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# A comparative study of proof-of-concept centres in Chinese and American universities

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***Abstract:*** *As the main source of scientific and technological achievements, the industrialisation of scientific and technological achievements has attracted much attention in universities. In order to reduce the risk of industrialization and fill the funding gap, proof-of-concept centres have emerged as innovative organizations for the industrialization process of scientific and technological achievements in universities. This paper provides an overview of the construction and connotation characteristics of proof-of-concept centres in Chinese and American universities, especially research universities, and compares and analyses proof-of-concept centres in Chinese and American universities in terms of construction purpose, organisational mode, functional positioning and funding sources.*

***Keywords:*** *Research University; industrialisation of scientific and technological achievements; proof of concept centre*

## 1. Introduction

Universities are the main source of scientific and technological achievements, but the transformation of their achievements into market productivity is not satisfactory. Further analysis shows that there is a "valley of death" and "Darwin's sea" between the scientific and technological achievements of universities and the market [1].In order to reduce the uncertainty of industrialization of university scientific and technological achievements, especially original research results, and to improve the attractiveness of social capital for the transformation of university achievements, Chinese and American universities, especially research universities have explored proof-of-concept centres (PoCC) in recent years[2].The proof-of-concept centre is mainly a proof-of-concept centre built on the basis of a research university, which aims to make up for the shortage of technology licensing offices (OTL), technology transfer offices (TTO) and other institutions, fill the funding gap for the proof-of-concept of university scientific and technological achievements, solve the problem of the "initial kilometre" of the industrialization of original scientific and technological achievements of universities, and help the transformation of university scientific and technological achievements to cross the "valley of death[3].At present, Chinese and American universities have already had some experience in the construction of concept validation centres, and Chinese and foreign scholars have conducted more detailed studies on the construction experience of concept validation centres in the US and Europe[4][5][6], but there is a lack of research on concept validation in Chinese universities, which especially the comparison of concept validation centres in Chinese and American universities. Based on this, this paper provides an overview of the construction of university concept validation centres in China and the United States, contrasts and analyzes the similarities and differences between them, and draws certain insights from them, which is of great significance for the subsequent construction of university concept validation centres in China and the formulation of university policies on the transformation of scientific and technological achievements.

## 2. Overview of the construction of proof-of-concept centres in US universities

The first university proof-of-concept centre in the US was the von Liebig Center at the University of California, San Diego (UCSD), which was established in 2001 with an initial $10 million grant from the William J. von Liebig Foundation. "The core mission of the von Liebig Center is to "accelerate the commercialisation of innovations at the University of California, San Diego, facilitate the exchange of

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ideas between the university and industry, and develop engineering talent for the entrepreneurial marketplace", and the Center's main functions include providing Funding, advisory services, and educational training for the commercialization of innovations at the University of California, San Diego[9]."The Von Liebig Center model was recognized by universities, companies and other sectors of society in the US, and many universities subsequently built proof-of-concept centres alone or in collaboration with other organizations, such as the MIT Deshpande Center (built independently by MIT), the Louisiana Proof-of-Concept Center (built independently by Louisiana Tech), and the Venture Lab (built jointly by six universities in Georgia). In March 2011, then President Barack Obama announced the creation of the Proof of Concept Centre project as a key element of the i6 Challenge, and in 2012 the US Economic Development Administration (EDA) awarded $1 million in funding to seven new PoCCs [7].According to statistics, after more than two decades of development, there are now more than 40 proof-of-concept centres in US universities, and PoCC has become an important element in the innovation system of US universities, playing an important role in the commercialization of technology in US universities[5].

"The Deshpande Center for Technological Innovation (DCTI) was founded in 2002 with a $17.5 million donation from the Deshpande women and was built on the back of the MIT (Massachusetts Institute of Technology). The core mission of the Centre is condensed into one word: "Impact", which means helping MIT researchers to make a significant impact on the world by developing innovative technologies in the laboratory and bringing them to market in the form of breakthrough products and new companies. funding, business consulting, communications and training functions to achieve its core mission. In terms of outcome evaluation, the DCTI grant application process shows that the DCTI has a dedicated Selection Committee that evaluates each application and provides selection criteria on the DCTI website, including commercialisation potential, technological advancement, commercial value and potential risk. In terms of funding, the DCTI offers Initial Grants, which provide MIT researchers with $50,000 for the first year to continue experimenting with proof-of-concept or prototype inventions, and Renewal Grants for completing milestone experiments. Renewal Grants range from $50,000 to $150,000, with total funding not to exceed $250,000. Renewal Grants are not open to applications and only support projects from the initial grant that have market value and are commercially viable, facilitating further commercialisation of the project, including the formation of a new company or licensing to an existing company.In terms of business consulting, DCTI provides Catalysts, also known as Mentors, for each project. The Catalysts are the core competencies of DCTI, providing business advisory services to the fund recipients, especially in the areas of innovation and entrepreneurship knowledge, business plan writing, business model analysis and IP layout. In terms of communication and training, in addition to providing business knowledge training courses for MIT students and faculty, DCTI also regularly conducts Idea Stream, open house and catalyst gatherings. "In addition to providing business knowledge training courses for MIT students and faculty, MIT also runs regular networking events such as Idea Stream, open house and catalyst party. From 2002 to 2022, DCTI has funded more than 190 projects with more than 400 MIT students and faculty members, and more than $20 million in grants, driving the creation of 47 new companies and facilitating more than $130 million in venture capital, making a significant impact in the life sciences and clean energy sectors.[8]

## 3. Overview of the construction of proof-of-concept centres in Chinese universities

The first university proof-of-concept centre in China is the Xi'an Jiaotong University Proof-of-Concept Centre. It established in April 2018, that the centre is positioned to incubate early-stage academic entrepreneurial projects at Xi'an Jiaotong University through proof-of-concept, aiming to solve the problem of the "initial kilometre" of the transformation of scientific and technological achievements at Xi'an Jiaotong University, help early-stage projects cross the "Valley of Death At present, Xi'an Jiaotong University's Proof of Concept Centre, in collaboration with social investment institutions, has selected a number of early-stage scientific and technological achievements with potential for transformation and provided proof-of-concept services. At the same time, Xi'an Jiaotong University's Proof of Concept Centre has established a proof of concept fund of RMB 10 million with the United Nations-owned capital to invest in supporting the transformation of early scientific and technological achievements of Xi'an Jiaotong University. The Xi'an Jiaotong University proof-of-concept centre model has received responses from the Ministry of Education, other provinces, cities and universities.

The Beijing Zhongguancun Committee has the most mature experience in building university proof-of-concept centres with universities in the Haidian District. 2018 saw the Ministry of Education's Department of Science and Technology and the Zhongguancun Science Park Administrative Committee jointly issue the Implementation Plan for Promoting the Transformation of Scientific and Technological

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Achievements of Universities in Beijing, clearly proposing to "promote the construction of proof-of-concept centres in Beijing universities". Subsequently, Beijing Haidian District released the "Proof of Concept Support Plan" for Zhongguancun Science City, which focuses on the early stage of transformation of scientific and technological achievements. In October 2019, the first university proof-of-concept centre in Beijing, the Zhongguancun Science City-Beijing University of Aeronautics and Astronautics Proof-of-Concept Centre, was officially inaugurated. The centre focuses on the selection of key projects in the fields of new materials, aerospace and electronic information, and provides them with "one-stop" proof-of-concept services such as results evaluation, technology maturation and business planning, and builds a whole-process service and a whole-chain transformation system from original innovation, proof-of-concept, incubation and cultivation, in order to The "proof-of-concept + incubation + investment" innovation model realizes the productization, commercialization and capitalization of research results. The Centre has selected seven key projects in the fields of new materials, electronic information, aerospace and medical-industrial combination to carry out proof-of-concept support, providing services such as technology maturation and commercial planning, exploring the verification mode of university research results for market application, and providing effective support for the transformation of research results with commercialization prospects into actual productivity.

In addition to Beijing, Shanghai, Shenzhen, Sichuan and Jiangsu are also working on the construction of proof-of-concept platforms, support for proof-of-concept projects and the establishment of proof-of-concept funds. Shanghai's first university proof-of-concept centre, the Shanghai Normal University Proof-of-Concept Centre, was established in May 2019, and the Shanghai Action Plan for Promoting the Transfer and Transformation of Scientific and Technological Achievements (2021-2023), released in June 2021, clearly states that professional institutions should be supported to carry out scientific and technological evaluation and proof-of-concept services. Piloting the establishment of guidance funds for proof-of-concept of scientific and technological achievements and encouraging investment institutions, technology transfer institutions and others to invest in early stage scientific and technological achievements. Shenzhen University Innovation Validation Centre", the first university innovation validation centre in Shenzhen, was launched in November 2020. The Innovation Validation Centre provides personalised support for innovation validation projects through the provision of validation funds, matching seed funds, expert advisory services, entrepreneurial talent training and incubation space. The Shenzhen 2021 Party Congress report clearly states that in the future, it will "improve the mechanism for industrialising the achievements of universities and research institutions, support the construction of proof-of-concept centres and small and medium-sized trial bases, and promote the transformation of more scientific and technological achievements along the way". The core function of the platform is to select basic research projects with application prospects for universities and institutes inside and outside the province to carry out proof-of-concept activities and promote laboratory results into the pilot maturation cultivation system.

## 4. Conceptual characteristics of university proof-of-concept centres and comparison between China and the United States

An overview of the construction of proof-of-concept centres at universities in China and the US shows that proof-of-concept centres are based on the evolution of proof-of-concept research and the exploration of technology transfer practices at US universities. From its beginnings as engineering technology demonstration research in the aerospace sector, through to a grant-funded programme to provide funding for the further engineering and commercialisation of early research results, the proof of concept has evolved into an innovative organisational model to accelerate the process of translating university research results.According to the literature and case studies of domestic and international practice, proof-of-concept centres are generally considered to be innovative organisational models established by research universities to accelerate the transfer of university research results and help them to cross the "valley of death"[10].

From the connotation function, the proof of concept centre is to assess and prove whether the scientific and technological achievements have commercial value, provide financial support and entrepreneurial guidance for research results with commercial value, transform the research results into prototypes or product prototypes with market potential, reduce the risk of marketable products of research results, and improve the transformation rate of results and social capital attractiveness[11].The core purpose of the proof-of-concept centre is therefore to accelerate the industrialisation of university research results and help them cross the "valley of death", with functional features such as evaluation of results, funding, commercial services, training and exchange, and prototype realisation.

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The Chinese university concept validation centre is built on the basis of the introduction and absorption of the American university concept validation centre, and further innovation and exploration in accordance with the actual situation in China, and there are naturally similarities and differences between the two countries' university concept validation centres. The typical university concept validation centres in China and the United States are shown in Table 1. The purpose of their construction is the same, both aiming to promote the industrialisation of university scientific and technological achievements, but there are differences in the organisational model, functional positioning and funding sources. In terms of organisational model, US university proof-of-concept centres are non-entity organisations established in research universities, such as the Liebig Centre and the Deshpande Technology Innovation Centre, while Chinese university proof-of-concept centres are generally entity organisations relying on university-affiliated units engaged in the transfer and transformation of scientific and technological achievements, such as the Technology Transfer Centre of Xi'an Jiaotong University and the University Science and Technology Park of Beijing University of Aeronautics and Astronautics. In terms of functional positioning, the US university proof-of-concept centres are different from traditional incubators in that they do not provide shared experimental sites and incubation space, fund researchers to continue research in their laboratories, and mainly act as a supplement to university TTOs and other institutions, providing financial support, entrepreneurial guidance, intellectual property layout and other services for university achievements with commercialisation prospects; compared to the US university proof-of-concept centres, Chinese university proof-of-concept centres have a broader functional positioning. In addition to the core functions of providing financial support and business consultancy for promising research results, the Centre also provides extended functions such as test and demonstration space and incubation space to facilitate prototype realisation and sample demonstration of university research results.In terms of funding sources, the construction funds of proof-of-concept centres in American universities mainly come from social donations, for example, the initial construction funds of the von Liebig Centre were donated by the William J. von Liebig Foundation, and the start-up construction funds of the Deshpande Technology Innovation Centre were donated by the Deshpande women; while the proof-of-concept centres in Chinese universities are mainly provided by relevant government units, for example, the construction funds of the proof-of-concept centres of Beijing University of Aeronautics and Astronautics and Tsinghua University Industrial Research Institute are mainly provided by Zhongguancun Science City under the Beijing government.

*Table 1: Typical university proof-of-concept centres in the US and China*

| National | Centre Name | Established Date | Supported Universities | Construction Location |
|---|---|---|---|---|
| United States | Von Liebig Centre | 2001 | University of California, San Diego | California |
| | Deshpande Centre for Technological Innovation | 2002 | Massachusetts Institute of Technology | Massachusetts |
| | University of Colorado Validation Program | 2004 | University of Colorado | Colorado |
| | Maryland Proof-of-Concept Consortium | 2010 | University of Maryland | Maryland |
| | Louisiana Proof of Concept Centre | 2011 | Louisiana Tech | Louisiana |
| China | Xi'an Jiaotong University Proof-of-Concept Centre | 2018 | Xi'an Jiaotong University | Xi’an |
| | Shanghai Normal University Proof of Concept Centre | 2019 | Shanghai Normal University | Shanghai |
| | Shenzhen University Innovation Validation Centre | 2019 | Shenzhen University | Shenzhen |
| | Beijing University of Aeronautics and Astronautics Proof of Concept Centre | 2020 | Beijing University of Aeronautics and Astronautics | Beijing |
| | Tsinghua University ITRI Proof-of-Concept Centre | 2020 | Tsinghua University | Beijing |

## 5. Summary and suggestions/inspiration

Based on the overview of the construction of concept verification centres in Chinese and American universities and the typical brief analysis, after comparing and analyzing the similarities and differences of concept verification centres in Chinese and American universities in terms of construction purpose, organization mode, function positioning and funding source, two inspirations can be obtained. On the one hand, the society and academia should make more efforts to summarize and promote the experience of the concept verification centre, which has proven to have a positive effect on the industrialization of

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scientific and technological achievements in universities and has indeed accelerated the process of industrialization of scientific and technological achievements in universities. On the other hand, the state and the society should further support universities to set up proof-of-concept centres, especially high-level research universities, and rely on them to provide "one-stop" services for the industrialisation of scientific and technological achievements within the university, together with internal OTL and TTO institutions, and to act as a bridge of communication between the university and the outside, and to explore the implementation of The Centre will also serve as a bridge for exchange between the university and the outside world, and explore the implementation of a pluralistic operation mechanism comprising universities, research institutions, enterprises and capital, so as to unite various innovation bodies, accumulate various innovation resources and jointly promote the industrialisation of university technological achievements.

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