universities are either completely or primarily managed by the university through school investments, and have legal responsibilities and possession of business license production and management entities. Their industrial property rights belong in whole or, in part, to the school. The relationship between the school and industry is a relationship between the property right owners and industry operators [4]. Considering education policy authority deregulation of remaining private-school investments and public-school endowment fund management, as well as the urgent requirement for university investment income and cooperative education revenue, the authors conducted a feasibility assessment of a university-operated enterprise establishment to serve as an operating-decision reference in establishing university-operated enterprises by studying relevant domestic laws and analysing domestic and foreign research. The authors subsequently collected details of domestic and international laws and documentation related to university-owned enterprises to conduct an analysis that examined the connotations of cooperative education and attempted to establish a viable university-owned enterprise model.

CONTRADICTION BETWEEN INDUSTRY-UNIVERSITY COLLABORATION

Industry-university collaboration is advocated by educational policy authorities. Tang and Cheng noted that industry-university collaboration is joint R&D between academia and industry [5]. Ji indicated that industry-university collaboration in education and industry-university collaboration in research is a sub-concept of overall industry-university collaboration [6]. The two differ in that industry-university collaborative research is research and development-oriented and its products include technology. Industry-university collaborative education is oriented toward knowledge production and dissemination, and its products are people. The goal of cooperative education lies in providing students with internship and employment-guidance channels. It serves as a starting point to counsel and assist students, whereas industry-university education is multifaceted. In addition to providing students with internships and research opportunities with professors, industries also provide industry-related education and on-the-job education channels. Therefore, industry-university collaboration includes education, training, research and services depending on the nature of the industry-university programme, and does not only rely on industry-university education and industry-university research.

The primary mission of universities is to create and disseminate knowledge. The creation of knowledge induces a knowledge gap, and the dissemination of knowledge can pre-empt this gap. University knowledge creators generate knowledge from collected resources. These resources come from government and private agencies. To pre-empt a knowledge gap, university knowledge creators disseminate the information so that the knowledge is not lost. They abandon opportunities to self-accumulate knowledge and replace these opportunities with external reputation enhancement, such as in publications [7]. According to present industry-university collaborations, and the definition of collaborative education before the University Act was amended in 2004, university-accumulated knowledge gaps, research, training, education and services can be used to collaborate with industry or other entities and obtain appropriate resources.

A collaborative relationship is formed when both parties agree on the prerequisites for exchanging equal resources. Universities not only improve their reputation and assist in enriching the college fund with external financial resources, but also enrich the follow-up resources of knowledge creators. In this atmosphere of industry-university collaboration, a contradiction appears between university knowledge creation and dissemination and obtaining anticipated returns. To gain greater compensation returns, knowledge creators often disseminate less knowledge. The incentive of improving their reputation is less than that of compensation returns. Subsequently, knowledge dissemination relies on the lag of knowledge from the entity compensation resources model and on whether the magnitude of the knowledge creator's lead can force the lagging party to pay with increased compensation resources.

The challenges of globalisation include creating new colonial histories and replicating higher education policy leadership [8]. The financial crisis that has occurred in the last few years magnifies the concerns of education globalisation. The majority of industry-university collaborations must address the requirements of local plans and university research- results technology transfer. In addition to promoting industry upgrades and promoting national economic growth, universities can obtain academic and research institution, industry or government research resource

investments. The previous forms a positive cycle that elevates the national economic cycle. Through continued government resource investments, the 5-year NT$50 billion higher-education development plan focuses on prospect research and competitive published results, which attracts students to the university through academic features, such as the number of citations and its international prestige. These achievements contribute to the country's advancement (and academic history), bringing prestige to the university and government, albeit with limited assistance for economic and industrial growth. Public opinions shift with the reduction of national resources and, when government project resources become unsustainable, a negative cycle forms.

KNOWLEDGE VALUE AND UNIVERSITY-OWN ENTERPRISES

Value of Knowledge-Gap

In addition to the primary university goal of disseminating knowledge, knowledge creation is an accountability requirement and is gradually receiving more recognition. Newly created knowledge is divided into two types, specifically, academic knowledge and commercial knowledge [7]. Academic knowledge is disseminated easily, but it is not clearly applicable and is difficult to value. Conversely, commercial knowledge is clearly applicable and easily valued. Under the promotion of education authorities, universities who disseminate academic knowledge gain prestige from high numbers of publications and citation rates. These universities are listed among renowned universities. However, they disseminate commercial knowledge and achieve high entity compensation resources from collaborative programme technology transfer cases.

As mentioned previously, a knowledge gap exists. Thus, when new knowledge generated by universities shows marketability (it can be valued), the foundation of the industry-university collaboration is established and further derive new ventures. For incubation centres, Li believes they should establish university-owned enterprises and the relevant business matters should be operated by a commissioned professional managerial team [9]. In addition to providing venture-related business counselling, it can mobilise and manage venture capital, permitting a combination of the two functions of venture incubation and venture capital. The professional managerial team can assist with important functions of university-owned enterprises, such as migrating university R&D results to industries, or deriving and establishing technology companies, and assisting student-teacher ventures (company regulations, financing and financial planning, factory construction, government subsidy programme information, patent application assistance, equity negotiation information assistance), which permits universities to become a core base in driving overarching social innovations. Taiwan must move toward a vision of a knowledge economy before it can realise its social vision [9].

He has stated that *university-owned industries* are industries run by universities, that is, businesses that are founded or co-founded by universities, and the university and relevant business present an ownership and management relationship [4]. After a company obtains a business license from the industrial and commercial administration departments, they can qualify as a legal entity that independently conducts business activities within the scope of their constitution/articles. However, the organisation, economically, and in other aspects, continues to be subject to the administrative and business management of the school's relevant competent departments. Thus, university-owned industries pass the operating-profit obligations to the school [4].

In 1978, after reforms in the PRC, certain universities began to manage enterprises derived from the school with university-industry management committees, consisting of industry management offices. For example, on 1 August, 1995, all enterprise groups of Tsing Hua University were established unincorporated. By the end of 2000, they possessed CNY7.3 billion in assets. University-owned enterprises have three main characteristics: a) the university has an absolute or relative maximum investment ratio; b) in the start-up period, members of the corporate management team primarily come from university faculty or students; and c) the company primarily relies on the university's resources to draw contracts, develop new products and for other development processes. University-owned enterprises are the background of high-technology enterprises and focus on studying the industrialisation of new discoveries [10].

The aforementioned knowledge can be segregated into academic knowledge and commercial knowledge. The applications of academic knowledge are not obvious and cannot be valued. The applications of commercial knowledge are clearer and easier to value. However, the nature of knowledge cannot be explicitly distinguished with the binary method, particularly, the knowledge created in the engineering and applied sciences departments or R&D centres. To obtain higher numbers of published journal articles, some knowledge creators trend towards research with science prospects to accelerate promotion. In addition, knowledge creators in the engineering and applied science fields primarily trend towards applied science knowledge creation.

Applied science emphasises utilisation, thus, related knowledge creation would inevitable be applied. However, knowledge creators are concerned about the lack of market development time. New-knowledge application timing is often determined by the industry. The industry is often the main factor in whether a university-industry collaboration case succeeds. If a university has a venture capital firm but hesitates on whether to invest in university-industry collaboration, it can use the knowledge valuing method to establish a university-owned enterprise. It can, then, focus on expanding the knowledge developed by the university, creating larger niches and can, then, focus on attracting industry

collaboration, mergers and acquisitions and, thereby, increase the school's endowment fund. This is the prospective establishment of university-owned enterprises, which can further increase knowledge value prices.

Knowledge Value Enhancing University-Owned Enterprises

Taiwan's higher education policy leaders should consider methods to invest university funds and catalyse social and economic development [11]. Furthermore, Taiwan's higher-education policy leaders should assess their strengths, actively communicate with the business community, respond to globalised resourcefulness through businesses, understand the fundamental points of economic development, strive for entrepreneurial establishment of R&D units at universities, seek new research resources, and form strategic alliances between universities and the industrial world [12]. In addition, because technical and vocational educational systems implement university-industry collaborative education, developing technical and vocational education requires training sites. If one combines the construction of technical and vocational educational training facilities with the development of university-owned industries, the problem of technical and vocational education training sites can be solved.

University-owned industry revenue could then be used to supplement funding for technical and vocational education. Currently, Taiwan primarily adopts the method of cooperative education to compensate for the deficiencies in student-technology internships. If vocational schools founded their own university-owned enterprises, this method could effectively address both issues. Therefore, one should first study the possibility of a trial university-owned business model in Taiwanese vocational schools [4]. The science and technology universities in Taiwan can be committed to numerous technological inventions and apply for worldwide patents to enhance the nation's competitiveness. In addition, numerous private universities that are owned by enterprise groups exist. In comparison to public universities, they are more helpful in expanding production and research cooperation and simultaneously incorporating business concepts. In the following, the authors present an analysis on the feasibility of private and public universities establishing university-owned enterprises.

To establish university-owned enterprises, universities must adhere to relevant laws and regulations. In the amended Private School Act (amended 01/16/2008), it is stated that:

> *...Private school revenue should be fully used on annual budget expenses and the surplus amount should be retained in this school's fund. With the agreement of the school's foundation and legal authorities, of this remaining amount, half of the accumulated surplus shall be put into investments that will aid in increasing the school's financial resources…*

The Private School Act states that after the year's annual budget expenses have been paid, half of the remaining amount must be invested to increase the school's financial resources:

> *To increase teaching effectiveness and enrich the school's financial resources, after this rule receives approval from the school's competent authorities and industry competent authorities, the school foundation's private university must establish subsidiary bodies for teaching, training, experiments, and promotions. The same applies to using investments, accepting government authorities, private enterprises or private commissions, cooperative business operations or other legal methods, to handle education, training, experiments, research, and promotions related to businessmen.*

However, this surplus is dependent on each year's annual budget. Because of the necessity of tightening budget provisions, it may not be difficult to achieve a surplus this year. Because the act does not account for the disposal of losses, this could be one method of gaining investment funds.

CONCLUSIONS

In the ever-changing atmosphere of higher education and drive for education leadership authorities, university-industry collaboration is advocated in the hope of combining the research abilities of university professors with enterprise R&D activity resources, and narrowing the gap between students and corporate training. The primary problems of university-industry collaborations are local plan requirements and technology transfers of R&D results that universities release. In addition to promoting industry upgrades and spurring the growth of the national economy, universities make academic and research institution investments and industry or government research investments and, thus, are a positive influence on the national economic cycle. For example, universities adopt new knowledge in economic activity policy applications.

When the industrial technology establishments are adopted as the primary tools for new or old market demand economic activity strategy application, universities expects to implement endowment funds using technology transfer or patent licensing. In addition, the entity-return resources of behind-knowledge are comparatively lower, and the number and amount of university-industry collaborations and technology transfers are limited and often cannot be paired successfully. Technology transfer institutions, incubation centres and technology parks can further derive new ventures, attract established joint ventures, obtain government grants and use university fund purchases in hybrid-organisation

capital projects. Joint venture initial investments are not large-scale; thus, government grants and school-matching funds can establish trials using hybrid organisations to thrive as independent new start-ups. This trial production line and plant can be rented out to new ventures, combining university incubation-centre abilities to further expand capital investments and achieve effective university-owned enterprise benefits.

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REFERENCES

1. Ministry of Education. National University and College Endowment Fund 2008 Budget Assessment Report Table. Taiwan Assembly Part 1, No. 0970049981 (2008).
2. Ministry of Education. The Ministry of Education Selects Excellent University-Industry Collaboration Incentive Program Schools, Strive to Raise University Knowledge Value, Create New Socio-economic Development Opportunities, 28 December 2008, http://www.edu.tw/
3. Jongbloed, B. and Vossensteyn, H., Keeping up performances: an international survey of performance-based funding in higher education. *J. of Higher Educ. Policy and Manag.*, 23, **2**, 127-145 (2001).
4. He, Y.L., Mainland China's University-Industry Collaboration System - Peking University's University-Owned Enterprise Case Study. Unpublished Master Thesis in Education, Jinan International University (2003).
5. Tang, Y. and Cheng, Q.H., *Higher Education Operations*. Taipei: Higher Education Press (2003).
6. Chi, C.H., The current status and reform on the Operational Mechanism for M.O.E's Industrial-Academic Cooperation of Vocational Colleges. Unpublished Master Thesis in Education, Jinan International University (2004).
7. Teichler, U., The changing debate on internationalisation of higher education. *Higher Educ.*, 48, **1**, 5-26 (2004).
8. Deem, R., Mok, K.H. and Lucas, L., Transforming higher education in whose image? Exploring the concept of the *world-class* university in Europe and Asia. *Higher Educ. Policy*, 21, **3**, 83-97 (2008).
9. Li, W.H., The importance of innovation incubation center operation on the university of technology. *National Taipei University of Technology Newsletter*, 124 (2005).
10. Song, J. and Wang, T., The Interaction between research and industrialization in Chinese universities. *Technol. and Industrialization in Chinese Universities*, 4, 24-27 (2005).
11. Mok, K.H., Globalisation and higher education restructuring in Hong Kong, Taiwan and mainland China. *Higher Educ. Research and Develop.*, 22, **2** (2003).
12. Valimaa, J., Nationalisation, localisation and globalisation in Finnish higher education. *Higher Educ.: The Inter. J. of Higher Educ. and Educational Planning*, 48, **1**, 27-54 (2004).