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Special Issue on Guangdong-Hong Kong-Macao Greater Bay Area (GBA) in China: building a world-class finance, innovation and technology hub

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Special Issue on Guangdong-Hong Kong-Macao Greater Bay Area (GBA) in China: building a world-class finance, innovation and technology hub

Guest Editors: Roger C.K. Chan, Peter K.W. Fong and Alice Y.C. Te

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Since first established in 1990, Hong Kong Public Administration Association (HKPAA) is committed to promote and enhance the quality of research and practice of public sector management in Hong Kong and the region. It provides a forum for the identification and discussion of important issues in public policies and management.

To commemorate its 35th anniversary, HKPAA collaborated with the International Chamber of Sustainable Development (ICSD) to host the "APAC ESG Forum - The Impacts of ESG on Business and Government: An Asia-Pacific Perspective". The forum was held at the Hong Kong Convention and Exhibition Centre on 22 October 2025 and was very well received by over 100 participants from the professional, academic, and business communities. The forum brought together leading experts from across the Asia-Pacific region to examine the transformative role of Environmental, Social, and Governance (ESG) frameworks in modern business operations and government policies. This landmark event marked a significant milestone, calling for sustainable action across business and government. Regional leaders from Hong Kong, Korea, India, Singapore, and Indonesia shared their ESG insights, helping to shape Asia-Pacific's sustainable future.

As organisations worldwide increasingly integrate ESG principles into their strategic planning, this timely event addressed the critical need for understanding ESG's multifaceted impacts on both private and public sector management. The Asia-Pacific region continues to be the focal point of global economic growth, making it essential to understand how ESG frameworks can drive sustainable development across diverse markets and governance systems. The forum explored how organisations can enhance their environmental sustainability, social responsibility, and governance practices while leveraging emerging technologies, including artificial intelligence, to achieve strategic objectives.

Professor Peter Fong, President of HKPAA, emphasised the practical significance of the event: "Understanding the impacts of ESG on the operations of both business and government is crucial for achieving long-term success and addressing global challenges. By bringing together experts from across the Asia-Pacific region, we aim to facilitate knowledge sharing and best practice development."

As stated by Dr. Angus Yip, Founding Chairman of ICSD, "In today's rapidly evolving global political and economic landscapes, the integration of ESG frameworks into business operations has become increasingly important for both business and government. This forum aims to provide valuable insights from various regional experts to help participants understand the current developments of ESG impacts across this vibrant region."

After the opening introduction, Professor Peter Fong moderated the keynote presentations by a line-up of distinguished regional experts. Professor Carlos Lo (Hong Kong), Director of the Centre for Business Sustainability and Director of the Public Policy Research Centre at The Chinese University of Hong Kong, presented on "Sustainability Indices: Business ESG and Beyond". Professor Ryan S. Song (South Korea), Professor of Law and Policy Advisor to Chancellor at Kyung Hee University, addressed "Korea at a Regulatory Crossroads: Double Materiality, and the Future of ESG Accountability". Professor Ram Kumar Mishra (India), Former Director and Chair Professor of Corporate Governance and CSR at the Institute of Public Enterprise, discussed "Government strategies in achieving Sustainable Development Goals (SDGs) in India". Ms. Hardini Kusumadewi (Indonesia), Vice Coordinator of the

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Ministry of Health-Institute for Health Metrics Project, presented "ESG-Driven Digital Health Innovation: Lessons from Robotic Tele-surgery Adoption in Indonesia". Dr. Sabrina Luk (Singapore), Assistant Professor at Nanyang Technological University, explored "Harnessing digital technology to create a sustainable city: The case study of Singapore". Dr. William Yu (Hong Kong), Founder and CEO of World Green Organisation (WGO), examined "The Influence of AI and Geopolitical Talent Management on ESG."

During the panel discussion moderated by Dr. Alice Te, Vice President of HKPAA, the guest speakers further shared their insights on how to move beyond ESG disclosure as a compliance exercise and use frameworks like Double Materiality to drive genuine, measurable impacts in both business strategy and public policy across the region. Moreover, ideas were exchanged on how can emerging technologies like AI and digital health be used as powerful tools for achieving ESG goals, and what are the critical governance and talent strategies needed to ensure they are implemented ethically and effectively across Asia-Pacific.

After the forum, and inspired by the insights from the APAC experts, participants were invited to turn talk into action by making a pledge to integrate one SDG into their work or to share a key takeaway regionally. A collective "Pledge Wall" of commitments, featuring simple, personal steps, was displayed.

HKPAA hosted a Luncheon after the forum. Professor Song delivered a keynote address on "The Impacts of ESG and Sustainability on Public Organisations in Korea – Sustainability as Infrastructure". He examined how ESG responsibilities are reshaping the role of public organisations in Korea and across the Asia-Pacific. He argued that the next stage of sustainability governance requires a shift from rule-making to nation-building – treating sustainability as public infrastructure rather than mere compliance. Instead of relying solely on hard laws and penalties, governments should invest in the fiscal, institutional, and physical foundations that enable responsible growth: green bonds and tax incentives, unified reporting systems, renewable grids, and digital networks for accountability, focusing on policy coherence. By building the environment in which sustainability can thrive, the public sector becomes an enabler of competitiveness and trust. The address invites reflection on how Hong Kong and other APAC economies can lead through governance by provision, not punishment.

HKPAA has served as a leading professional body for public administration academics and practitioners for 35 years, and it will continue to promote the excellence in public sector governance and policy development through organising various conferences, forums, seminars, and visits on a regular basis.

Peter K.W. Fong
President, Hong Kong Public Administration Association
Chair of Organising Committee of the APAC ESG Forum
Alice Y.C. Te
Vice President, Hong Kong Public Administration Association
Member of Organising Committee of the APAC ESG Forum

Editorial: Preface to the Special Issue on the Greater Bay Area

Since its establishment in 1990, the Hong Kong Public Administration Association (HKPAA) has been committed to promoting and enhancing the quality of research and practice of public sector management in Hong Kong and the broader region. It provides a forum for the identification and discussion of important issues in public administration and management, collaborating with local universities and overseas counterpart organisations to spark interest in the pursuit of best practices in public services and emerging themes through regular dinner talks, seminars, and conferences featuring renowned leaders from both public and private sectors.

To celebrate its 35th Anniversary, HKPAA has jointly organised, with the International Chamber of Sustainable Development (ICSD), the "APAC ESG Forum on The Impacts of ESG on Business and Government: An Asia-Pacific Perspective" on 22 October 2025 in Hong Kong. In today's rapidly evolving global political and economic landscapes, integrating Environment, Social and Governance (ESG) into business and government operations is crucial for long-term success, sustainable development, risk mitigation, and stakeholder trust. ESG guides organisations to adopt environmentally friendly practices, fulfill social responsibilities, maintain robust governance, and drive innovation and efficiency. Artificial Intelligence (AI) serves as a key tool for automating data collection, improving ESG reporting accuracy, and optimising resource use to enhance sustainability and operational performance. Together, ESG and AI help organisations navigate complexity and meet stakeholder expectations. The Forum has gathered insights from various experts, including academics, practitioners, and regulators from South Korea, Singapore, India, Indonesia, and Hong Kong to explore how ESG can help both private and public organisations to address global challenges and achieve long-term success.

First published in 1992, the PAP journal has been available online in open access on the Emerald Insight Platform since 2018. This year marks the 32nd anniversary of its first launch and the 8th anniversary of its online publication with Emerald. Currently, the Journal publishes three issues annually, including at least one special issue and around twenty-five articles per year.

In 2024, PAP attracted over 200 paper submissions from authors in 54 countries. As of April 2025, the total amount of downloads for all published articles in the last 12 months was 45,569. The Journal has obtained a 5-year Journal Impact Factor (JIF) of 1.3 as released by Clarivate and is abstracted and indexed by Emerging Sources Citation Index (ESCI). The Scopus/WoS Citations were 292 and 140 respectively in 2024 (increased from 192 and 111 in 2023), while the Scopus CiteScore index was 2.8 (increased from 2.5).

PAP has invited more editor/associate editors to join as member of the Editorial Board in handling the growing number of paper submissions. In 2025, many scholars from renowned universities and institutes have accepted the invitations to serve as PAP's advisors in the Asia Pacific Editorial Board and the International Editorial Advisory Board.

In summary, PAP is abstracted and indexed by: Scopus, Emerging Sources Citation Index (ESCI), CrossRef, Directory of Open Access Journals (DOAJ), EBSCO Discovery Service, Google Scholar, Health Research Premium Collection (ProQuest), Healthcare Administration Database (ProQuest), ProQuest Central, ProQuest Central Basic (Korea), ProQuest Central Essentials, ProQuest Central Student, Publicly Available Content Database (ProQuest), Summons (ProQuest), WorldCat and The British Library. Academics and practitioners in public administration, management, public policy, and related fields are encouraged to contribute papers to this journal.

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This third issue of PAP in 2025 is comprised of two parts. The first part contains articles of the Special Issue on "Guangdong-Hong Kong-Macao Greater Bay Area (GBA) in China: building a world-class finance, innovation and technology hub", guest-edited by Professor Roger C.K. Chan, Professor Peter K.W. Fong and Dr. Alice Y.C. Te. It includes six articles focusing on various aspects of the GBA, including the overall development, cross-border healthcare, state banks, smart city development, urban planning, and female academic profession. Please refer to the Introduction to the Special Issue for brief descriptions of each article.

In addition to the articles of the Special Issue, the second part includes two regular articles on higher education in India and AI in healthcare in Indonesia. A summary of these two articles is provided below.

The first article "Revolutionizing higher education: rethinking funding and global models with an Indian lens" by Ram Kumar Mishra highlights the heavy reliance of India's higher education sector on government funding as a critical challenge. It emphasises the need to explore alternative, sustainable financial sources to reduce dependency and ensure robust support for academic institutions in a global context. Using a cross-national comparative approach grounded in secondary data, the study evaluates financing practices and policy frameworks across countries. The findings reveal that while research on higher education in India is multidimensional, it lacks sufficient focus on self-sustained finance and models linking to market economies. To address this gap, the paper proposes innovative financing instruments and reform measures. Key recommendations include transforming the legal framework, enhancing internal systems, increasing project management awareness, controlling massification, implementing thoughtful privatisation, improving financial management skills, and diversifying the products offered by higher education institutions. These measures aim to reduce reliance on state support and create a more sustainable financial ecosystem for academic institutions.

The second article "Championing AI in healthcare: the impact of stakeholders on the adoption of Robotic Telesurgery Project in Indonesia" by Hardini Kusumadewi and Ning Jing explores how various stakeholders, namely the Ministry of Health (MOH), hospitals, universities, health polytechnics, and health industries, influence the adoption of the Robotic Telesurgery Project in Indonesia. Employing a qualitative approach grounded in stakeholder theory and the Technology-Organization-Environment (TOE) framework, stakeholders are categorised into four types based on their power and interest: Key Players, Keep Informed, Keep Satisfied, and Minimal Effort. These stakeholders impacted the adoption of robotic telesurgery through three key mechanisms — technological, organisational, and environmental — which encompassed factors such as the technology's advantages, trust, communication, infrastructure readiness, regulatory support, and alignment of interests. The study is pioneering in its examination of stakeholder dynamics in the context of advanced health technology adoption within a developing country like Indonesia. It provides valuable, practical insights into managing collaborative efforts among diverse stakeholders to facilitate the successful implementation of innovative medical technologies.

We hope this special issue will make significant contributions to the understanding of the GBA for policy makers, scholars, and practitioners in various countries around Asia and the world.

Peter K.W. Fong
Editor-in-Chief, PAP Journal
President, Hong Kong Public Administration Association

About the Editor-in-Chief

Professor Peter K.W. Fong, PhD (New York University), is President of Hong Kong Public Administration Association and Editor-in-Chief of PAP Journal. He teaches strategic management and supervises DBA students' dissertations of the University of Wales TSD. He also serves as Principal

Consultant of the International Chamber of Sustainable Development and holds memberships of HK Institute of Planners & Planning Institute Australia. He was a Teaching Fellow of Judge Business School, University of Cambridge; Visiting Scholar, Department of Urban Studies & Planning, MIT; Founding Director of EMBA programme, HKU Business School; Founding Director, Centre for Executive Development, HKU SPACE; Associate Professor, Department of Urban Planning and Urban Design, HKU; Executive Vice President of City University of Macau; Honorary Professor, China Training Centre for Senior Civil Servants in Beijing; Studies Director, Civil Service Training & Development Institute, HKSAR Government. He was appointed as Advisory/Visiting Professors by Tongji, Tsinghua, Renmin, and Tianjin universities in Mainland China, and Chinese University of HK and HK Polytechnic University. He was Consultants of the World Bank and Delta Asia Bank. Peter K.W. Fong can be contacted at: fongpeter@netvigator.com

Introduction to the Special Issue on the Greater Bay Area

The Guangdong-Hong Kong-Macao Greater Bay Area (GBA) in China comprises two Special Administrative Regions of Hong Kong and Macao, and nine cities including Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, and Zhaoqing in Guangdong Province with a total land area of 56 000 square kilometres. The total population in the GBA is over 87 million and the GDP is US$1.97 trillion in 2024. China's objectives of setting up the GBA are to: 1. strengthen the cooperation amongst Guangdong, Hong Kong, and Macao, 2. promote coordinated regional economic development, and 3. facilitate in-depth integration within the Pearl River Delta region, with the aim of building a world-class bay area for people to live, work and travel.

This special issue brings together six diverse yet interconnected articles that collectively illuminate the multifaceted development of the GBA as it strives to become a world-class hub for finance, innovation, and technology. The articles explore this grand ambition through various critical lenses: from foundational analyses of financial integration, innovation potential, and regulatory challenges, to in-depth examinations of sector-specific cross-border coordination in healthcare, smart city implementation, urban planning, and the crucial social dimension of gender issue in academia. Together, they paint a comprehensive picture of the GBA's unique experiment in leveraging the "One Country, Two Systems" principle to foster regional synergy, while also candidly addressing the persistent disparities and institutional hurdles that must be overcome to achieve truly integrated and sustainable development.

The first article "Can China develop the Guangdong-Hong Kong-Macao Greater Bay Area into a sustainable innovation technology and finance hub?" by Peter K.W. Fong and Alice Y.C. Te examine the GBA's potential to become a world-class finance, innovation and technology hub. After evaluation of the policy measures and implementation challenges, a comparative review of two cases of Hong Kong and Shenzhen, as well as a comparison with Tokyo, New York, and San Francisco Bay Areas were conducted. The findings highlight significant achievements in sustainable innovation, driven by strong policy support for R&D investment and cross-border collaboration initiatives. However, there are challenges, including regulatory harmonisation and economic disparities amongst the GBA cities. Hong Kong's role as a global financial centre and international gateway contrasts with Shenzhen's strengths in high-tech industries, advanced manufacturing, and sustainable urban development. Deeper government-community collaboration is essential to ensure long-term policy coherence, foster collaborative governance, and promote inclusive growth. Ultimately, such coordinated efforts are critical for securing the GBA's position as a 21st-century leader in finance, technology, and sustainability.

The second article "Cross-border healthcare: analyzing the phenomenon of Hong Kong residents seeking care in the Greater Bay Area in Mainland China" by Peter P. Yuen and Simon T.Y. Cheung critically examines the increasing trend of Hong Kong residents seeking medical services in the GBA, with particular focus on three key areas: dental care, long-term care, and expensive pharmaceuticals. Using a push-pull framework, the study identifies key drivers — such as high costs, long waiting times, and inadequate public health services in Hong Kong — that push patients toward more affordable and accessible healthcare options in cities such as Shenzhen and Guangzhou. The research highlights systemic challenges in Hong Kong's healthcare system, including healthcare financing gaps and capacity constraints exacerbated by an aging population and growing demand for innovative treatments. The authors advocate for urgent policy reforms to improve healthcare delivery and accessibility, while also emphasising the potential for cross-border integration within the GBA. They argue that coordinated efforts could enhance health

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outcomes, optimise resource allocation, and position the region as a leading healthcare hub.

In the third article "The network role of China's state banks in Hong Kong and the Greater Bay Area", David R. Meyer argues that the network structures and relations of China's state banks position them as pivotal actors in fostering the integration of Hong Kong and the GBA with the global economy, aligning with the Chinese government's objective to develop the GBA into a leading world region. Utilising social network theory, the study examines these banks' intra- and inter-organisational ties by analysing websites of financial firms and government entities, while also interpreting their financial activities in relation to foreign banks and the GBA business through news articles. The findings reveal how state banks network with each other and foreign financial firms in Hong Kong, and how their network relations within the GBA enhance their role in global economic integration. This research contributes to financial geography and related literature by applying social network theory to demonstrate how these previously understudied network dynamics are crucial for connecting Hong Kong and the GBA to global markets.

The fourth article "Examining smart city implementation models in Hong Kong, Macao, and Shenzhen: an analytical review" by Yi Ma, Roger C.K. Chan, and Kishan Datta Bhatta examine the smart city implementation models (SCIMs) across Hong Kong, Macao, and Shenzhen within the GBA. Applying a comparative, actor-focused political-economic framework, the study assesses how state-market-community relationships shape project-level outcomes under the "One Country, Two Systems" principle. The analysis identifies four distinct SCIMs, revealing proactive government support and place-specific strategies tailored to each city's unique socio-economic context. Key findings highlight the critical role of mega-technology firms and the influence of local institutional conditions in driving smart city development. The study underscores the importance of contextual factors — such as regulatory frameworks, economic structures, and community engagement — in shaping successful smart city pathways. By comparing these models, the authors provide valuable insights for policymakers and urban planners aiming to optimise collaborative governance and harness technological innovation for sustainable urban development in the GBA and beyond.

In the fifth article "Strategies for strengthening cross-border urban planning coordination between Hengqin, Zhuhai, and Macao Special Administrative Region, China", Jing Song Yang, Bin Li, and Jing Yang analyse the challenges and strategies for cross-border urban planning coordination between Hengqin and Macao under the "One Country, Two Systems" framework, aiming to foster regional integration within the GBA. Utilizing a qualitative case study approach that includes policy analysis, field research (2021-2024), and interviews with planners, commuters, and citizens, the study identifies significant social, cultural, and institutional differences that hinder communication and create disparities in planning objectives, priorities, and technical standards. These divergences have led to contradictory practices, especially in transportation and public facilities. The authors propose establishing a formal coordination mechanism and fostering multi-level communication to address these challenges, leveraging the unique policy framework to enhance practical collaboration and bridge a critical gap in cross-border planning research and implementation.

The sixth article "Striking the balance between academic profession and family: a study of female academics in universities in the Greater Bay Area" by Lin Luo and Yanju Shao examines the experiences and strategies of twenty female academics balancing academic careers and motherhood. The study identifies distinct challenges based on career track: those on the professoriate tracks emphasized persisting in professional pursuits, undertaking research responsibilities, and achieving work-family balance, while those on the teaching track focused on struggling for a PhD degree, workplace survival, and seeking work-family balance. A supportive family structure was crucial for both groups in managing dual roles of academic careers and motherhood. This research provides a collective portrait of academic mothers in the GBA's higher education institutions, highlighting their challenges and

strategies, and offers pragmatic advices for policymakers and higher education institutions to improve workplace conditions for female academics.

We wish to thank all the authors for contributing their papers and the anonymous reviewers for their critical but constructive comments in helping the authors to improve their papers.

Roger C.K. Chan, **Peter K.W. Fong and Alice Y.C. Te**
Guest Editors

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Can China develop the Guangdong-Hong Kong-Macao Greater Bay Area into a sustainable innovation technology and finance hub?

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Abstract

Purpose – This paper reviews whether China's Guangdong-Hong Kong-Macao Greater Bay Area (GBA) can be developed into a sustainable innovation technology and finance hub through analysing the policy measures and actions taken by the governments to deal with the challenges in the plan implementation.

Design/methodology/approach – The study employs a qualitative framework based on policy document reviews, including the GBA Development Plan (2021-2035) and cross-border case studies of Hong Kong and Shenzhen. A comparative approach evaluates the GBA's progress with those of global best practices in sustainable urban development and innovation ecosystems in Japan and the USA.

Findings – The GBA has made significant achievements in sustainable innovation, driven by strong policy support for R&D investment and cross-border collaboration. However, some challenges such as regulatory harmonisation and economic disparities amongst cities are identified. The case studies of Hong Kong and Shenzhen reveal that Hong Kong is one of the world's leading finance centres, serving as a gateway between Mainland China and the world. In contrast, Shenzhen has emerged as a pioneer in high-tech industries, advanced manufacturing, and sustainable urban growth. Deeper collaboration between the governments and the communities — the market, private enterprises, and professional communities — is required to ensure long-term policy coherence, collaborative governance, and inclusive growth, in securing the GBA's position as a 21st-century leader in finance, technology, and sustainability.

Originality/value – The paper provides a comparative review of the development of the GBA through analysing the two cases of Hong Kong and Shenzhen, as well as a comparison with Tokyo, New York and San Francisco Bay Areas.

Keywords China's Greater Bay Area, Development plan, Innovation technology and finance hub, Hong Kong, Macao, Shenzhen

Paper type Research article

Introduction

Purpose of the paper

This paper reviews the development of China's Greater Bay Area into a sustainable innovation technology and finance hub. It analyses the policy measures and actions taken by the governments to deal with the challenges and issues in the plan implementation. This paper argues that enhancing cross-border governance requires holistic planning, role specialisation, and technology-enabled collaboration. By addressing these challenges, the GBA can solidify its position as a leader in sustainable urban and economic development.

This paper forms part of a special section "Special Issue on Guangdong-Hong Kong-Macao Greater Bay Area (GBA) in China: building a world-class finance, innovation and technology hub", guest edited by Prof Roger C.K. Chan, Prof Peter K.W. Fong and Dr Alice Y.C. Te.

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A "sustainable innovation technology and finance hub" is a dynamic ecosystem that strategically integrates technological innovation, financial mechanisms, and sustainability practices to foster solutions addressing environmental and social challenges, as well as promoting sustainable well-being (Etzkowitz and Klofsten, 2005; Hautamäki and Oksanen, 2015). Such innovative ecosystems should possess globally recognised competences and businesses, encourage the creation of new knowledge and technologies, and demonstrate the ability to attract both talent and investments. Key components — including environmental sustainability, technological advancements, financial innovation, and social inclusivity —must align with global standards for modern hubs.

The study employs a qualitative framework based on policy document reviews, including the GBA Development Plan 2021-2035 and case studies of key cities in the GBA, namely, Hong Kong and Shenzhen. A comparative approach evaluates the GBA's progress against global best practices in sustainable urban development and innovation ecosystems. By examining policy frameworks, case studies, and global best practices, this study identifies key barriers — such as disparities in governance models, economic imbalances, and environmental sustainability — and proposes solutions. The findings underscore the necessity of cohesive policies, technology-driven governance, and ecological stewardship to achieve the GBA's goal as an international innovation technology and finance hub in South China.

Background of the development of GBA

The GBA consists of the two Special Administrative Regions (SARs) of Hong Kong and Macao and nine cities in Guangdong province, including Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, and Zhaoqing, with a total land area of 56,000 square kilometres (Table 1, Figure 1, Figure 2). The total population is over 87 million, representing an enormous market, with GDP over RMB14 trillion (around US$1.97 trillion) in 2024 (HKG, 2025a). The GBA is home to many world-renowned research universities, large-scale national scientific projects and high-tech companies. It has outstanding capabilities in R&D and commercialisation, as well as several challenges.

Goals, objectives, principles, and strategies

On 1 July 2017, witnessed by President Xi Jinping, the National Development and Reform Commission and the governments of Guangdong, Hong Kong, and Macao signed the "Framework Agreement on Deepening Guangdong-Hong Kong-Macao Cooperation in the Development of the Greater Bay Area" in Hong Kong. The Agreement sets out the goals and principles of cooperation and establishes the key cooperation areas in the GBA development.

Table 1. The Background of China's GBA

	Characteristics
Cities cover	- 2 SARs: Hong Kong and Macao SARs - 9 cities: Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, and Zhaoqing in Guangdong Province
Total land area	- 56,000 square kilometres
Population	- Over 87 million (2024)
GDP	- US$1.97 trillion (2024)
Development goal	- Develop into an Innovation Technology and Finance hub
Main strengths	- World-renowned research universities and high-tech enterprises - High capabilities in R&D and commercialisation
Challenges	- Regulatory harmonisation across cities - Economic disparities risking uneven development - Environmental sustainability concern on rapid urbanisation

Source: By authors

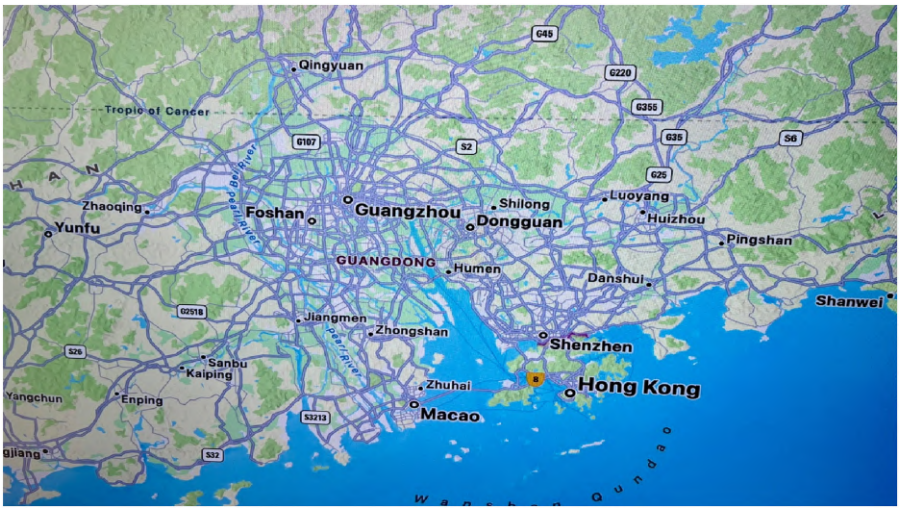

Figure 1. Location of China's GBA. Source: Google map (2025)

Figure 2. Eleven Cities of China's GBA. Source: HKG (2025b)

Since then, the relevant Central Government departments and the three governments have strived for policy breakthroughs with an innovative and open mind in taking forward the development the Bay Area jointly (HKG, 2025a).

The "Outline Development Plan for the Guangdong-Hong Kong-and-Macao Greater Bay Area" ("the GBA Plan") was announced on 18 February 2019, whilst the goals are expected to be achieved by 2035. This GBA plan is an important component of the "Belt and Road Initiative" which has the vision of building a multi-dimensional and multi-tiered connectivity network between Asian, European, and African continents (HKG, 2025a).

The main goal of the GBA Plan is to develop the GBA into the most open, market-oriented, and innovative pole of economic growth in China. As a powerhouse for sustainable finance, innovation, and technology hub, GBA should lead in cutting-edge research, financial services, and technological advancements. It positions strategically in blending the international and Mainland Chinese business environments (Yu, 2021).

Specifically, development objectives (GBA Development Office, 2019) are stated:

1. Regional development should become more coordinated, and a city cluster which has a reasonable division of labour, complementary functions and coordinated development should basically be established.
2. The environment for coordinated innovative development should be enhanced, the aggregation of factors of innovation should be accelerated, and the innovation capacities regarding new technologies and the commercial application of scientific and technological achievements should be significantly enhanced.
3. Supply-side structural reform should be further deepened, the transformation and upgrading of traditional industries should be accelerated, the core competitiveness of emerging and manufacturing industries should continuously increase, the digital economy should see rapid growth, and the development of modern service industries such as financial service should be expedited.
4. Infrastructural support and protection, such as transport, energy, information and water resources, should be further strengthened, and urban development and management should be further enhanced.
5. A green, intelligent, energy-saving and low-carbon way of production and lifestyle, as well as mode of urban development and management, should be established initially, and the lives of residents should become more convenient and happier.
6. There should be accelerated development of the new system of an open economy, greater connectivity among Guangdong, Hong Kong and Macao markets, more effective and efficient flow of various resources and factors of production, and more vibrant cultural exchanges.

The mission envisages a new attempt to break new ground in pursuing opening up on all fronts, as well as a further step in taking forward the practice of “One Country, Two Systems”.

The basic principles include (GBA Development Office, 2019):

1. To be driven by innovation and led by reform.
2. To coordinate development and plan holistically.
3. To pursue green development and ecological conservation.
4. To open up and cooperate and achieve a win-win outcome.
5. To share the benefits of development and improve people’s livelihood.
6. To adhere to “One Country, Two Systems” and act in accordance with the law.

Development strategies are also listed below:

1. Coordinating city and regional plan.
2. Division of roles based on strengths.
3. Integrated development.

4. Efficient resource allocation.
5. Infrastructure planning and connectivity.
6. Policy consistency and harmonisation.
7. Ecological conservation and sustainable development.
8. A quality living circle for living, working and travelling.

Policy implementation and execution of the development plan

Central Government's policy measures and actions on Hong Kong and Macao

Since Hong Kong and Macao are under different legal and administrative systems, specific cross-border measures are crucial in facilitating the flow of people, money, and information. The Central Government of China has hence implemented measures to facilitate cross-border movements, including simplifying cross-border procedures through information technology. The Hong Kong SAR Government has been actively reflecting Hong Kong people's wishes to relevant Mainland authorities for greater convenience for Hong Kong people studying, working, and living in the Mainland. Since November 2019, the Central Government has promulgated many policy measures to benefit Hong Kong people and facilitate the development of various sectors in the GBA (HKG, 2025c).

Moreover, a wide range of measures covering different scopes for targeted groups have been adopted (HKG, 2025c). The following are some examples.

A. Citizen-centric for the benefit of the general public:

1. Hong Kong residents to be treated as local residents in purchasing properties in the Mainland cities of the GBA.
2. Supporting the use of mobile electronic payment by Hong Kong residents on the Mainland.
3. Ensuring that the children of Hong Kong and Macao residents working in Guangdong enjoy the same education as those of Mainland residents.
4. Exploring the establishment of a cross-border wealth management scheme.
5. Foreigners holding Hong Kong Permanent Identity Cards to be able to apply to the relevant Mainland authorities for a visa or permission for residence with a validity of up to two to five years to stay or reside in Mainland cities in the GBA.
6. Permitting the use of Hong Kong-registered drugs and common medical devices in designated Hong Kong-owned healthcare institutions in the GBA.

B. Supporting professional services:

1. Relaxation on partnership associations by Hong Kong and Mainland law firms, employment of Hong Kong legal consultants and practice of Hong Kong legal practitioners in the Mainland cities of the GBA.
2. Further extending the scope of mutual recognition of qualifications for construction professionals.
3. Expanding the scope of liberalisation measures for construction professionals from Hong Kong and Macao to practice on the Mainland.
4. Preferential treatment on insurance regulation.

C. Promoting sustainable innovation and technology:

1. Supporting the development of the Shenzhen-Hong Kong Innovation and Technology Co-operation Zone.
2. Facilitating customs clearance of imported animal-derived biomaterials.
3. Relaxing the limitation on exporting Mainland human genetic resources to Hong Kong and Macao.

D. For the start-up, business and the working people:

1. Starting from 1 January 2019, an individual who has no domicile and has resided in the Mainland for an annual aggregate of 183 days or more for less than six consecutive years, shall, upon filing records with the relevant tax authorities, not be required to pay individual income tax with respect to his/her income derived from sources outside the Mainland and paid by institutions or individuals outside the Mainland.
2. The requirement for the people of Hong Kong and Macao to apply for employment permits for working in the Mainland has been removed.
3. Hong Kong and Macao people working in the Mainland can join the Housing Provident Fund and enjoy the same treatment accorded to Mainland residents in terms of base deposit, deposit ratio, processing procedures, as well as the drawing of money from the Housing Provident Fund, and the application for personal housing loans under the Housing Provident Fund, etc.
4. Eligible Hong Kong and Macao residents can take part in the qualification accreditation examinations for primary and secondary school teachers.
5. The introduction of a host of talent schemes and youth development plans to facilitate Hong Kong people's development in the GBA.

E. For education and study:

1. It is specified in clear terms that to protect the rights and interests of Hong Kong and Macao students, Mainland higher education institutions and relevant authorities must accord equal treatment for Hong Kong and Macao students in admission, nurture, management, and supporting services.
2. Mainland higher education institutions should facilitate Hong Kong and Macao students' job search and employment and issue Employment Agreements and Employment Registration Certificates to them upon their graduation.
3. Both the quota and number of scholarships open to Hong Kong and Macao students as well as overseas Chinese students studying at Mainland higher education institutions have been increased.
4. The Guangzhou Municipal Education Bureau has approved the Guangdong Overseas Chinese High School to enroll children of Hong Kong and Macao.

F. For daily living:

1. Hong Kong residents living in the Mainland who meet the relevant criteria can apply for residence permits. A residence permit holder is entitled to enjoy, in accordance with the law, three categories of rights, six basic public services, and nine facilitation measures in the place where he or she is residing. This covers areas relating to daily living including employment, education, medical care, travel, financial services, etc.

2. The People's Government of Shenzhen Municipality announced on 21 August 2019 the expansion in the scope of facilitation measures for senior citizens who have reached the age of 60. Hong Kong and Macao residents living in Shenzhen who are holders of residence permit are also eligible. Shenzhen is the sixth GBA Mainland city after Dongguan, Huizhou, Zhuhai, Foshan, and Jiangmen to offer free public transports to Hong Kong senior citizens.
3. The interim measures announced on 29 November 2019 stipulated rules for Hong Kong, Macao, and Taiwan residents working, doing business, living or studying in the Mainland to join the local social insurance scheme. The interim measures took effect on 1 January 2020.
4. The China Railway Corporation has installed automatic ticket vending and issuing machines to read and verify Home Visit Re-entry Permits at train stations of various provinces and cities with relatively large demand for ticketing services from Hong Kong people. This can reduce the amount of time otherwise spent on queuing over the counter.

G. Other recent measures to reduce barriers between cities:

1. In June 2023, Cyberspace Administration of China and Hong Kong's Innovation, Technology and Industry Bureau signed a MOU to establish rules for data transfer within the GBA under China's data security framework. This helps build Hong Kong into a global data hub.
2. Industries like smartphone, AI, biomedicine, new energy, and new materials will elevate the GBA into the knowledge economy stage.
3. In March 2023, Hong Kong signed several agreements with other city governments on information and technology, finance, smart city development, and regulations of pharmaceutical and medical devices.
4. Guangdong province has introduced a preferential individual tax subsidy for foreign talent living in the GBA.
5. The development of the Northern Metropolis between the border of Hong Kong and Shenzhen will further drive the integration of Hong Kong with Shenzhen and the GBA.
6. Shenzhen-Zhongshan bridge opened on 30 June 2024 and other high speed rail routes will make every destination in the GBA ecosystem accessible within an hour's commute, call it a "One hour living circle".
7. Remove stringent restrictions on Hong Kong-Zhuhai-Macao Bridge and increase "Hong Kong cars going north" and "Macao cars going north" making a remarkable growth of cars using it.
8. Allow non-Chinese permanent Hong Kong residents to get a 5-year visiting pass to enter the Mainland.
9. Grant over 50 countries' citizens to visit and stay for 144 hours in the Mainland without the need to apply for a visa.
10. Propose to extend cross-border customs clearance time and full implementation of "Two inspections in one place".
11. Promote "Hong Kong-funded and Hong Kong-based arbitration" for enterprises in commercial dispute resolution.

Analysis of the policies and plan implementation

Achievements and challenges

The GBA aims to be a powerhouse for finance, innovation, and technology. Its significance lies in its strategic positioning as a hybrid governance model, blending market-driven Mainland policies with the autonomy of Hong Kong and Macao SARs (Li *et al.*, 2022). This unique framework enables the region to serve as a bridge between international capital markets and Mainland China's industrial ecosystem, fostering cutting-edge research, financial services, and technological advancements. However, this hybrid model also faces challenges and obstacles in institutional coordination. There is a need for harmonised policies to maximise stakeholder engagement and economic integration.

The GBA has made significant achievements in sustainable innovation, driven by strong policy support for R&D investment, cross-border collaboration, and green technology incentives. Initiatives such as the Hetao Shenzhen-Hong Kong Science and Technology Innovation Cooperation Zone (referred to as "Hetao Innovation Zone") demonstrate how cross-border partnerships accelerate innovation, attracting global talents and companies and reducing carbon emissions through green infrastructure. Additionally, the region's digital transformation — exemplified by blockchain-enabled cross-border payments — has streamlined financial transactions and enhanced efficiency. These achievements align with frameworks emphasising innovation ecosystems and urban sustainability, positioning the GBA as a model for other global hubs.

Despite the GBA's significant progress and comprehensive policy measures and actions, the following challenges still need to be addressed.

(a) Legal and regulatory differences between cities

The GBA's integration is complicated by divergent legal systems across the jurisdictions of the nine cities in the Mainland and two SARs, particularly between Hong Kong's common law framework and Mainland China's civil law system. For instance, Hong Kong's data privacy regulations under the Personal Data (Privacy) Ordinance (PDPO) lack specific cross-border transfer rules, while Mainland cities adhere to the stringent Personal Information Protection Law (PIPL), creating compliance hurdles for businesses operating across borders (*China Briefings*, 2024). Efforts to harmonise these differences, such as the Qianhai Court's bilingual legal guides comparing Mainland and Hong Kong corporate and private lending laws, highlight the complexity of aligning judicial practices (Qianhai Shenzhen, 2024). Despite pilot programmes allowing 470 Hong Kong and Macao lawyers to practice in Mainland GBA cities since 2021, regulatory gaps in commercial arbitration and intellectual property rights persist, slowing cross-border dispute resolution (Ministry of Justice PRC, 2024).

(b) Data privacy and security concerns

Cross-border data flows face significant barriers due to mismatched regulatory regimes. While Mainland GBA cities require security certifications for data transfers under PIPL, Hong Kong's lack of equivalent rules creates uncertainty for multinational firms. The 2024 GBA Data Transfer Guide introduced a voluntary mutual recognition mechanism, but its limited scope (excluding "critical data") and non-binding nature have led to low adoption rates among Hong Kong-based enterprises. Moreover, concerns over state access to personal data under Mainland laws may deter foreign investors, despite the GBA's push to become a digital economy hub (*China Briefings*, 2024).

(c) Technological infrastructure and inter-operability

Although the GBA has built world-class hardware infrastructure — such as the 2,700-km railway network and the Hong Kong-Zhuhai-Macao Bridge — soft infrastructure gaps remain. For example, cloud computing platforms used by Shenzhen's tech firms often employ different hypervisors and data protocols than those in Hong Kong, hindering seamless data

sharing. The lack of standardised applications for fintech services also complicates integration between Hong Kong's international banking systems and Mainland mobile payment platforms like WeChat Pay. These interoperability issues are exacerbated by competing municipal priorities; while Shenzhen focuses on AI-driven governance, Guangzhou prioritises traditional manufacturing digitisation.

(d) Resistance to change and capacity building

Local bureaucracies in smaller GBA cities (e.g., Zhaoqing) often lack the expertise to implement advanced policies as compared with Guangzhou or Shenzhen. Moreover, partly due to complex accreditation processes and cultural barriers, only 3,200 Hong Kong professionals (e.g., doctors, architects) have obtained licenses to work in Mainland GBA cities since 2019. Training programmes for civil servants on cross-border collaboration, such as those under Guangdong's "Bay Area Connect" initiative, have reached fewer than 10,000 officials, leaving implementation gaps in hinterland regions (*China Daily*, 2025).

(e) Coordination among government agencies

Fragmented governance is evident in infrastructure planning. The Shenzhen-Zhongshan Link, while reducing travel time to 30 minutes, required 17 separate approvals from Guangdong, Hong Kong, and Macao authorities due to conflicting environmental and safety standards. Similarly, the Qianhai cooperation zone's financial reforms face delays as Hong Kong's Monetary Authority and China's central bank negotiate yuan convertibility limits. The absence of a supranational GBA authority forces reliance on ad hoc joint conferences, which lack enforcement power (Ministry of Justice PRC, 2024).

(f) Disparities in financial resources and investments

There is huge diversity amongst the economic development of the nine Guangdong cities. For example, Shenzhen has per capita GDP of US$20,000, whereas that of Zhuhai is US$12,000, which is triple that of Zhaoqing. While the GBA attracted RMB5.7 trillion in pledged investments during its 2024 Global Promotion Conference, funding disparities persist. Shenzhen's R&D budget (RMB500 billion in 2023) dwarfs Zhaoqing's entire fiscal revenue (RMB32 billion), limiting equitable growth. Green finance initiatives, such as Qianhai's carbon-neutral bonds, struggle to scale due to Mainland banks' risk aversion and Hong Kong's stricter ESG disclosure rules (*China Briefing*, 2024).

Policy measures to deal with the challenges and issues

In summary, the GBA faces three core challenges. First, regulatory harmonisation, including divergent data privacy laws, licensing requirements, and customs procedures between Mainland China, Hong Kong, and Macao hinder seamless integration. Second, economic disparities remain while Shenzhen and Guangzhou thrive in tech and manufacturing, other cities like Zhaoqing and Jiangmen lag, risking uneven development. Third, environmental sustainability could be a concern with rapid urbanisation which may strain ecosystems, necessitating stronger balance between growth with conservation.

To address some of the above challenges, policymakers may need to prioritise some harmonised regulations (Patchell, 2023). For example, a GBA-wide data governance framework would standardise cross-border data flows while maintaining security. The role specialisation among the various cities can be further enhanced. For example, leveraging Shenzhen's tech ecosystem and Hong Kong's capital markets may co-develop green finance products, such as carbon trading platforms. Digital infrastructure may be expanded to scaling blockchain-based payment systems to reduce transaction times and enhance financial interoperability. To address the economic disparities amongst the various cities, administrative and tax incentive policies should be introduced to encourage firms and education institutes to invest in less developed areas. Some non-core cities such as Zhaoqing have invited the second-

tier Hong Kong universities to set up branch campuses there. A new GBA coordination office with representatives from all the 11 cities may be set up to tackle and mediate the issues and challenges in the development process.

Impacts of COVID-19 pandemic

The COVID-19 pandemic had significantly disrupted policy implementation globally from 2019 onward, including within the GBA. The lockdowns and supply chain interruptions in early 2020 delayed numerous infrastructure and innovation projects. However, pandemic-driven policies also accelerated digitalisation and technological adoption. For example, China's rapid deployment of smart healthcare technologies, including health code apps and contact tracing systems, enhanced digital infrastructure in the GBA (National Health Commission of the People's Republic of China, 2018).

The pandemic had disrupted the finance and innovation networks initially through economic contraction and reduced foreign investment. Yet, official responses like fiscal stimulus, special bonds, and targeted support for industries helped mitigate these impacts. In Hong Kong and Shenzhen, pandemic policies accelerated digital transformation and fintech adoption, though strict travel restrictions hindered cross-border collaboration and slowed physical integration efforts (HKIMR, 2022). Overall, while COVID-19 initially hindered development goals by causing delays and economic pressures, it has ultimately pushed the GBA toward faster digital integration and innovation in technology and finance, though at the cost of temporary setbacks in physical connectivity and mobility.

Case studies of key cities in the GBA: Hong Kong and Shenzhen

Hong Kong and Shenzhen are selected as key case studies in the GBA. This section examines their features, as well as the interplay between inter-city competition and cooperation.

Hong Kong

Hong Kong plays a pivotal role in the development of GBA with its strategic position as the gateway between Mainland China and the world (Sharif and Chandra, 2022).

A. Infrastructure leadership and connectivity

Hong Kong serves as the GBA's global financial and logistics hub, leveraging its US$363 billion GDP (2024) with per capita of US$48,000 and world-class infrastructure. Hong Kong has a well-developed transport system that includes buses, trams, ferries, and the Mass Transit Railway (MTR) system, which is one of the most efficient and densely used metro systems in the world (carries 90 percent of all passengers). Hong Kong International Airport is a major transportation hub in the region, also ranks top globally for cargo throughput, while its Port Community System enhances real-time tracking for cross-border e-commerce, aligning with plans to become a regional logistics hub.

Hong Kong and the Mainland are closely connected. With well-developed cross-border transportation networks and cross-border facilities, there are frequent contacts between the two places and cross-border passenger traffic has been on the rise in recent years (Park *et al.*, 2022). In 2019, over 236 million passenger trips crossed the border via land crossings, which include Lo Wu, Lok Ma Chau Spur Line, Hung Hom, Shenzhen Bay Port, Lok Ma Chau (Huanggang), Sha Tau Kok, Man Kam To, West Kowloon Station, and Hong Kong-Zhuhai-Macao Bridge (HZMB) Hong Kong Port, with a daily average of over 640,000 passenger trips.

The Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) connects with the national high-speed rail network and greatly shorten the travelling time between Hong Kong and Shenzhen, Guangzhou, and other cities in the GBA. It consolidates Hong Kong's position as a regional transport hub.

The Hong Kong-Zhuhai-Macao Bridge (HZMB) opened in October 2018, spans from Hong Kong port to Zhuhai and Macao with a total length of 41.6 km. Together with the 13.4 km-long Zhuhai Link Road, the total length is 55 km. It is the longest bridge-cum-tunnel sea-crossing in the world. It reduces the travelling time between the Kwai Tsing Container Terminals and Zhuhai from currently 3.5 hours or so to about 75 minutes; reduces the travelling time between the Hong Kong International Airport and Zhuhai from currently 4 hours or so to about 45 minutes; incorporates the western side of the Pearl River Delta into a reachable "three-hour commuting radius" of Hong Kong. Moreover, Hong Kong is now connected with the over 30,000-km National High Speed Rail Network, having direct train service to 58 Mainland destinations. The travelling time for trains departing from the West Kowloon Station is shortened tremendously with about 14 minutes to Futian (a district in Shenzhen), about 18 minutes to Shenzhen North, and about 46 minutes to Guangzhou South.

B. Top financial centre with unique strengths

Hong Kong's key industries include finance, trade, tourism, logistics, and professional services. Backed up by unique strengths with numerous advantages under the "One Country, Two Systems" framework, free flow of capital and information, rule of law, safe and low crime rate, clean government, independent legal and judicial system, robust intellectual property protection regime, friendly and easy business environment, low and simple tax regime, diverse and international talent pool, good transport and communication infrastructure.

Amongst the world's top financial centres, Hong Kong is ranked third, with well-established stock market, and a gateway to China. The first is New York City which is home to Wall Street and major financial institutions, followed by the London which is the historic financial hub with banking, insurance, and foreign exchange. Hong Kong is also ranked first amongst the World's Freest Economies with the score of 10 by Fraser Institute Canada in 2024 (*China Daily,* 2024).

C. Roles of Hong Kong in the GBA Plan

The roles of Hong Kong in the GBA include basic research, applied research, prototype development, testing and certification, marketing and other professional support (e.g., intellectual property protection), mass production and manufacturing, fund raising in capital market, and a bridge connecting GBA, Mainland China, and the world.

The GBA Plan (GBA Development Office, 2019**)** identifies eight key functions for Hong Kong, which are as follows:

1. Consolidate and strengthen its status as the international financial, shipping and trade centre.
2. Strengthen its status as an offshore renminbi business hub, international asset management centre, and risk management centre.
3. Develop finance, trade and commerce, logistics and professional services towards the high-end and high value-added direction.
4. Forcefully promote innovation, science and technology.
5. Cultivate emerging industries; build up Hong Kong as the centre of international legal and arbitration services; and construct a competitive international metropolis.
6. Hong Kong, one of the four core cities in the GBA with Guangzhou, Shenzhen, and Macao, with comparative advantages such as well-established institutions, sound legal system, abundant talents, free information circulation, advanced financial and service systems, and extensive international contacts, should perform pivotal, coordination and central functions in the GBA.

7. Being an integral part of the GBA, Hong Kong is expected and supported by the Central Government to develop into a hub of the Area, and leveraging on Hong Kong's status as an international metropolis, to connect the Area with the world.
8. GBA will enable Hong Kong to integrate fully into the country's development. Leveraging on its advantages of "One Country, Two Systems", Hong Kong can contribute to the country and pave way for the GBA to further link up with the world.

D. Innovation and cross-border synergies

Hong Kong's collaboration with Shenzhen in the Northern Metropolis and Hetao Innovation Zone aims to create 150,000 tech jobs, focusing on AI, fintech, and green technologies. A pilot programme for cross-border data flows (covering banking and healthcare) reduces compliance costs, addressing regulatory fragmentation — a unique challenge compared to mature bay areas like New York or Tokyo.

The "One Country, Two Systems" framework enables Hong Kong to bridge the Mainland and global markets playing the role of super-conductor, but hurdles remain. For example, the regulatory misalignment with divergent data privacy laws and licensing requirements will hinder talent mobility. Moreover, with the land constraints of only 1,106 square kilometres, Hong Kong faces shortage of usable land for long term development. The high living expenses may deter the stay of the talent.

For the future pathways, to sustain leadership, Hong Kong has to deepen GBA integration, expand the financial reforms and mutual recognition of professional licenses, boost green finance, leverage its offshore RMB hub status to fund GBA-wide carbon-neutral projects, enhance digital ecosystems, standardise applications for fintech interoperability with Mainland platforms like WeChat Pay. One example of financial innovation of Hong Kong is that the Hong Kong Monetary Authority has formulated a regulatory regime for stable coin issuers in Hong Kong (HKMA, 2025). Stable coins are virtual assets that are designed to maintain a stable value relative to certain assets, typically currencies.

Hong Kong's success hinges on balancing global connectivity with regional cohesion, transforming the GBA into a "high-end, high-value-added" economy. By addressing integration bottlenecks and capitalising on its legal autonomy, financial strengths, and infrastructure, the city can solidify its role as the GBA's gateway to the world.

Shenzhen

Shenzhen is selected as another case study of GBA given its pioneering and strategic role amongst the nine cities in Guangdong province.

A. Economic and technological leadership

The population of Shenzhen is estimated to be around 17.5 million people (2024) with the land area of 2,050 square kilometres. With GDP of US$364 billion and per capita GDP of US$20,800, making it one of the wealthiest cities in China (Shenzhen Luohu Government, 2025). It has experienced rapid population growth due to its status as a leading tech hub. The city's economy has thrived, driven by industries such as technology, finance, logistics, and manufacturing. Key industries in Shenzhen include information technology, biotechnology, financial services, and advanced manufacturing. Shenzhen, standing as the GBA's innovation engine, is driven by its dominance in technology (e.g., Huawei, Tencent), biotech, and advanced manufacturing integrating AI and robotics into production. Shenzhen's R&D intensity (6.46 percent) surpasses Hong Kong's service-oriented economy, fuelled by collaborations with universities like Southern University of Science and Technology (SUSTech) and global tech hubs.

B. Shenzhen as a low carbon city

Shenzhen is a benchmark and model for sustainable urban development in China and globally, which successfully reduced carbon emissions and energy consumption alongside GDP growth through integration of economic development with environmental sustainability. The Government undertakes effective strategic approach to achieve innovation and sustainability goals, for example, apply low carbon urban planning and construction, promote renewable energy utilisation, and green transportation systems through integrated comprehensive planning and policies on green technologies. Supported by public policies and incentives to adopt electric vehicles (EVs) and the necessary electricity charging infrastructure, Shenzhen is a leader in electric mobility, showcasing GBA's commitment to innovative solutions for sustainable transportation.

C. Infrastructure and connectivity

Shenzhen's strategic infrastructure projects exemplify GBA integration. For example, the 24 km long Shenzhen-Zhongshan Bridge consisting of a cluster of infrastructure, including a sea-crossing bridge, a subsea tunnel, artificial islands, and an underground interchange opened in June 2024. With four lanes in each direction and with a speed of 100 km/h, the Bridge connects Shenzhen, Zhongshan, and Nansha District of Guangzhou. It is the only direct expressway connecting Shenzhen, Dongguan, and Huizhou with Zhuhai, Zhongshan, and Jiangmen, reducing the travelling time between Shenzhen and Zhongshan from two hours to 20 minutes. Such connectivity has significantly enhanced the supply chain efficiency.

Shenzhen has successfully embodied the GBA's "innovation-sustainability" paradox, leveraging its tech prowess and infrastructure to drive regional cohesion while grappling with probably higher environmental costs. By addressing policy and ecology, the city can solidify its role as the GBA's core node, bridging Mainland dynamism with global standards.

After studying the unique characteristics of both Hong Kong and Shenzhen, it reveals that there are both areas of competition and cooperation. Hong Kong and Shenzhen have been competing for international talent (through various talent attraction schemes), venture capital and tech start-ups (different incentives plans offered by both governments). On the other hand, there are areas of cooperation, for example, the Hetao Innovation Zone is a flagship collaborative project which is beneficial to both cities. It envisions seamless cross-border infrastructure connectivity, aligned regulatory frameworks, and clusters of key laboratories (Shenzhen Government Online, 2025).

Comparison of the world's bay areas

The GBA demonstrates both competitive strengths and developmental gaps when benchmarked against the world's three other leading bay economies — Tokyo, New York, and San Francisco.

The Tokyo Bay Area covers Tokyo and its seven surrounding prefectures, which is under one country and one jurisdiction of Japan. Second, the San Francisco Bay Area covers nine counties bordering the San Francisco Bay. Like Tokyo Bay Area, it is within one state, California, also under the same jurisdiction. Third, the New York Bay Area covers the three states of New York, New Jersey, and Connecticut with 23 surrounding counties. These tri-states have different laws, rules, and regulations. For GBA, it involved three different jurisdictions of Mainland China, Hong Kong, and Macao. Hence, the context of GBA is like New York Bay Area which is much more complicated as it involves different administrative, legal, and social environments.

As shown in Table 2, as of 2024, the GBA has already solidified its position amongst the other three Bay Areas with GDP of US$1.97 trillion, getting close to Tokyo Bay (US$2.08 trillion) and surpassed San Francisco (US$1.95 trillion) in absolute output, and heading towards New York Bay (US$2.3 trillion) in growth momentum, though New York retains the

Table 2. Comparison of the World's Bay Areas

	Guangdong-HK-Macao	Tokyo	New York	San Francisco
Area (km^2)	56,118	36,904	17,312	17,887
Population (million)	Over 87	41	19.5	7.6
GDP (US$ trillion)	1.97	2.08	2.30	1.95
Services industry as % in GDP	65%	85%	77%	73%
Key industries	Finance, technology, professional services, advanced manufacturing	Automobiles, petroleum, and finance	Finance, real estate, medical and healthcare	Technology and professional services
Industry focus	Finance and technology	Transport and finance	Finance	Technology
Development stage	Developing	Mature	Mature	Mature

Note 1: The figures of population and GDP are of 2024.
Note 2: The San Francisco Bay Area covers nine counties bordering the San Francisco Bay. The New York Metropolitan Area covers the three cities of New York, Newark, and Jersey City and 23 surrounding counties. The Tokyo Bay Area covers Tokyo and its seven surrounding prefectures.
Source: By authors and HKTDC (2025)

highest absolute wealth concentration. The population of over 87 million people dwarfs all three peers combined, reflecting a unique scale-density dynamic. Moreover, the GBA's hybrid economic model — combining finance (65 percent services share), advanced manufacturing (e.g., BYD's new electric vehicles), and tech innovation (Shenzhen's 6.46 percent R&D intensity) — contrasts with the mature, services-dominated ecosystems of Tokyo (85 percent services) and New York (77 percent), as well as San Francisco's tech-centric profile (73 percent services). The GBA's rapid growth in innovation (e.g., Shenzhen's patent leadership) and infrastructure (e.g., Hong Kong-Zhuhai-Macao Bridge) positions it as a developing powerhouse**,** contrasting with the entrenched maturity of New York's finance hub or San Francisco's tech ecosystem. It becomes the only world-class Bay Area which integrates finance, professional services, technology, and advanced manufacturing (Table 2).

The main strengths of the GBA over the other bay areas lie on its outstanding capabilities in scientific R&D and commercialisation, home to world-renowned universities (Tang, 2022), scientific research institutes, high-tech enterprises and large-scale national scientific projects (Ba *et al.*, 2022).

Challenges remain in balancing regional disparities and upgrading industrial structure, but the GBA's integration under "One Country, Two Systems" offers unparalleled flexibility to blend Hong Kong's financial depth with Mainland China's manufacturing and tech ambitions.

Discussion and conclusion

The GBA as a powerhouse for finance, innovation, and technology, its significance lies in its strategic positioning as a hybrid governance model, blending market-driven Mainland policies with the autonomy of Hong Kong and Macao SARs. This unique framework enables the region to serve as a bridge between international capital markets particularly via Hong Kong and Mainland China's industrial ecosystem, fostering cutting-edge research, financial services, and technological advancements. However, this hybrid model also introduces challenges and obstacles in institutional coordination, as highlighted in the above discussion, which stresses the need for harmonised policies to maximise stakeholder engagement and economic integration.

The GBA is China's ambitious vision to create a world-class integrated region comparable to the Tokyo Bay Area, New York Bay Area, and San Francisco Bay Area. It combines the Mainland's manufacturing prowess with Hong Kong's financial infrastructure and Macao's tourism expertise. The GBA's significance focuses on its unique tripartite synergy: leveraging Hong Kong's financial and legal infrastructure, Shenzhen's technological prowess (home to big corporations such as Tencent and Huawei), and Macao's tourism and Portuguese-speaking market linkages. The GBA's ambition extends beyond economic integration; it aims to become a "high-quality development" model by 2035, balancing innovation with sustainability through green finance initiatives and carbon neutrality targets.

Strategically positioned along the Pearl River Delta, the GBA serves as a critical nexus for global trade, technological innovation, and cross-cultural exchange. For example, infrastructure projects like the Hong Kong-Zhuhai-Macao Bridge (the world's longest sea crossing) and a 2,700-km railway network are essential for facilitating cross-border mobility and creating a "one-hour living circle" for residents.

While the GBA's potential is immense, its fragmented governance structure poses challenges. Differences in legal systems (e.g., Hong Kong's common law versus Mainland China's civil law), regulatory frameworks, and priorities among cities hinder cohesive policymaking. For instance, Shenzhen's tech-driven economy contrasts with Macao's reliance on gaming and tourism, complicating alignment on innovation strategies.

China's GBA represents a transformative initiative to integrate nine Mainland cities in the Guangdong province, and the two Special Administrative Regions in Hong Kong and Macao into a globally competitive hub for technology, finance, and innovation. As a major national development strategy which was articulately planned, deployed and promoted, it reflects the strong determination and ambition of the China's Central government.

Notably, the collaboration between the governments and the communities — the market, private enterprises, and professional bodies — will play a critical role. Moreover, it requires joint effort of the central and local governments to enhance the competitiveness of the region through economic integration, complementary advantages, and division of labour. The GBA covers the South China region, and it will hopefully become a powerful driving force for China's overall development.

To conclude, the GBA's journey to becoming a sustainable innovation technology and finance hub is promising but requires long-term policy coherence, collaborative governance, and inclusive growth strategies. By learning from global peers and leveraging its unique strengths — such as the "One Country, Two Systems" framework — the region can hopefully overcome administrative fragmentation and set a global benchmark for urban development. Policymakers have to balance economic ambition with ecological stewardship to ensure prosperity benefits all residents, securing the GBA's position as a 21st-century leader in finance, technology, and sustainability.

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Cross-border healthcare: analyzing the phenomenon of Hong Kong residents seeking care in the Greater Bay Area in Mainland China

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Abstract

Purpose – This study critically examines the growing trend of Hong Kong residents seeking healthcare services in the Greater Bay Area (GBA) of Mainland China. It aims to elucidate the motivations behind this shift, explore its implications, and address the systemic challenges within Hong Kong's healthcare sector.

Design/methodology/approach – Utilizing a push-pull framework, the research analyzes factors driving Hong Kong residents to pursue medical services in GBA cities such as Shenzhen and Guangzhou. It investigates three key areas: dental care, long-term care, and expensive pharmaceuticals, supported by qualitative data from patient interviews and policy documents.

Findings – The findings reveal that Hong Kong's high costs, long waiting times, and inadequate public health, dental and long-term care services push patients to seek affordable and accessible alternatives in the GBA. Additionally, the study identifies significant gaps in Hong Kong's healthcare financing and service provision, exacerbated by an aging population and rising demand for innovative treatments.

Originality/value – This research highlights the urgent need for policy reforms in Hong Kong's healthcare system to enhance service delivery and accessibility. It underscores the potential for cross-border healthcare integration within the GBA, suggesting that coordinated efforts can improve health outcomes and optimize resource allocation, thereby transforming the region into a leading healthcare hub.

Keywords Cross-border healthcare, Self-financed drugs, Greater Bay Area, Healthcare access, Dental care, Long-term Care

Paper type Research article

Introduction

Hong Kong used to be a destination for higher-end healthcare for many Chinese Mainland residents (Ye *et al*., 2012, 2013). In recent years, however, the reverse flow of Hong Kong residents traveling to the Mainland, especially to neighboring cities in the Greater Bay Area (GBA) for healthcare services has become increasingly noticeable. Ever since the lifting of pandemic travel bans, this trend has become very prominent with Hong Kong residents traveling to Shenzhen not only for leisure on the weekends but also for various types of healthcare services. Receiving healthcare services in the Chinese Mainland was once confined to emergencies and low-cost alternatives for the low-income, has now become a regular practice for many. While this may initially seem incidental, it actually highlights deeper systemic issues within Hong Kong's healthcare sector, and such developments could have far-reaching implications for Hong Kong residents' healthcare accessibility as well as health services development in the GBA.

This article explores the motivations and implications of cross-border healthcare utilization by Hong Kong residents. It first examines the Hong Kong healthcare system as well as the

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system in the Mainland side. Three key areas where this phenomenon is most evident — dental care, long-term care, and expensive drugs — are analyzed. Other healthcare services in GBA that are also getting popular with Hong Kong residents include health check, non-urgent radiography, endoscopy, and aesthetic medicine. By examining both "push" factors from within Hong Kong's healthcare system and "pull" factors offered by services across the border, this research aims to uncover not only the immediate drivers of such phenomenon but also the broader policy implications for Hong Kong and the rest of the Greater Bay Area.

Hong Kong's healthcare system: structure and constraints

Hong Kong's healthcare system operates on a dual-track model, comprising a heavily subsidized public sector and a privately funded alternative. The public healthcare system is dominated by the Hospital Authority (HA), overseeing over 90 percent of hospital beds and delivers 30 percent of outpatient services in Hong Kong. Primarily funded through general taxation, public hospital services are available at highly subsidized rates — approximately HK$120 per inpatient day — rendering public healthcare services highly affordable to the majority of the population. The private sector delivers around 70 percent of outpatient visits, and around 10 percent of inpatient services, financed mostly privately by out-of-pocket payments and private health insurance (Yuen, 2014).

Despite being one of Asia's most developed economies, Hong Kong is facing structural challenges in its tax-funded public health infrastructure. While the government is committed to Universal Health Coverage, the public system, in recent years, has struggled to meet the growing demand in light of a rapidly ageing population and the proliferation of new drugs and new health technologies. Long waiting times for specialist consultations and elective procedures have become commonplace. For instance, the median waiting times for joint replacement surgery could exceed 56 months in some New Territories clusters (Hospital Authority, 2025a). Additionally, limited public provision for essential services — such as dental care and high-cost life-saving medications — has caused hardship for many (*SCMP*, 2020).

The situation is further worsened as the territory faces ongoing budget deficits since the COVID-19 pandemic, with the 2024-2025 fiscal year projected to exceed HK$85 billion in deficit (HKSAR Budget, 2025). A shrinking labour force further undermines the sustainability of the current tax-based model, raising concerns about the long-term viability of health financing in the city. Public dental clinics, for instance, offer only emergency extractions and pain relief care with limited quotas to the general public (Chu *et al.*, 2013; HKU Faculty of Dentist, 2024). Many high-cost cancer drugs are designated as "self-financing drugs" in public hospitals, requiring the patient to bear the full cost unless their income qualifies them for charitable funding schemes such as Samaritan Fund (SF) and Community Care Fund (CCF) (Hospital Authority, 2025b; Social Welfare Department, 2025). Long-term care is also plagued by multi-year waitlists, and poor-quality care in many residential care institutions (Yuen, 2014).

Mainland China's health system: expansion and affordability

Mainland China's healthcare system has undergone rapid transformation in the past two decades. Through the introduction of universal basic insurance schemes — the Urban Employee Basic Medical Insurance (UEBMI), Urban Resident Basic Medical Insurance (URBMI), and the New Rural Cooperative Medical System (NCMS) — over 95 percent of the population now has some form of medical coverage (Zhang and Yuen, 2016; Huang and Gan, 2017). Pilot programmes for long-term care (LTC) insurance have also been launched in 49 cities, including Guangzhou in the GBA, supporting institutional and home-based care for elderly residents (Luk *et al.*, 2022; Cousins, 2025). While benefit levels and service quality vary by region, the massive scale of the system produces significant cost advantages. The Mainland healthcare system has rapidly expanded in both scale and sophistication.

Supported by state and big corporate investment, and a massive domestic market, Mainland providers are increasingly able to offer high quality services at a fraction of the cost found in Hong Kong's private sector. These advantages are further reinforced by infrastructure improvements and policy developments that support regional integration across the GBA.

Healthcare in the Greater Bay Area (GBA): opportunities and gaps

The Greater Bay Area (GBA) initiative, launched by the State Council of the People's Republic of China in 2019, to enhance economic and social integration across 11 cities — including Hong Kong, Macao, and key Mainland cities like Guangzhou and Shenzhen — presents a unique opportunity for regional health cooperation (Constitutional and Mainland Affairs Bureau, 2018). Shared infrastructure and geographical proximity offer fertile ground for cross-border service provision. The area has a world-class intra-region infrastructure that supports the concept of a "one-hour living circle", with efficient transit options such as superhighways, bridges, high-speed trains, and airports.

GBA has a population of over 86 million, with a GDP of RMB14 trillion, and has an economic output that surpasses that of Australia. The healthcare sector has experienced rapid growth in recent years, with the number of outpatient visits reaching 652 million and inpatient visits 14 million in 2023 (PwC and The GBA Healthcare Group, 2024).

In terms of healthcare infrastructure, cities in GBA such as Shenzhen have a growing number of high-end hospitals, some of them with dedicated VIP wings catering to affluent or cross-border patients. The streamlined border controls further facilitate access for Hong Kong residents, many of whom live less than an hour away from these Shenzhen health facilities.

However, integration is not without barriers. Licensing and credentialing of medical professionals differ across jurisdictions. Financing models are incompatible: Hong Kong public healthcare providers receive block-grants from the government where "money does not follow the patient", while in the Mainland providers receive income mainly from the social insurance reimbursement and patient copayment. Governance, legal liability, quality assurance, and data interoperability all pose practical and political challenges.

Nevertheless, isolated schemes suggest that pragmatic cooperation is possible. For example, many Mainland hospitals now accept Hong Kong private medical insurance; Elderly Health Care Vouchers (EHCV) for Hong Kong elderly residents are also accepted in 19 major hospitals and clinics in GBA cities designated by the Department of Health (2025); some Mainland licensed healthcare professionals are also able to work in Hong Kong operating under special GBA licensing arrangements; and some Hong Kong non-governmental organizations (NGOs) also operate care homes in GBA. But overall, policy harmonization remains limited and fragmented.

The following sections examine the factors in Hong Kong and in GBA that led to the current growth in cross-border healthcare consumption.

Push-pull dynamics in cross-border healthcare

This research adopts a push-pull framework to conceptualize why Hong Kong residents seek care across the border. "Push" factors include the gaps in public sector service coverage and high cost of private healthcare in Hong Kong. "Pull" factors encompass lower prices, faster access, and good customer service provided by healthcare facilities in some GBA cities. Similar studies have been carried out by Wang *et al.* (2025) investigating cross-border healthcare seeking behavior from Myanmar to China, and internal migration of elderly within China by Gu *et al.* (2022). Other studies conducted in Denmark and Poland have also employed the push-pull framework to examine the factors influencing destination choices for acquiring health services abroad (Lokdam *et al.*, 2016; Godlewska *et al.*, 2023).

This dynamic development is especially visible in three domains: dental care, long-term residential care, and costly pharmaceuticals. The following sections examine in greater detail the push and pull factors in these three areas. The discussion section analyzes the deeper policy implications associated with these developments.

Dental care: Notwithstanding that Hong Kong has one of the best dental schools in the world (QS, 2025), dental care in Hong Kong remains one of the most underserved components of its healthcare system. The extensive public hospital network providing health services to its residents does not include regular dental services. Government subsidized dental clinics offer only emergency procedures — typically pain relief and tooth extractions (Department of Health, 2024). Even these limited services are delivered with tight quotas and long queues, making them inaccessible to many residents in practice. Normal dental care such as check-ups, scaling, fillings, and more complex procedures like root canals, dental prosthetics and implants are generally excluded from public provision. As a result, residents must turn to private practitioners, where fees can be prohibitively high (Kong and Wong, 2024). According to multiple media reports and policy briefings, a root canal in a private Hong Kong clinic may cost between HK$30,000 and HK$50,000. The extraction of a wisdom tooth — one of the most common procedures — can range from HK$8,000 to HK$10,000, not including consultation, X-rays, or medications (Navigator Insurance, 2025). These costs are rarely covered by private insurance.

This scarcity of affordable dental care is a clear "push" factor driving patients to seek treatment in Shenzhen. Across the border, public and private dental providers offer a full range of services, often at less than one-tenth the cost. For example, media reports reveal that the root canal procedure in Shenzhen may cost approximately RMB4,000 (around HK$4,300), while comprehensive treatment packages — including consultations, imaging, and post-op medication — can be completed within a single visit. Basic scaling is available for RMB180 to 500 per session, and dental fillings range from RMB300 to 1,500 depending on materials and complexity (Vickong Dental, 2025).

In addition to affordability, Shenzhen offers greater service availability and convenience. Clinics often have extended opening hours and short appointment wait times. Some clinics employ Cantonese-speaking staff and accepting mobile payment platforms commonly used in Hong Kong. Given the geographical proximity — less than an hour's travel from most areas in Hong Kong — and efficient border infrastructure, accessing dental care in Shenzhen is relatively frictionless.

Long-Term Care (LTC): The provision and financing of long-term care (LTC) services in Hong Kong are facing serious problems. Community long-term care is provided predominantly by NGO's receiving funding mostly from Government, supplemented by donations and users' fees. As for residential care services, they are delivered by a mix of NGO's and private providers. Some NGOs receive heavy subsidies from Government, covering almost full operating expenses, capital costs and the provision of premises. Many NGOs and private providers operate on a self-financing basis. Government also has a programme to subsidize residents to stay in privately run facilities, known as the "bought place scheme". In general, the quality of care is higher in government subsidized homes than the self-financing homes. However, over 70 percent of the homes are privately operated, and waiting time for a place in a subsidized home is long (Yuen, 2014).

As the population ages rapidly — with nearly more than 36 percent of the population projected to be aged 65 or above by 2046 (Census and Statistics Department, 2023) — the demand for residential and community-based elder care has far outpaced the city's capacity to supply it. Despite the government's commitment to "ageing in place", Hong Kong still faces huge shortage of both subsidized and private home care options.

As of 2023, Hong Kong had approximately 79,100 residential care places. Of these, 41 percent were directly subsidized by the government operated either by subvented social organizations or certain private care homes subsidized via Enhanced Bought Place Scheme ("EBPS") and RCS Voucher Scheme, while 58 percent were in private homes where fees must

be paid entirely out-of-pocket (LegCo, 2024). Demand far exceeds supply: over 40,000 individuals remain on waiting lists for subsidized care homes. The average wait time ranges from 29 to 41 months, and an estimated 5,000 people die each year before securing placement. The availability of community-based services, such as home care packages, is equally strained, with over 10,000 people on waitlists and an average waiting time of 13 months (LegCo, 2024).

Quality is another critical concern. Many private LTC homes operate with minimal oversight and face chronic shortages of trained personnel. Limited floor space, low wages for care workers, and outdated facilities further compound the challenges. The situation is unsustainable, both economically and morally, and has created a compelling "push" factor for families seeking timely, affordable, and decent care for ageing loved ones (Law and Fong, 2022).

Increasing numbers of Hong Kong residents have turned to options in Shenzhen and other nearby cities within the Greater Bay Area. The "pull" factors here are clear: lower land costs, lower labour costs, and growing availability of modern facilities. Some Hong Kong-based NGOs have even begun operating or co-managing care homes in Shenzhen, offering culturally familiar environments and bilingual staff tailored to the needs of elderly Hong Kong residents (LegCo, 2024). Many families have found this option both economically viable and emotionally acceptable, particularly when compared to the uncertainty and delay associated with waiting for local subsidized care.

One early mover is the Hong Kong Jockey Club–funded residential facility operated by the Hong Kong Society for Rehabilitation in Yantian, Shenzhen. The home provides nursing care, rehabilitation services, and social support at rates far below those charged in Hong Kong's private market (Hong Kong Society for Rehabilitation, 2025). A recent government initiative, the Residential Care Services Scheme in Guangdong (GDRCS) allows Hong Kong elderly on the waiting list for subsidized care in Hong Kong to opt for designated care homes in Guangdong. This scheme provides monthly subsidies to eligible low-income elderly who opt to retire in Guangdong and reside in designated facilities. The number of homes participating in the GDRCS has increased, with places available in Shenzhen, Guangzhou, Foshan, Zhongshan, Zhaoqing, and Jiangmen (LegCo, 2025).

Furthermore, with the introduction of long-term care insurance pilot programmes in cities like Guangzhou, it has boosted the supply of long-term care services throughout the Mainland (Luk *et al*., 2022).

The growing trend of seeking LTC in the Mainland is likely to accelerate, especially in the absence of major reform within Hong Kong's own long-term care financing and delivery systems. This reflects a broader failure in policies and planning on the part of Hong Kong to match financing and service provision with demographic realities.

Expensive cancer drugs: Among the most financially devastating gaps in Hong Kong's healthcare system is access to lifesaving but expensive cancer drugs. Recent years have witnessed a concerning surge in cancer diagnoses in Hong Kong, underscoring a growing public health crisis (Hong Kong Cancer Registry, 2023).

While public hospitals provide diagnosis and treatment for most conditions under a highly subsidized model, certain categories of expensive medications — particularly targeted therapies for cancer and rare diseases — fall under the "self-financing drug" list. These medications are not covered by the government and must be paid for entirely out of pocket, unless patients qualify for charitable assistance through schemes like the Samaritan Fund or the Community Care Fund. Self-financed cancer drugs in Hong Kong can be as high as HK $270,000+ per month for one patient. Without additional financial support, it has been estimated that nearly 50 percent of patients may be unable to afford these treatments (Legco, 2019).

This exclusionary structure creates a heavy burden for many families, especially those who fall into the so-called "missing middle": individuals whose incomes are too high to qualify for charity support but who lack the financial means or private insurance coverage to pay for the treatment, often for an indefinite period. As of 2024, over 32,000 patients in the Hospital

Authority system were using self-financing drugs, incurring an estimated collective out-of-pocket expenditure exceeding HK$1.1 billion annually (Lo, 2024).

Faced with such costs, many patients and their families are increasingly looking across the border for more affordable options. The Mainland Chinese pharmaceutical market offers a clear "pull" factor. Leveraging its vast population size and centralized purchasing system, China is able to negotiate significantly lower prices for drugs manufactured overseas (Zhu *et al.*, 2019). Additionally, the emergence of competitive domestic pharmaceutical companies has resulted in lower-cost, bioequivalent alternatives to brand-name treatments. Media reports and case studies have highlighted stark price differentials. For example, a lung cancer drug priced at over HK$40,000 per cycle in Hong Kong may cost less than one-third that amount in Shenzhen. In many instances, identical brand-name medications are available at pharmacies in the Mainland for a fraction of the price charged in Hong Kong. For patient's ineligible for Hong Kong's limited subsidy schemes, this pricing gap can mean the difference between getting the necessary medicine and forgoing treatment (*SCMP*, 2020). There have been calls for the Hospital Authority to purchase these expensive drugs from the Mainland using the Mainland price. However, in view of the "One Country Two Systems" principle, so far not much progress has been made.

Many hospitals in the Mainland, apart from treating patients under the basic medical insurance schemes, offer higher-end services via their "international departments" or "VIP clinics", providing nicer amenities, shorter waiting times, multilingual staff, and streamlined services aimed at medical travelers from Hong Kong. In some cases, patients report completing diagnostic tests, purchasing medication, and receiving follow-up care all in a single trip.

However, this form of cross-border medicine raises important governance questions. At present, there is no formal mechanism for Hong Kong government to subsidize the care received outside Hong Kong (apart from a limited amount from the EHCV scheme), nor are there systems in place to ensure continuity of care or pharmacovigilance for drugs obtained outside Hong Kong. While the authority does permit the import of certain medications with documentation for personal use, such cross-border care remains largely individual patient-driven and unregulated.

Meanwhile, Hong Kong's middle-class residents also express concerns about the quality of healthcare services in the Mainland, viewing them as less favorable compared to those in Hong Kong. Many in this demographic feel uncertain about navigating the different healthcare systems, which can create discomfort and hesitance. Negative portrayals in local media, such as reports about the overuse of antibiotics and a lack of patient-centered care, contribute to these perceptions. As a result, even when they have private healthcare insurance that could cover treatments in the Mainland, many middle-class residents prefer to return to Hong Kong for medical attention (Yan and He, 2023). This tendency suggests that their concerns about service quality may outweigh financial considerations. Ultimately, perceptions of quality and safety play a crucial role in shaping the healthcare decisions of Hong Kong's middle class when it comes to seeking services in the Mainland.

Nonetheless, the overall trend of cross-border healthcare is expected to continue — if not expand — particularly as high-cost, precision medicine becomes more central to cancer treatment. For thousands of cancers and rare disease patients, Shenzhen is not merely an affordable alternative; it is a lifeline.

Discussions

The following sections discuss the broader underlying systemic problems in Hong Kong that contribute to the above developments and propose possible way forward.

A failing tax-based Universal Health Coverage System: Hong Kong claims to have Universal Health Coverage for its residents, and the frequently used official phrase that "no one is deprived of medical care because of lack of means" is actually written in the law (Hospital

Authority Ordinance 1990, Section 4(d)). Analyses above show serious inadequacies in the area of dental care, long-term care and expensive drugs. Population ageing and the proliferation of new drugs have exacerbated the problems. While Hong Kong has one of the highest per capita GDP in the world and spends close to 10 percent of its GDP on healthcare (Health Bureau, 2024), it seems unacceptable that so many Hong Kong residents are denied of the needed care in these three areas.

A closer examination suggests that there are major structural deficiencies in Hong Kong's healthcare financing system. The current system is flawed with allocative inefficiencies and X-inefficiencies, which could account for, to a large extent, government's inability to find sufficient resources to fund these needed services. Allocative Efficiency means putting resources in areas that bring the most benefits, while X-efficiency means using the resources allocated in a most effective manner. There is plenty of evidence of both allocative inefficiencies and X-inefficiencies in the Hong Kong public healthcare sectors. Regarding allocative efficiency, it is generally accepted that government spending in primary healthcare is highly cost-effective. In Hong Kong, however, the government underspent significantly in primary care when compared to other high income country groups. The average percentage of government spending on primary care in 2022 for high income country group was 36 percent, while Hong Kong government's percentage was only 17 percent, less than half of what other countries are spending (Hanson *et al.*, 2022; Health Bureau, 2024).

In 2022-23, the Hong Kong government spent HK$150.7 billion on healthcare, with 56.1 percent of government's health dollars spent on hospital services, while spending on ambulatory care and residential long-term care were only 8.2 percent and 10.2 percent respectively. One study found that 46.8 percent of all public hospital admissions were found to be of ambulatory care sensitive conditions (Our Hong Kong Foundation, 2021) which could be treated on an outpatient basis at a much lower cost. Treating this huge number of patients who do not need to be hospitalized is extremely wasteful. Treating these patients on an outpatient basis will save money, manpower, and space. The savings could be diverted to deliver more needed care including dental care, long-term care and expensive drugs.

X-efficiency is the organizational inefficiency mostly due to lack of competition and poor incentive structure. Regarding X-efficiency, the block grant funding system to public hospitals in Hong Kong does not promote X-efficiency. In Hong Kong, a budget, mostly historical based, is given to public hospitals at the beginning of the year, regardless of demand or performance. Money does not follow patients. In fact, under this system, good services that can attract more patients are not given more resources. On the other hand, poor services that deter patients from the hospital are not penalized, as the hospital gets to keep the funding already allocated. There are no incentives for public hospitals to be efficient. One of the results of such system is long waiting time for non-urgent conditions. For example, in 2023-24, the median waiting time for joint replacement in Hong Kong public hospitals ranges from 9 to 52 months (Hospital Authority, 2025a), while the OECD average for hip replacement was 3.7 months (OECD, 2023), despite the fact that public hospitals in Hong Kong already receive the lion share of public healthcare resources from government. This inefficiency is pushing many Hong Kong residents to cross the border to seek care. Shenzhen and other GBA cities, on the other hand, offer short waiting times, dramatically lower costs, wider service coverage, good customer service, and modern infrastructure. It is not surprising that the GBA healthcare system is becoming a de facto extension of care for those whom Hong Kong's system cannot adequately serve (Zhou and Wang, 2024).

Way forward: structural reforms are needed

Two major structural reforms are badly needed in Hong Kong to address the above-mentioned inefficiency problems and to better make use the opportunities available in the GBA.

Centralize health governance and funding: To solve the problem of allocative inefficiency, the current silos of different public funded services need to be broken down, and

resources centralized to allow a gradual shift of resources from the Hospital Authority to the other less expensive and more effective providers. A central Health Authority should be created to take over the services currently controlled by different bodies — Hospital Authority, Department of Health, Primary Health Commission, Elderly care section within the Labour and Welfare Bureau — putting prevention, early detection, ambulatory services, hospital services, and long-term care under a single body. This body will have full government authority, own all of those facilities, employ all of the staff in those facilities, and provide funding. Only then, can resources be deployed away from acute care facilities to primary care and long-term care in an orderly and gradual manner. This move should result in huge savings, which could be used to fund the currently underfunded services.

Separate financing from provision: Currently the Hospital Authority is responsible for both financing and provision of hospital services. Under this block-grant model, "money does not follow the patient", and those who seek care elsewhere must bear the full financial burden —even when this approach may reduce system-wide costs or improve health outcomes. While there are talks about more strategic commissioning of services, the current financing structure only allows such practices to happen at the margin, mostly for new services with very limited impact on the overall cost. To have a major impact on costs, even core services should be subjected to outsourcing. Private providers in Hong Kong can provide services to eligible Hong Kong residents at an agreed rate. Public hospitals will not be given a block grant at the beginning of the year, and they have to compete amongst themselves and with private hospitals in Hong Kong or in GBA for patients. They will first have to deliver the services to patients and get reimbursement subsequently. Public hospitals that are unable to attract enough patients will go out of business. Patients will be empowered to choose providers. Money follows patients. The newly created Health Authority will establish a unit to purchase services. All hospitals and clinics, public and private, become providers that have to earn income after delivering services. X-efficiency should go up significantly under this system.

A cross-border regulatory and governance framework needs to be set up: A formal policy framework should be established to integrate, orchestrate, harmonize, and regulate all providers who wish to participate in cross-border care between Hong Kong and other cities in the GBA. Similar models exist in the European Union, where citizens can receive care in other member states with reimbursements processed through structured agreements (European Commission, 2025). This framework could involve:

- Creating a registry of GBA providers eligible to treat Hong Kong residents
- Mutual recognition of medical credentials and facility standards
- Bilateral agreements on malpractice liability and dispute resolution
- Cross-jurisdiction data exchange with privacy protection for continuity of care
- Agreements on the metrics for evaluating quality, accessibility, and efficiency for all participating providers

Conclusion: aligning with the GBA vision

The growing trend of Hong Kong residents seeking healthcare services in Mainland China —particularly for dental care, long-term residential care, and expensive cancer drugs — reflects a critical and structural development in the region's healthcare landscape. Far from being an isolated or temporary phenomenon, cross-border healthcare has emerged as a practical, rational response to persistent gaps in Hong Kong's health system, particularly in areas where services are either inaccessible, unaffordable, or unavailable altogether.

These policy innovations align directly with the strategic goals of the GBA initiative: intra-regional cooperation, resource optimization, service integration, and mutual benefit. Health

should be recognized as a key dimension of social infrastructure integration within the GBA development framework, positioned alongside finance, technology, and human capital to support broader welfare ambitions (Constitutional and Mainland Affairs Bureau, 2019; Pang, 2022). A regionally integrated, patient-centric model of healthcare planning would not only serve Hong Kong residents more effectively but also reinforce the GBA as a platform for innovation and public goods delivery.

The existing cross-border institutional developments — such as the University of Hong Kong–Shenzhen Hospital — demonstrate viable models for public–private partnerships that deliver healthcare across the Hong Kong-Mainland boundary (Wang *et al.*, 2020). Regulatory gap analyses further underscore the necessity of coordination in provider accreditation, financing alignment, and data interoperability to realize meaningful integration (Wu, 2025).

As the GBA continues to evolve into an economic powerhouse with a highly connected and interdependent components within the region, health policymakers must begin to treat cross-border healthcare seriously. Only with appropriate institutional reforms in Hong Kong and the establishment of a proper cross-border healthcare framework, can Hong Kong transform patient mobility into a source of relief for its strained healthcare system, and the region transforming itself into a world-class medical hub, benefiting the people of Hong Kong and the GBA and beyond.

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The network role of China's state banks in Hong Kong and the Greater Bay Area

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Abstract

Purpose – China's government wants Hong Kong actors to integrate it with the Greater Bay Area (GBA) and with the global economy, thus making it a leading world region. State banks of China in Hong Kong are expected to participate in this integration, but little is known about their networks within Hong Kong and the GBA. This paper argues that network structures and relations of China's state banks position them as pivotal actors in the growth of the GBA.

Design/methodology/approach – Social network theory is used to examine China's state banks in Hong Kong. Websites of financial firms and government entities reveal network structures and relations of state banks. Interpretations of how financial activities of state banks relate to foreign banks and to business in the GBA are based on news articles.

Findings – Results reveal how China's state banks network with each other and with foreign financial firms in Hong Kong and their network relations in the GBA impact their role in integrating the GBA with the global economy.

Originality/value – This paper contributes to the literature, including financial geography, on financial firms which uses social network theory. Researchers give limited attention to the network structure and relations of China's state banks in Hong Kong and the GBA. This paper demonstrates how their networks determine their integration of Hong Kong and the GBA with the global economy.

Keywords China's state banks, Cohesive ties, Financial centre, GBA, Hong Kong, Social network theory

Paper type Research paper

Introduction

The Guangdong-Hong Kong-Macao Greater Bay Area (GBA) Plan and China's 14th Five-Year Plan (2021-2025) prominently promote Hong Kong as China's global financial centre and pivotal intermediary for the GBA (State Council, 2019; *Xinhua News Agency*, 2021). The Chinese government's expectation is that the full array of Hong Kong actors, including government, civic leaders, businesses, and universities, contribute to development of the GBA into a leading world region.

China's state banks operate major offices in Hong Kong (Bank of China (Hong Kong), 2024; China Construction Bank (Asia), 2024; Industrial and Commercial Bank of China (Asia), 2024). Paradoxically, neither plan mentions their role, yet they are pivotal Hong Kong financial institutions with extensive branch networks in the GBA and global connections through their international offices. As key policy instruments of the government, China's leaders expect them to actively participate in integrating Hong Kong and the GBA with the global economy (Naughton, 2018). The business press widely covers their participation with foreign global banks in syndicates related to, for example, loans and stock and bond issuance. However, these articles rarely examine the network implications of the state banks' syndication behavior.

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Most research on Hong Kong's financial networks focuses on aggregate characteristics of its firm. Studies demonstrate that Hong Kong is the leading finance-corporate centre of Asia-Pacific. Typically, major global firms base their regional headquarters for Asia in the city. These senior managers supervise offices in other financial centres of the region, such as Shanghai, Bangkok, and Singapore. The latter has extensive links with Hong Kong and serves as regional centre for Southeast Asia (Lui, 2022; Meyer, 2015). Among global centres, Hong Kong's finance-corporate sector retains the most linkages with London and New York, and it has extensive linkages with other global centres outside Asia (Derudder *et al.*, 2018). None of these studies explicitly identify the state banks of China; therefore, how they participate in networks remains unknown.

A few network studies explicitly include Chinese financial firms. An examination of overseas expansion of these firms revealed they chose Hong Kong as their first location. It accounts for almost half of all offices of Chinese financial firms outside the mainland (Pan *et al.*, 2018). However, none of the state banks were specifically noted. Therefore, their network ties within Hong Kong and externally cannot be identified. A study of investment banking linkages in Hong Kong specifically identified Chinese banks. Using a social network approach, it demonstrated they occupied central positions in the equity capital markets of the city (Gemici and Lai, 2020). However, the structure of networks of individual banks was not reported.

Examination of Bank of China International (BOCI) in Hong Kong focused on personal networks of the firm's CEOs (Meyer, 2017). It did not address their specific network ties to individuals and firms within Hong Kong or the GBA. A study of Shenzhen's financial networks emphasized bank networks (Meyer, 2016). It revealed the dominance of China's state banks in Shenzhen, whereas foreign banks based in Hong Kong made few inroads. Shenzhen's two major locally headquartered banks, China Merchants Bank and Ping An Bank, also operate Hong Kong offices. The former is tightly integrated with global banks in Hong Kong through syndication deals.

China's state banks are major actors in Hong Kong and the GBA. Nevertheless, their network structure and their behavior in them, key means through which they execute their business, remains obscure. Social network research has developed a rich framework to examine the network structure of actors and their behavior which applies to organizations, groups, and individuals. Organizational sociologists and business management scholars use social network theory to examine financial networks but seldom refer to financial centres (Gu *et al.*, 2019; Liu *et al.*, 2024). Financial geographers have incorporated social network theory into their research both at the level of financial firms (Gemici and Lai, 2020) and at the level of financial centres (Yang and Zhu, 2023).

The paper is organized as follows. First, components of social network theory are briefly synthesized. Then, China's view of Hong Kong's status is identified. This sets the stage to examine networks of China's state banks in Hong Kong and the GBA. Network characteristics of these banks are summarized. Then, an interbank tie, initial public offerings, bond issuance, innovations in financial services, and private wealth management are analyzed. The paper concludes with an assessment of China's state banks in the GBA and policy recommendations.

A social network framework

China's state banks are embedded in social network relations; network structures and relations among actors impact their financial decision making. Social relations include expectations about behavior such as reliability, trustworthiness, and reciprocity. Social attachments are mechanisms to share specialized knowledge, expertise, and business opportunities. Nevertheless, social relations also may constrain actors' decision behavior. They occupy different positions within networks. More centrally located actors have better access to knowledge and resources, and they may exploit these advantages for financial benefits and/or influence over other actors less centrally located (Granovetter, 2017).

Actors structurally positioned such that they possess links to other actors who are not linked to each other possess a pivotal position within networks. They can leverage their position to build the bridge between the unconnected actors. They are the *tertius gaudens*, the ones between who benefit. The *tertius gaudens* actor gains access to nonredundant information about opportunities from the unconnected actors. They only know the information the other actor has if the *tertius gaudens* actor shares it. This control over information generates brokerage benefits for the *tertius gaudens*, and the brokerage role supplies advantages in negotiations (Burt, 1992).

Financiers possess weak ties which reach a wide range of actors, thus providing extensive contacts, albeit with limited knowledge exchanges. They develop strong ties with other financiers through working together over time, forming a cohesive network (Granovetter, 1973; Marsden and Campbell, 2012). Financiers within a firm access extensive social capital, which is defined as resources they acquire (Lin, 2008). Through working together, resources they gain include a high capacity to share deep knowledge, advice, and expertise. Redundancy supports the validity of what is shared (Aral and van Alstyne, 2011; Brashears and Quintane, 2018). Financiers within the cohesive network of the firm, however, have little incentive to structurally constrain each other's access to opportunities. Instead, their incentives are to help each other (Burt, 1992).

Relations among financiers within a firm may take on emotional intensity and a feeling of closeness. They confide in each other and feel obligated to reciprocate. Strong ties among members provide access to relational social capital. As an asset, this may consist of respect, friendship, commitment, mutual obligation, and trust (Gubler and Cooper, 2019). For example, a financier within a firm may face a delicate issue with a client regarding how to convince the client's board to sell the firm. The financier draws on relational social capital built within the firm to get advice to help the client convince the board to sell the firm.

The financier within a cohesive network of a firm can leverage benefits from external networks of each colleague. This structural social capital comprises both resources that the actor can access from others, as well as the structure of the networks through which they access resources. Financiers within a cohesive network of a firm may access immense structural social capital because each member accesses their own external networks which often are not redundant (Burt, 1992; Gubler and Cooper, 2019). For example, investment bankers use their cohesive intrafirm network to share expertise about advising clients. Each banker has their own external networks with other investment bankers and clients from whom they learn about deal opportunities. They share this with each other within the firm, thus gaining immense structural social capital of knowledge and expertise.

This framework offers a lens to interpret networks of China's state banks in Hong Kong and the GBA. Diverse intraorganizational and interorganizational evidence is used, consistent with social network studies. Evidence includes organizational structures of banks, an interbank tie, participation of banks in initial public offerings (IPOs) and bond issuance, innovations in financial services, and private wealth management. Collectively, the evidence offers new insights into how China's state banks integrate Hong Kong and the GBA with the global economy.

Network behavior of individual financiers is not available. However, a study of such behavior of financiers in leading global financial centres provides generalizations which help frame interpretations (Meyer, 2023). First, a synthesis of how China views Hong Kong's status defines the role of state banks in the GBA.

China's view of Hong Kong's status

In the plan for development of the GBA, the Central Committee of the Communist Party of China (CPC) and the State Council stated their aim for Hong Kong:

> To consolidate and enhance Hong Kong's status as international financial, transportation and trade centres as well as an international aviation hub, strengthen its status as a global offshore Renminbi

> (RMB) business hub and its role as an international asset management centre and a risk management centre, promote the development of high-end and high value-added financial, commercial and trading, logistics and professional services (State Council, 2019, p. 12).

These roles match activities of a leading finance-corporate business centre.

The GBA plan charges Hong Kong's financial firms to support global strategies of China's firms. Financiers are:

> To leverage Hong Kong's status as an international financial centre, and provide services such as investment, financing as well as consulting to mainland enterprises 'going global'. To support mainland enterprises in establishing capital operation and corporate treasury centres in Hong Kong for carrying out business operation such as financing and financial management as well as enhancing risk management (State Council, 2019, p. 50).

More broadly, the 14th Five-Year Plan (2021-2025) firmly underscored in article 61 that Hong Kong, a global financial centre, should support GBA development (*Xinhua News Agency*, 2021).

Leading mainland Chinese banks

Intraorganizational and interorganizational structures of the leading Chinese state banks in Hong Kong provide an overall perspective on their networks. Arguably, Bank of China International (BOCI) ranks among China's most sophisticated investment banks. Not only does its Hong Kong office serve the GBA, its Shenzhen office lies at the heart of that dynamic technology district. Its offices in Beijing and Shanghai add network access to these economic centres of China. Outside of China, BOCI has offices in other leading financial centres — London, New York, and Singapore. This organizational structure provides the bank and its financiers access to immense structural social capital through their cohesive networks within each office and their external networks with financial firms in these cities. BOCI offices in London and New York, not only provide network access to Europe and the Americas, respectively, the Singapore office also deepens its network ties to southeast Asia. While some of these inter-office ties may be strong because they work on deals together, other ties may be weak. The latter, however, may be beneficial for referrals.

BOCI's parent company, Bank of China, enhances its access to structural social capital (Figure 1). The parent's branches give BOCI access to every major city in China, as well as to the parent's international offices (Bank of China International, 2024). This reach of BOCI through its own international offices and that of its parent means that BOCI acts as a *tertius gaudens* firm for businesses in the GBA. Its Hong Kong office is the bridge that connects GBA businesses with global markets and it supplies external investors access to investment opportunities in the GBA.

Bank of China (Hong Kong) (BOCHK) is a restructured holding company that combines various banks belonging to its parent company, Bank of China (Beijing) (Figure 1).

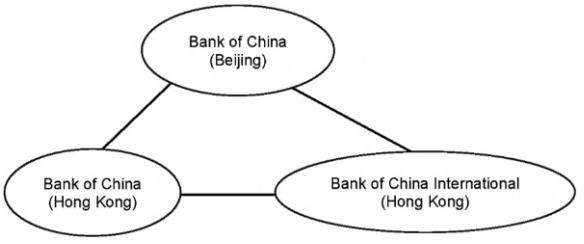

Figure 1. Organizational chart of Bank of China. Source: Bank of China (2024)

Consequently, its financiers draw on the accumulation of network ties of those banks that were added to the holding company. This supplies substantial structural social capital to the bank and its financiers. They access the GBA directly, and, along with BOCI, they work with financiers in numerous branches of Bank of China in the GBA. Strong ties derive from collaboration on deals, whereas weak ties among branches may serve as referrals of customers. BOCHK has offices in every major country of Southeast Asia. It is a *tertius gaudens*, the bridge between GBA businesses and Southeast Asian economies (Bank of China (Hong Kong), 2024).

Both Industrial and Commercial Bank of China (Asia) ('ICBC (Asia)') and China Construction Bank (Asia) (CCB (Asia)) in Hong Kong serve as international business units of their respective parent companies headquartered in Beijing (Industrial and Commercial Bank of China (Asia), 2024; China Construction Bank (Asia), 2024). Both international units access numerous parent company branches in the GBA, as well as global branches of their parent company. As with other state banks, they access substantial structural social capital through their intrafirm networks, and they operate as *tertius gaudens*, the bridge between GBA businesses and global markets and investors. Financiers in ICBC (Asia) and CCB (Asia), similar to BOCI and BOCHK, combine strong ties with other offices when they collaborate on deals and their weak ties provide referrals of customers.

Shenzhen houses global headquarters of two banks with numerous branches in the GBA and in major cities of China, and important offices in Hong Kong (Meyer, 2016). China Merchants Bank (CMB) is owned by China Merchants Group, a major state-owned enterprise headquartered in Beijing (China Merchants Group, 2024). CMB International Capital Corporation headquartered in Hong Kong runs the international investment banking business of CMB (China Merchants Bank International, 2024). CMB International leverages intrabank networks to CMB branches in the GBA to function as *tertius gaudens* for customers to reach global markets and as a conduit for international investors to reach GBA clients.

Ping An Bank has a representative office in Hong Kong and close ties with its parent, Ping An Insurance Group (Ping An Bank, 2024). Ping An Bank's representative office leverages its intrabank network ties to its parent's bank's branches in the GBA. Thus, it functions as *tertius gaudens* for GBA customers to access markets in Hong Kong. However, the representative office provides weak ties to global markets. It chiefly relies on its local networks with Hong Kong's global banks to reach international markets. On its own, therefore, it does not serve as *tertius gaudens* for GBA customers to reach global markets or for foreign investors to reach GBA customers.

With the exception of Ping An Bank, international offices of the leading mainland Chinese banks in Hong Kong occupy hub network positions as *tertius gaudens* between GBA customers and global markets and investors. Their intrafirm networks to GBA branches of their parent banks consist of cohesive ties of repeated coordination and collaboration. They build substantial relational social capital consisting of respect, friendship, commitment, mutual obligation, and trust which they draw on. Local branch financiers likewise build relational social capital with their customers.

The state banks' international offices in Hong Kong access immense structural social capital of resources through their network ties to branches and from branches to local customers. Foreign banks do not have these ties because few of them have branch networks in the GBA. HSBC, Standard Chartered, Bank of America, and Deutsche Bank are exceptions, but almost all of their branches are in Guangzhou, the leading financial centre and capital of Guangdong Province. Consequently, international offices of China's state banks are the *tertius gaudes*, the one between who benefits. They control access of foreign banks to GBA markets. Foreign banks have difficulty mitigating that control, with the exception of large customers in the GBA. Sophisticated financiers in Hong Kong's foreign banks are globally linked. However, their high compensation and technology infrastructure costs require that they focus on the largest GBA customers.

Direct evidence of the network behavior of Chinese state banks provides deeper insight into how they integrate the GBA with Hong Kong and the global economy.

An interbank tie

Direct participation of China's state banks in financial networks of Hong Kong gives them access to knowledge, expertise, and contacts of the world's most important global banks and other financial sectors (e.g., private equity, fund management) with local offices. Cohesive ties exist between foreign institutions and China's state banks. They draw on this relational social capital to enhance their performance. This redounds to the GBA because its entities (businesses, consumers, governments) draw on these networks of China's state banks both for inbound resources and for access to external business opportunities.

Formal interbank ties between foreign banks and China's state banks create opportunities to strengthen cohesive ties and provide access to relational social capital. Foreign banks have an incentive to actively participate with China's state banks because they control network access to the GBA. However, cohesive ties among China's state banks and with foreign banks, mean that foreign banks can be structurally constrained. The tie between JP Morgan and China Merchants Bank (CMB) illustrates how this structural constraint can be mitigated. Mary Callahan Erdos, the New York-based CEO of JP Morgan's asset and wealth management division visited Hong Kong. She lauded the bank's decades-long experience in Hong Kong dealing with high-net-worth clients. Its local office is Asia hub for this activity, and she claims her bank is well-situated to provide wealth management services for the GBA. JP Morgan announced it would purchase a 10 percent stake in Shenzhen-based CMB Wealth Management (Sito, 2022). It hopes to gain brokerage benefits of access to GBA clients from that purchase.

Initial public offerings (IPOs)

Interfirm networks among China's state banks and their networks with local offices of leading foreign banks provide capacity to support IPOs of Chinese firms both on the Hong Kong Stock Exchange and on other global exchanges. Through these IPO processes China's state banks strengthen cohesive ties with foreign banks. This enhances the sharing of knowledge and expertise about executing IPOs successfully. China's banks leverage that when they execute IPOs for GBA firms.

Lufax, a retail loan and wealth management platform headquartered in Beijing, focuses on the mainland market. It raised USD2.4 billion in an IPO on the New York Stock Exchange in 2020. Hong Kong offices of China's banks, BOCI, Ping An Securities, Citic CLSA collaborated with Hong Kong offices of foreign banks, including Goldman Sachs, Morgan Stanley, HSBC, UBS, and Bank of America Securities (*Business Wire*, 2020).

AIM Vaccine, headquartered in Beijing and China's second largest vaccine company, listed on the Hong Kong Stock Exchange in 2022. The Hong Kong office of China International Capital Corporation co-sponsored the IPO listing with Goldman Sachs' and Macquarie Capital's Hong Kong offices (*JCNNewswire*, 2022). The international Hong Kong offices of ICBC, BOCI, and CMB also participated in the offering. These IPO offerings not only illustrate cohesion between China's banks in Hong Kong and local offices of foreign banks, but also they exemplify strengthened cohesion among the Chinese banks who participate in many of the same deals.

Listing of Tian Tu Capital on Hong Kong Stock Exchange in October 2023 reveals interweaving of network structures of international offices of China's state banks and GBA financial firms. Tian Tu Capital is one of China's leading private equity firms focused on the country's consumer brand companies. Founded in 2002, with its headquarters in Shenzhen, it has over 200 portfolio companies and over 20 billion renminbi assets under management. All members of the executive team were experienced investors in Chinese companies before they joined Tian Tu Capital (2024).

Consequently, the firm contains a cohesive network of financial professionals who share sophisticated knowledge and expertise gained from their external contacts with portfolio companies across China. They access immense structural social capital, which is typical of these types of financial firms (Meyer, 2023). BOCI's (Asia) financiers in Hong Kong,

provided investment banking expertise to lead the IPO and developed cohesive relations with Tian Tu's professionals. This constitutes relational social capital of respect, friendship, commitment, mutual obligation, and trust which BOCI's (Asia) financiers can tap for access to Tian Tu's portfolio companies when they are ready for IPOs.

BOCI's (Asia) financiers gained recognition in the financial networks of Hong Kong from leading the listing of Tian Tu Capital's IPO. It was the first mainland Chinese private equity firm with an IPO listing on Hong Kong's exchange (*Herbert Smith Freehills*, 2023). The centrality of BOCI (Asia) in these networks gained validation from collaboration with the large local law office of Herbert Smith Freehills who managed the IPO (*Herbert Smith Freehills*, 2024). Freehills' pivotal network hub status among global law firms rests on its 150-years-old London office and its 40-year-old major office in Hong Kong.

This collaboration between a prominent China state bank and a leading global law firm in Hong Kong reflects cohesive ties between financial sectors of the city and sophisticated professional services firms. The relational social capital is a resource which banks and law firms access, and this, in turn, is available to GBA firms. The Hong Kong network of banks and law firms are brokers for the GBA with the global economy.

Bond issuance

Arguably, bond issuance is more significant than IPOs in capital market networks in which China's state banks in Hong Kong operate. A wide range of entities besides businesses, including governments at all levels, government entities such as transportation authorities, and nonprofits such as universities, issue bonds.

In March of 2022, the State Grid Corporation, a Chinese government-owned firm headquartered in Beijing and the world's largest utility, raised USD1.0 billion. Hong Kong offices of Bank of China, ICBC, and BOCI participated, along with local offices of foreign banks from Asia (Mizuho Securities, DBS), Europe (Banco Santander, BNP Paribas, Société Générale, Deutsche Bank), and the United States (Goldman Sachs, Bank of America Securities). Asia-Pacific investors took 98 percent of the issuance, demonstrating the key role Hong Kong's banks play in Asian capital markets (Dalal, 2022). Cohesive ties between China's state banks in Hong Kong and local foreign banks give them access to leading banks in Asia, Europe, and the United States.

Similarly, the USD512 million which the Airport Authority of Hong Kong raised in a bond issuance in January 2024 revealed the significance of local offices of China's state banks. Bank of China (Hong Kong), BOCI, ICBC, China Merchants Bank, China Everbright, and Bank of Communications participated. HSBC and Standard Chartered, prominent British banks in Hong Kong, also had key roles. Other foreign banks with Hong Kong offices, as with the State Grid bond deal, included banks from Asia (DBS, ANZ, Mizuho, OCBC, SMBC Nikko), Europe (Barclays, UBS, BNP Paribas, Crédit Agricole, Deutsche Bank), and the United States (Citigroup, Bank of America Securities, Goldman Sachs, JP Morgan, Morgan Stanley) (Dalal, 2024).

As with IPOs, bond issuance offers repeated opportunities to strengthen cohesive ties both among Chinese banks and between them and local offices of foreign banks. Participation of many foreign banks in bond issuance in Hong Kong whose global headquarters are in Asia, Europe, and North America, demonstrates that Chinese banks in Hong Kong access substantial structural social capital. They leverage this access to position themselves as central players in equity capital markets of Hong Kong (Gemici and Lai, 2020). Their access to resources of expertise, advice, and business opportunities on a global basis makes them superb *tertius gaudens* between the GBA and the global economy.

Innovations in financial services

China's plan for the GBA emphasizes support of innovation in the mainland portion and in Hong Kong. As policy instruments of the national government, therefore, China's state banks

must actively provide innovative products and solutions. Thus, they require network access to innovative financial firms, in addition to their own contributions to innovation.

The Hong Kong government, with implicit backing of China's government, aims to make the city a cryptocurrency hub. Hong Kong Monetary Authority (HKMA), along with financial entities of the government, set out a step-by-step approach to building the technical infrastructure, licensing, and regulatory framework (HKMA, 2023a, 2023b).

HKMA and SFC (Securities and Futures Commission) pressure banks in Hong Kong to support cryptocurrency exchanges and to explore creating cryptocurrency products. BOCI offered a USD28 million digital structured note on the Ethereum blockchain. UBS originated the product to offer to its Asian clients. This collaboration between BOCI and UBS resulted from cohesive ties they built through numerous financial deals on which they worked together. Trust developed in these collaborations supplies confidence for both banks to take a risk on an innovative product. This was viewed as a forerunner of future products for Asian clients.

Involvement of UBS supplied endorsement from a globally prominent bank and implied that the Swiss government supported this effort. Participation of BOCI implied that China's financial regulators were supportive (Shen and Haldane, 2023; Singh, 2023). Thus, other Chinese state banks in Hong Kong know they can take risks on cryptocurrency innovation. They can leverage their network ties to GBA clients to provide them with the latest innovative approaches to financial intermediation.

China's state banks in Hong Kong leverage relational social capital of respect, commitment, mutual obligation, and trust they develop based on repeated transactions with each other to develop innovative products. China Merchants Bank International Securities and BOCI collaborated on such a product for China Mengniu Dairy. It is a manufacturing and distribution company of dairy products and ice cream and a leader in China's dairy industry. Most of its production and sales are in China, but it also has operations in Australia, New Zealand, and Indonesia and sells products in various Southeast Asian countries. Its official global headquarters is Hohhot, Inner Mongolia, where it was founded; however, its operational global headquarters is in Hong Kong (China Mengniu Dairy, 2024).

Strong ties that China Merchants and BOCI developed through their financial business in Southeast Asia gave them shared expertise in regulatory issues and operation of financial markets. That expertise was essential to create the product that China Mengniu Dairy wanted. It was for both onshore mainland (including GBA) and Hong Kong employees and offshore employees. They would benefit from the company's growth (*Asiamoney*, 2022).

China Merchants Bank International Securities in Hong Kong created a special purpose vehicle to buy convertible bonds sold by China Mengniu Dairy. Then, the bank issued repackaged notes backed by the bonds to employees. This complex product was structured so that employees were isolated from financial risks of the parent company. China Merchants Bank arranged the deal and BOCI served as placement agent for the convertible bonds (*Asiamoney*, 2022). This sophisticated deal required strong ties between the two banks' financiers. They possessed a high capacity to share deep knowledge, advice, and expertise, along with confidence in each other's qualities and commitment to the project.

Private wealth management

With total assets under management of USD3.9 trillion as of the end of 2022, Hong Kong ranks as one of the world's leading wealth management centres. Mainland-related licensed corporations and registered institutions accounted for USD328 billion of the total wealth management business, less than 10 percent of the total (Securities and Futures Commission, 2023). However, the mainland business of the GBA looms as a driver of Hong Kong's growth as a wealth management centre (Private Wealth Management Association, 2024). China's state banks in Hong Kong, therefore, can leverage strong ties of their parents' branches with GBA clients. Using their *tertius gaudens* position, Hong Kong offices of the state banks have power to broker access to wealth management clients in the GBA. Foreign banks have difficulty bypassing them.

The Cross-boundary Wealth Management Connect Scheme in the GBA launched in September 2021 illustrates how Chinese state banks exploit their *tertius gaudens* positions to control wealth management in the GBA. Connect consists of Northbound and Southbound Schemes. Northbound allows residents in Hong Kong and Macao to invest in wealth management products offered by eligible mainland financial institutions. Southbound allows residents in mainland GBA cities to invest in wealth management products offered by eligible financial institutions in Hong Kong and Macao (Greater Bay Area, 2024; HKMA, 2024).

Several foreign global banks participate in the Wealth Management Connect Scheme. A few, such as HSBC and Standard Chartered, have entities in both Hong Kong and mainland GBA. Foreign banks with only offices in Hong Kong partner with a Chinese bank in the GBA. Chinese banks, however, dominate the Wealth Connect Schemes, northbound and southbound. The largest of China's state banks whose international offices are in Hong Kong partner with their mainland parent bank offices in the GBA (HKMA, 2024). Consequently, these Hong Kong banks may comprise the greatest beneficiaries of the Wealth Management Connect Scheme. The structure of the partner relations demonstrates that Chinese state banks significantly control the connect schemes because of their *tertius gaudens* positions.

China's state banks and the GBA

Cohesive ties among China's state banks in Hong Kong and their ties with local offices of foreign banks position them as central actors within Hong Kong's financial networks. Their networks provide China's state banks access to relational social capital and structural social capital both within the GBA and globally. China's state banks also possess significant control over access to finance opportunities in the GBA through their brokerage position as *tertius gaudens*.

Extensive office structures of state banks within the GBA, along with their international offices in Hong Kong, supply an integrated financial services network within the GBA. China's state banks are well-positioned to support economic development of the GBA, thus serving the policy goals of China's government. However, to be fully effective, state banks need to expand their investment in the GBA. This means both allocating more capital for investment and hiring a larger number of sophisticated financiers in their Hong Kong offices who are charged with GBA business.

China's financial and non-financial firms increasingly shift their global management to Hong Kong, even as their official headquarters remain on the mainland (Pan *et al.*, 2018). This enhances the *tertius gaudens* role of China's state banks in Hong Kong because they have strong ties with these firms on the mainland and specifically in the GBA. To support these global operations of China's non-financial firms, state banks need to hire larger numbers of sophisticated financiers who have global networks and strong ties with foreign financiers based in Hong Kong.

Foreign financial firms must maintain their local offices to leverage ties with China's state banks in order to participate in the country's global financial networks. This enhances Hong Kong's financial role for the GBA. Because China's state banks are in the *tertius gaudens* position to control access to financial opportunities in the GBA, foreign banks need to strategically collaborate with China's state banks.

This research used intraorganizational and interorganizational evidence, consistent with social network research. It did not have access to individual behavior of financiers in China's state banks. Such evidence is difficult to acquire because elite financiers are reluctant to be interviewed (Meyer, 2023). Future work on them in Hong Kong and the GBA would benefit from interview studies of these financiers and their firms. Furthermore, the relationship between China's state banks and elite professional services in law and accounting would add important insights into how China's state banks access sophisticated knowledge and expertise in networks.

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Examining smart city implementation models in Hong Kong, Macao, and Shenzhen: an analytical review

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Abstract

Purpose – This study aims to review the variety of smart city development projects in Guangdong-Hong Kong, Macao, and Shenzhen of the Greater Bay Area (GBA) of China, based on social, economic, and political factors.
Design/methodology/approach – A comparative and actor-focused political-economic method is applied to explore project-level smart city implementation models (SCIMs). A framework is first constructed to assess the state-market-community relationships of smart city projects. Subsequently, the array of smart city projects is examined, along with the explanations of how social, economic, and political factors influence these cities against the backdrop of the 'One Country, Two Systems' principle.
Findings – The findings show four varieties of SCIMs that highlighted proactive government support for smart city development, with place-specific strategies and pathways. With the state-market-community background and engagement of mega-technology firms, a variety of smart cities were found to exist and thrive.
Originality/value – This study reviews the political-economic framework of smart cities under the 'One Country, Two Systems' principle. Different SCIMs are examined and investigated, and the locally adopted pathway for smart city development are identified.

Keywords Smart city projects, Smart city governance, SCIM, Greater Bay Area, Mega-technology firms, State-market-community relationship

Paper type Research paper

Introduction

Smart cities are at the frontier of urban development exploration. The UN Habitat's World Cities Report 2022 (UN-Habitat, 2022) expects that by 2030, 5.167 billion people, or 60.4 percent of the world's population will live in cities. Because of the smartness of digital technology, including real-time data collection, integration, processing, and analysis, efficient information transmission, and the coordination of multiple urban systems without delay, the integration of technology with urban development can effectively improve cities' governance and offer more convenience to their citizens (Batty, 2013a).

Three main research paths can be identified from the existing literature on smart cities development. First, the technological path highlights how digital and smart technologies can

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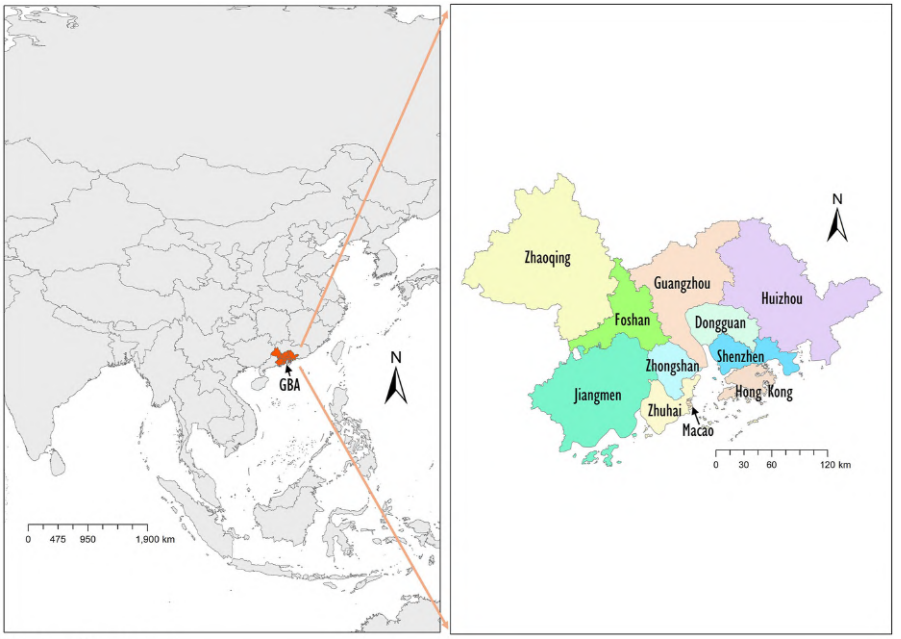
contribute to effective city governance and improve citizens' lives (Batty, 2013b; Janssen *et al.*, 2012). Second, there is a critical path that sharply captures the neoliberal nature of smart city development, and reveals the power play of international tech firms and their coalitions with local governments (Meijer, 2018; Grossi and Pianezzi, 2017). Finally, the political-economic path reveals the complex relationships between new and traditional stakeholders involved in smart city decision-making, infrastructure development, and operational processes (Jirón *et al.*, 2020; Drapalova and Wegrich, 2020).

The research adopts and develops the political economic approach and takes a project-focused perspective to explore how multiple actors interact to deliver smart city functions. Implementation of smart city technology creates an arena of local government, technology firms, normal enterprises, and citizens (Meijer, 2018). First, the heavy investment is a controversial issue for decision-makers and taxpayers. Second, technologies, such as blockchain, e-government, and online community engagement, change the way of governance and create a new round of adaptation and rule-setting (Meijer, 2018; Shorey and Howard, 2016). Finally, the rising importance of technology firms could cause political challenges and damage public interest. For example, research has found that in cities like Prague, technology provides an opportunity for the expansion and penetration of large tech firms' power into urban affairs and civil society (Drapalova and Wegrich, 2020).

In different conditions, these complex dynamics could result in expansion of technocracy and existing hegemony and, if harnessed properly, empower civil society. Nevertheless, they have not been well examined and existing research mainly focuses on city level instead of project level. In this research, the authors highlight the concept of 'smart city implementation models' (SCIMs), which reflects how multiple actors conduct smart city projects through cooperation and effective resource configuration.

This study focuses on the Guangdong-Hong Kong-Macao Greater Bay Area (GBA), an economic agglomeration hotspot and the most urbanised area in the world (Figure 1). Given



Source: By authors

Figure 1. Spatial delimitation of the GBA

the region's worldwide importance, the interactions between the smart city strategies of these cities and their local backgrounds under the 'One Country, Two Systems' policy have not been adequately explored. Hong Kong, Macao, and Shenzhen are selected for further analysis, which all view digital technologies as the core direction for future development. Hong Kong's blueprint depicts an integration of smart mobility, living, environment, people, government, and economy. Shenzhen's strategy is shaped by the strong local technological capacity and government leadership. Macao then emphasises the participation of local research institutions and tech firms from mainland China.

To address the research gap on the varieties and determinants of SCIMs, and GBA cities' smart city development, the research questions are as follows:

1. What are the state-market-community relationships reflected in smart city projects in the GBA, and what are the factors influence them?
2. What lessons does the variety of the GBA's smart city development offer for future local and global smart city developments?

The remainder of this paper is organised as follows. First, the literature on the political-economic analysis of smart cities is reviewed, and a comparative and actor-focused analytical framework for SCIMs is established. Thereafter the smart city development of Hong Kong, Macao, and Shenzhen is analysed based on 15 project cases selected based on the following three criteria: the project should be more attuned to public interest, thus more connected with the government, and representing local characteristics appropriately. The paper finally analyses the variety and determinants of the smart city development approaches in these three cities, and discusses the contributions and implications.

Political economy and the state-market-community relations of smart cities

A comparative and actor-focused approach to smart city research

In contrast to the first and second research paths on smart cities, the path of political economy focuses on the political relationships of actors (Meijer, 2018; Drapalova and Wegrich, 2020). The methodology of political economic research experienced a transition from a theory-driven one highlighting 'best practice' to a relational one, which emphasizes 'varieties of capitalism' (Hall and Soskice, 2001). Scholars began to pay more attention to the power of political and economic agents, and various contextual configurations (Brenner *et al.*, 2010). This gradually became a major task in political-economy research (Drapalova and Wegrich, 2020).

The literature on the political economy of smart cities also shows a development trend from traditional to comparative and actor-focused approaches. Earlier explorations were dedicated to revealing general theoretical models of how data influences existing social, political, economic, and governance processes (Meijer, 2018; Kitchin and Dodge, 2019; Kitchin, 2015). For example, in theorising data politics (Shorey and Howard, 2016) and 'datapolis' (Meijer, 2018), researchers showed that the political-economic impact of data is realized through the multiple arenas it creates, such as data storage, usage, and security, based on 'best practice' case analyses. However, the heterogeneity of technology and its implementation mechanisms determined that the smart city should not be examined through a 'one-size fits all' narrative (Kitchin, 2015). Many varieties are being encountered, and their strategies, pathways, and failures (Drapalova and Wegrich, 2020) require further research.

State, market, and community in smart city development

A classic state-market-community trichotomy is adopted to examine the roles of multiple actors. Studies focusing on state actors have found that smart cities incorporate factors such as managerial incentives, political performance, funding, technology availability, and city branding practices (Araral, 2020; Drapalova and Wegrich, 2020). The role of the state in technology-empowered governance has also been explored, especially during the COVID-19 pandemic (Guo *et al.*, 2022; Wu *et al.*, 2020). Most research on market actors highlights the

power of technology firms (Drapalova and Wegrich, 2020). State-market relationships shape value propositions, budgets, public interest, and data management policies in smart city development (Grossi and Pianezzi, 2017; Timeus *et al.*, 2020; Drapalova and Wegrich, 2020). For communities, technology acceptance is an important issue connected to trust, decision-making processes, and local backgrounds (Guo *et al.*, 2022; Kundu, 2019; Habib *et al.*, 2020; Sepasgozar *et al.*, 2019).

Smart city models

'Smart city model' reflects the overall configuration of actors' relationships revealed in smart city developments in a specific city, and describes the overall typology of the development strategy, path, and outcomes. Current literature primarily focuses on the evaluation of cases, aiming at summarising good practices in technology innovation (Ahn *et al.*, 2020) and power geometries (Miller *et al.*, 2021). Cases also reveal unique local strategies, experiences, and risks in cities like Dubai, Barcelona, and Santiago (Breslow, 2020; Jirón *et al.*, 2020; Charnock *et al.*, 2021). However, studies on the determinants of the models are rare.

In an early work on the factors influencing smart city models, Drapalova and Wegrich (2020) developed a typology of smart cities based on political involvement and civil society engagement, exploring how these factors influenced the development outcomes (Figure 2). In this study, large technology companies seek opportunities to maximise their power and economic returns, while governments and civil societies confront forces that aim to harness technology. Based on cases in four European cities, Drapalova and Wegrich (2020) found that strong political leadership and civil society activism could limit large tech firms' influences, allowing them to play a supportive role for public interest. Conversely, when civil society is weak, the state-business coalition will emerge. Weak political leadership and strong civil society will lead to patchy implementation, while a 'double-weak' situation will grant the power to tech firms.

However, a detailed examination of smart city projects may not fully confirm the framework. First, different state-market-community participation models typically coexist in the same city, particularly in different fields and scenarios. Second, viewing large tech firms as the only sources of technology and aggressive power seems unrealistic; this overlooks the digital transformation of the public and private sectors. Third, the linkage is not decisive, and financial and technological capacity limits are usually overlooked. Finally, the identification of smart city outcomes is incomplete.

In summary, research on smart city strategies and models is in its inception stage; therefore, to fill this gap, this study engages in a comparative and actor-focused approach, develops an analytical framework of SCIMs at the project-level, and attempts to connect the varieties with the unique roles of the state, market, and community in the local context.

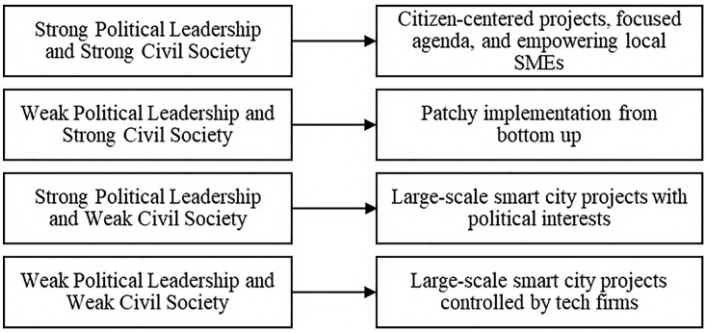


Figure 2. City-level political configuration and smart city development outcomes. (Source: Modified from Drapalova and Wegrich (2020))

Types of smart city implementation models

Identifying SCIMs: a state-market-community framework

This study defines SCIM as a model of how smart cities are realised in a certain project. It can be described as the sum of the integrated relationships between actors that maintain the existence and functioning of the project. In SCIMs, state, market, and community actors interact to allocate resources, realise human, financial, and material investments, and meet their needs. Analysis of SCIMs combines the evaluation of actors' features and relationships and the findings of previous research. Thus, the potential roles of state, market, and community actors were collected, as shown in Table 1.

By assembling the demand and capacities of these actors, the following models were identified that presented the common types of state-market-community interactions:

1. *State-centred Implementation and Purchase of Services*: In some projects, especially those related to digital governance, smart city functions are managed by the government itself. The government can also purchase a smart-city solution and then operate it within the bureaucratic system.
2. *Strategic Partnership*: It is common for governments to build strategic partnerships with large tech firms to create digital platforms and related infrastructures in multiple areas; this usually requires significant technological inputs and in-depth coalition.
3. *Public-Private Partnership*: By allowing a certain range of commercial practices to be conducted in smart city services, public-private partnerships could help the government provide services at lower costs.
4. *Public Initiative*: The government could use a limited budget to establish and manage a coordination office, although the actual digitalisation is accomplished by the initiative's participants and partners.

In the above discussion, the state-market-community relationships serve as a prism to reveal the SCIM in each project: matching of demands and capacities shapes the SCIMs, and state-market-community relationships then influence this process. However, SCIMs differ between cities and projects, and similar smart city functions could be achieved via different models. As a result, the capacity of cities to make suitable decisions based on their needs and endowments is important.

Spectrum of SCIMs

Instead of building a strict taxonomy of SCIMs, the research visualizes the spectrum of SCIMs based on the relevance and participation of state, market and community actors. In Figure 3,

Table 1. Roles of State, Market, and Community in Smart City Implementation

	State	Market	Community
Demand	City Competitiveness, Comprehensive Development, Voters' Support, Government Performance	Economic Returns, Commercial Environment	Governance effectiveness, Participation, Responsiveness, Privacy
Capacities	Leadership, Initiatives, Coordination, Planning, Smart City Strategy, State Investment, Administration, Regulations, Technology	Technology (Integrated and Distributed), Financial Investment, Project Development and Operation	Public Participation, Content Production, Consumption, Technology

Sources: Factors identified by Araral, 2020; Drapalova and Wegrich, 2020; Guo *et al.*, 2022; Wu *et al.*, 2020; Grossi and Pianezzi, 2017; Shrivastava, 2023; Kundu, 2019; Habib *et al.*, 2020; Sepasgozar *et al.*, 2019.

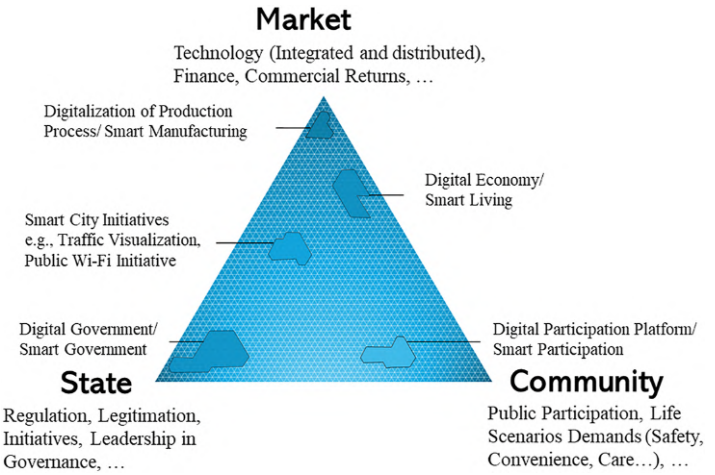


Figure 3. Locating SCIMs in the state-market-community pyramid. (Source: Adapted from McPhearson *et al.* (2022))

adapted from McPhearson *et al.* (2022), a pyramid-shaped diagram with state, market, and community placed at the three vertices was developed. Then, smart city functions and detailed models can be located on the figure according to the involvement level of the three types of actors. For example, digitalisation of the production process is usually a business decision (top of the pyramid). Similarly, digital government is more related to state actors, and technological input and public participation are also important; therefore, it locates near the vertex of the state, and extends to the others. Each function (and respective SCIMs) matches an area in the figure instead of an accurate point because SCIMs have elasticity, and the degree of actor involvement can vary over time.

Finally, this study applied a three-step framework to evaluate the varieties of SCIMs in three important cities in the GBA:

1. Analyse how the demands and inputs of multiple stakeholders combine to create specific SCIMs in each case.
2. Reveal how typical SCIMs can solve critical problems or meet critical demands, and their respective costs.
3. Connect the choice of SCIMs with the state-market-community conditions and the cities' social context and technological background.

Smart City Development in the GBA under 'One Country, Two Systems'

Research method

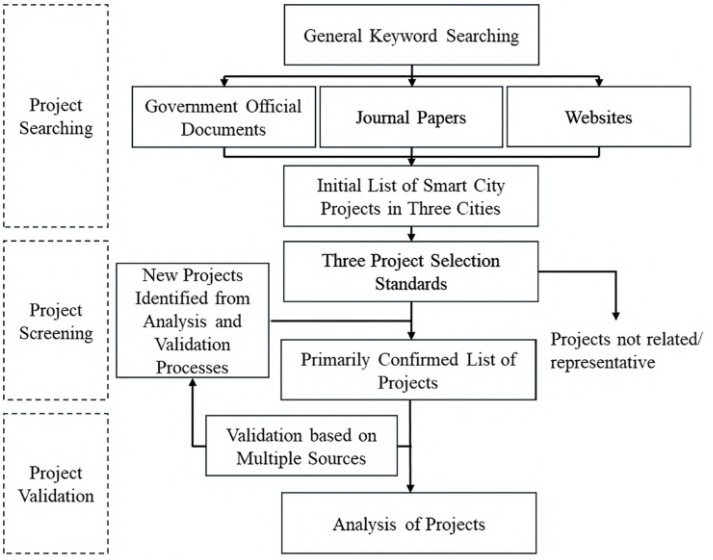
Hong Kong, Macao, and Shenzhen are selected for case study because of their special representativeness. Social, political, economic, and cultural heterogeneity caused by 'One Country, Two Systems' is a central concern for involving Hong Kong and Macao. The reason for not choosing other mainland cities is that their political background and SCIMs are similar. Shenzhen is the largest city in GBA and a technology center, and also represents smart city's frontline. Meanwhile, choosing Shenzhen is also helpful for comparison with Hong Kong, as the two cities are closely adjacent. Furthermore, although differences exist between mainland GBA cities regarding sizes, economic roles, and political scales, these dynamics are evaluated as not directly relevant for this research highlighting the 'One Country, Two Systems' context.

The data for this study were drawn from policy documents, research reports, smart city development plans, news, and academic research on smart city developments. First, the basic urban and smart city development status in three cities was obtained and analysed through keyword search. In this process, representative smart city projects were also identified. Then, project cases were selected and evaluated (Figure 4). To verify the results, there is cross-checking from official records such as original policy documents, Legislative Council Records (for Hong Kong), planning documents, and news reports related to bidding and outsourcing.

Case selection followed a three-step purposeful sampling and screening process (Figure 4). The first step was a keyword search using Google and Bing.com. The keywords included the cities' names, 'smart city', and common smart city functions, such as 'smart transportation' and 'smart government'. The results, mainly government documents, journal papers, news, and online media articles, were manually analysed to identify the projects. Second, in the project screening stage, the projects were primarily evaluated according to three standards: higher public influence, public interest, and local representativeness. Similar projects in the same city were also avoided to prevent information repetition, leading to a list of primarily confirmed list of projects. Finally, in the project validation stage, a focused search was conducted on these projects to collect and verify detailed information. During the process, additional projects could be identified. For example, when verifying primarily enlisted projects, sources such as government tendering websites, planning documents, and company websites sometimes referred to additional projects. In the end, a final list of 15 projects (five in each city) was confirmed to better represent the features of each city and avoid involving too many cases.

One Country, Two Systems

In Hong Kong and Macao, three major features were found to influence state-business-community relationships and SCIMs. First, major decisions need to be vetted by Legislative Council and Legislative Assembly, thus facing more substantive doubts and objections. This could influence large-scale projects particularly. Second, owing to the separation of powers,



Source: By authors

Figure 4. The flow chart of case selection and validation

the government's ability to collude with enterprises is lower. Finally, the existence of electoral and district council systems has cultivated active citizens and a political tradition of empowering participation. Comparatively, in Shenzhen, the government can establish large-scale projects through direct administrative orders and state-led investment, and maintain a close coalition with technology firms.

Market environments are also important. Macao's economic structure is relatively homogeneous and lacks local technological capabilities, while Hong Kong market is more open to international IT companies. Shenzhen is a frontier city in mainland China's reform and has a strong technology capacity. All three cities have strong financial capacities; therefore, differences in technological resources may be more influential than financial limits. Based on these features, the following is a detailed analysis of these three cities.

Hong Kong: distributed implementation highlighting civil society

Hong Kong's smart city development could be dated back to the early days of Hong Kong's return to China in 1997. Faced with an economic crisis, Hong Kong first released its Digital 21 Strategy in 1998 and offered annual updates in subsequent years. Mainly through a method of outsourcing (Hong Kong Legislative Council, 2008), the Hong Kong SAR Government established its first public service website 'ESD' in 2000, and then developed its current e-government platform GovHK in 2007.

Current smart city development in Hong Kong was marked by the Hong Kong Smart City Blueprint 1.0 in 2017, which included 76 measures covering six phases of smart city construction (Hong Kong SAR Government, 2017). In 2020, Blueprint 2.0 proposed over 60 extra measures (Hong Kong SAR Government, 2020). These blueprints forwarded a comprehensive agenda and included a variety of delivery methods other than outsourcing and purchasing services. Table 2 lists the Smart City projects explored in Hong Kong.

Table 2. Smart city projects implemented in Hong Kong

No.	Project Name	SCIM	Major Stakeholders	Field
1	Wi-Fi.HK	Government-led initiative. Managed by government and strategic partners and participated by private sector participants	Government, communication companies, private sector participants	Internet infrastructure
2	Faster Payment System (FPS)	Proposed by the Hong Kong Monetary Authority, operated by Hong Kong Interbank Clearing Limited, participated by payment service providers	Government, operator company, payment service providers	Fast payment
3	GovHK	Establishment: government procurement Operation: government	Government, project developer	Smart government
4	Energizing Kowloon East	Smart-city-involved urban regeneration scheme. A laboratory of smart city opened to multiple social actors.	Government, developers, academia, research institutions, citizens	Urban regeneration and smart living
5	Data.gov.hk	Developed and supported by the Office of the Government Chief Information Officer. Opening data from the government, public and private organisations for analysis, research, and further implementation	Government operators, data sources, academia, citizens, analysts, start-ups	Open data platform

Source: By authors

The first feature of these projects is the government's proactive role. Early smart city projects primarily focused on public services and government affairs. The FPS, an important fast payment and bank transfer method, is also led by government instead of commercial institutions. The second feature is the use of government initiatives to facilitate multiparty collaboration and reduce costs. For example, in the digital infrastructure project Wi-Fi.HK, the government project management team and its collaborators established a unified standard for Wi-Fi access and designed a mobile app (Wi-Fi.HK), and then called on the private sector to join. For public venues, the public-private partnership model was adopted to cover the cost. Third, unlike the other two cities, Hong Kong does not have a centralised government cloud platform. Projects are operated more independently and involve less system complexity. Finally, some projects show a strong desire to engage with civil society. For example, Energising Kowloon East is a revitalisation project highlighting smart city functions. The government is attempting to make the regeneration process a public laboratory in which multiple stakeholders such as developers, firms, academia, and citizens explore a future city.

These features could relate to the city's prevailing state-market-community relationship and economic background. Features such as the small size, lack of centralised digital platforms, and civil society involvement are common with a 'patchy implementation' model in some European cities (Drapalova and Wegrich, 2020). However, patchy implementation is often viewed as an outcome of weak governments (Figure 2); and Hong Kong SAR Government still actively leads the smart city agenda through procurement and initiatives. Then, the reason of the 'patchy implementation' may more profoundly relate to the social context and local tech capacity. The democratic decision-making process can be an obstacle for large-scale projects, and the community context makes data privacy a sensitive issue. Meanwhile, a lack of local technological capacity may hinder the development of large-scale projects.

Macao: making use of local and 'One Country, Two Systems' opportunities

Macao's smart-city development began relatively late. As early as 2005, Macao legislated to confirm the validity of electronic signatures and protection of personal data; however, further implementation of e-government did not follow immediately. At the end of 2015, Macao's government enacted the Master Plan for Macao Special Administrative Region e-Government 2015–2019, and began to focus on digitalisation and smart cities (Chui, 2016). Then, flagship projects of Macao were engined by a 4-year strategic partnership between the Macao government and Alibaba since August 4, 2017, covering smart government, transportation, tourism, and healthcare. In 2019, the e-government system 'Macao One Account' was released. In Macao's Second Five-Year Plan for Economic and Social Development (2021–2025), the government continued to emphasise the integration of smart cities and digital technology into multiple fields.

Table 3 shows selected projects in Macao. The first feature is the cross-border strategic partnership with mainland China's tech firms. Not only Alibaba, but later Baidu also joined the smart city scheme to involve AI technology in tourism. These technology sources helped build more integrated smart city systems and achieve rapid technology implementation, but also raised data security concerns. The second feature was the participation of public utilities and state-owned enterprises which eased coordination with market actors. The largest company in Macao, Nam Kwong (Group) Company Limited, is a state-owned enterprise which manages major smart city projects such as smart parking spaces and natural gas systems. CEM, the public utility for electricity supply, operates the Smart Streetlight project along with the University of Macao. Meanwhile, these projects also focused on providing local opportunities and building local technical capabilities. In the agreement between Macao and Alibaba, cultivating local talents in smart city technology was an important clause.

Connections can also be observed between SCIMs and local state-market-community backgrounds. Macao's simple economic structures and the existence of dominant state-owned

Table 3. Smart city projects implemented in Macao

No.	Project Name	Project Implementation Approach	Major Stakeholders	Field
1	Smart Streetlight	Government initiative, private implementation (Companhia de Electricidade de Macau, CEM), and academic participation	Government, project developer company, University of Macao	Smart infrastructure
2	Smart Government, Smart Transportation, Smart Healthcare	Government procurement and strategic partnership between Macao Government and Alibaba	Government, cross-border project developer	Smart government, smart transportation, smart healthcare
3	Smart parking space management	State-owned-enterprise-led implementation	Government, state-owned enterprise	Smart transportation
4	Smart Tourism	Government procurement and strategic partnership between Macao Government and Alibaba, then Baidu joined for AI implementation	Government, cross-border project developer	Smart tourism
5	State Key Laboratory of Internet of Things for Smart City	A scientific research institution jointly supported by the state and Macao, established in the University of Macao. The research direction focuses on large-scale platform and network applications	Ministry of Science and Technology of China, Macao Government, University of Macao	Smart city technology development

Source: By authors

enterprises allow government to maintain close relationships with major firms, making it easier to achieve development coalitions. Consequently, large cloud-computing-based smart city projects and rapid development could be achieved. Meanwhile, Macao citizens have a high sense of political identification with the government and the 'One Country, Two Systems' policy, which also makes it easier to involve cross-border tech firms and establish large-scale projects. In this context, Macao also demonstrates a liberal ideological tradition, and built stricter data protection rules by adopting EU and US security standards. Finally, Macao could be identified as a city flexibly making use of the opportunities provided by 'One Country, Two Systems' to achieve urban transformation.

Shenzhen: state-led technocratic mega projects and a vibrant digital industry

China's smart city industry is led by Ping An, Alibaba, Tencent, and Huawei, or often referred to as 'PATH', and Shenzhen is home to three of them (except Alibaba). Strong technical capacity and active government leadership have made Shenzhen a pioneer in the application of smart city technologies, especially large-scale platforms and models that can collect and process huge volumes of data and automatically regulate the operation of multiple urban fields.

Table 4 shows that most flagship projects have been conducted under government leadership. A representative feature of Shenzhen's model is large-scale projects with high levels of digital integration and smartness. For example, the Shenzhen Transportation Integrated Smart Platform connects sensors, cameras, traffic lights, and real-time data of transport industry vehicles; this provides the ability to model the city's transportation network and simulate the travel behaviour of more than 800,000 vehicles. The Government

Table 4. Smart city projects implemented in Shenzhen

No.	Project Name	Project Implementation Approach	Major Stakeholders	Field
1	Shenzhen Transportation Integrated Smart Platform	Government procurement, managed and operated by government.	Government, tech firms	Smart transportation
2	Shenzhen Smart City Group	Not a single project. It is a Shenzhen's state-owned technology enterprise focusing on smartness in real estate, environmental protection, planning, and property management.	Government and firms of respective fields	Smart real estate, environmental protection, and property management
3	Government Management Service Command Center (City Brain)	Constructed via government procurement (Huawei) and operated by government departments	Government, tech firm, all citizens and market actors in urban governance	"City brain" and smart urban governance
4	Government data opening platform of Shenzhen Municipality	Constructed via government procurement and operated by government-affiliated public institutions, involving data from some regulated firms.	Government, project developers, data sources, citizens, data users	Open data platform
5	i Shenzhen	Constructed via government procurement (Ping An) and operated by government departments.	Government, tech firm, and citizens.	Mobile public service platform

Source: By authors

Management Service Command Centre system provides a real-time analysis function of street video monitoring data and public reports to identify anomalous events such as brawls and pollution incidents. Through the 'i Shenzhen' mobile app, the government provides convenient public and administrative services. The platform links 43 municipal government departments and over 15,000 types of government, public, and enterprise-related services (https://isz-open.sz.gov.cn/iszhom).

The government-led SCIM is representative. Two types of state-market relationships are involved. For projects with high technical requirements, the government mainly contracts with private tech companies such as Huawei and Ping An, as shown in Table 4. The government also participates in smart city projects through state-owned technology enterprises, such as the Shenzhen Smart City Group, in areas with fewer technological requirements. Additionally, along with the high level of system integration, Shenzhen's SCIM places residents and urban spaces in a managed position and may face certain data risks (Guo *et al.*, 2022). The government information system involves detailed personal data, such as an individual's name, occupation, and place of work, and the video monitoring system covers urban spaces all-around to supervise sanitation, travel, and other behaviours. Citizens' participation in the decision-making process is indirect; they express their opinions by posting on the respective departments' platforms and monitoring their living environments.

Discussion

Determinants of Smart City's Varieties

Compared to existing theories of smart city development (Meijer, 2018; Kitchin, 2015; Shorey and Howard, 2016; Drapalova and Wegrich, 2020), the first contribution of the research is

enriching the understanding of smart cities by revealing multiple SCIMs. By exploring the actors' interactions in actual construction, the research provides another perspective to understand the political economic issues of smart cities in addition to theoretical construction and city-level analysis, which is closer to on-site practices.

Furthermore, in terms of determinants of smart city's varieties, this study corroborated some previous findings (Drapalova and Wegrich, 2020) and contributed new observations. These new findings also drive future research to further explore the causal influences of local political economic backgrounds on smart city development. For example, Hong Kong's social-political background of proactive government and active community is closer to the 'Strong Government and Strong Civil Society' model (Figure 2). Nevertheless, the development of digital platforms and smart city systems have been relatively slow. Thus, there may be limitations that render the city's smart city build up as a 'patchy implementation', as evidenced in considerations of data security, slower decision-making processes, and lack of local technology capacity (Araral, 2020). Therefore, political background and traditions are not the only factors affecting SCIMs. Ultimately, this study describes Hong Kong's smart city implementation as proactive and distributed.

Based on the Macao case, we argue that geographical factors should not be overlooked in the political economies of smart cities. As observed in the projects, Macao's model is not predicted by Drapalova and Wegrich's (2020) research, and the city can make use of geopolitical and geo-economic opportunities to boost smart city development and cultivate local talent and technological capacity. Tension between cross-border technology flow and local digital security is also involved and may be a critical theme. Based on the findings, future research could involve the lenses of geopolitics and geo-economics (Flint and Zhu, 2019; Porto Gomez, 2018), city diplomacy (Lauermann, 2016), and global production networks (Henderson *et al.*, 2002) to understand next-generation smart urban development.

For Shenzhen, the findings partly confirm the prediction of the current theory that a strong government, strong tech firms, and weak awareness of the community lead to a large-scale centralised implementation model (Drapalova and Wegrich, 2020). During the COVID-19 pandemic, cyber control powerfully supported social distancing measures but also revealed insufficient consideration of the community (Guo *et al.*, 2022; Wu *et al.*, 2020). Nonetheless, this study shows that in the 'Strong Government and Weak Civil Society' model, there remains diversity in SCIMs, such as procurement, state-owned enterprises, and the government's deeper alliance and control over enterprises. Simultaneously, this case also prompts us to think about the paradox between technology development and social governance: higher governance technology capabilities often require a more centralised political environment; however, this potentially threatens the government-market-community balance in governance.

Enriching smart city strategies based on the political-economic perspective and SCIMs

Furthermore, this study also aims to provide a roadmap and toolkit that contributes to future smart city development (the second research question). Existing studies tend to focus more on how technology solves problems (Janssen *et al.*, 2012), how technology causes social risks and challenges (Shayan and Kim, 2023; Grossi and Pianezzi, 2017; Wu *et al.*, 2020), and the diverse applications and influencing factors of technology implementation (Timeus *et al.*, 2020; Drapalova and Wegrich, 2020) but fail to fully discuss how a 'good' smart city development is achieved via actors' interactions. Then, these interactions are the focus of this study, and we argue that smart city development should be reviewed via dynamic political-economic relations.

Based on the findings, it is suggested that representatives of local public interest should build up a capacity to harness smart development and learn from the varieties. The first step is analysing existing SCIMs based on actors' relationships and identifying a bunch of situated

strategies. Second, decision-makers should enrich available SCIMs at hand and learn to appropriately use them in typical contexts. Practically, this requires building smart-city-related decision-making support mechanisms, such as special committees and expert consultations, and establishing participation mechanisms for the communication and collaboration of key actors. As a result, local actors could use flexible strategies to involve and regulate technological forces, ensure public participation, and realise harmonious cooperation with technology providers. As shown in the cases of GBA, cities could learn from Hong Kong about ways to promote smart city projects via government-led initiatives and how active community participation can revitalise urban or rural areas.

Finally, through the Market-State-Community Pyramid (Figure 3), this study provided a potential pathway to locally adaptive smart city strategy: if all SCIMs used in a city are drawn on a pyramid (Figure 3), the overall picture would show a range of strategic options for a city. It then visualizes the capacity of a city to effectively balance state, market, and community forces to achieve different types of smart city functions. One hypothesis is that a city with more skills and choices to achieve better solutions when developing a typical function will have advantages. Then, increasing these strategic choices and model flexibility could be a way to explore better smart city implementation.

Conclusion

This study examines the development of smart cities in three GBA cities from the political economic perspective. The contribution is three-fold. First, the analysis of the smart city political-economy was advanced from the city- to the project-level and we proposed an analytical method for SCIMs based on state-market-community relationships. Second, it is found that existing city-level research does not anticipate the dynamics of smart cities and the diversity of SCIMs in these cities. The influences of local political tradition, geopolitical and geoeconomic situation, and local technology capacity are shown. Finally, for future smart city construction, this study identified a variety of SCIMs and proposed that cities should learn from each other and establish mechanisms to enhance smart city implementation capacity. The study's results could then contribute to the understanding of the development of the GBA, the 'One Country, Two Systems' policy, and smart city development and governance. In addition, we acknowledge the limitations of the research in theoretical depth and providing more detailed guidelines. Instead, more future directions are proposed. Broader evidence and deeper examinations are necessary to validate the factors identified and develop comprehensive theories and guidelines.

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Strategies for strengthening cross-border urban planning coordination between Hengqin, Zhuhai, and Macao Special Administrative Region, China

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Abstract

Purpose – The paper examines the challenges and strategies for cross-border urban planning coordination between Hengqin and Macao, China, under the "One Country, Two Systems" framework. By doing so, it aims to enhance regional integration within the Guangdong-Hong Kong-Macao Greater Bay Area.

Design/methodology/approach – This study employed a qualitative case study approach to analyze the current urban planning systems and practices in Hengqin and Macao, as well as the needs and obstacles associated with cross-border planning coordination. The research data were derived from an examination of national policies, a compilation of data from the National Bureau of Statistics, field research conducted between 2021 and 2024, and an analysis of 14 semi-structured interviews with relevant groups, including urban planners, cross-border commuters, and citizens in both places.

Findings – Significant differences exist in the social, cultural, and institutional systems between Hengqin and Macao, which hinder effective communication and exacerbate disparities in urban planning objectives, priorities, regulations, and technical standards. These challenges have resulted in contradictory planning practices, particularly in transportation and public facilities. Cross-border planning coordination remains in its infancy and requires immediate attention. This study proposes leveraging the "One Country, Two Systems" policy to establish a formal coordination mechanism and foster multi-level, effective communication to address these challenges.

Originality/value – This study explores the cross-border coordination mechanisms between the urban planning systems of Hengqin and Macao, thereby addressing a research gap in cross-border planning coordination under the "One Country, Two Systems" paradigm. It emphasizes the significance of such coordination, a concept that is frequently disregarded in practical applications, and provides pragmatic recommendations for Hengqin.

Keywords Cross-border planning and coordination,
Guangdong-Macao In-Depth Cooperation Zone in Hengqin, Urban planning, Macao, Hengqin

Paper type Research article

Introduction

The Guangdong-Macao In-Depth Cooperation Zone in Hengqin, located to the west of Macao, covers an area of approximately 106 km^2 and has served as a pilot area for Guangdong-Macao cooperation for a considerable period (Hengqin is part of Guangdong Province, China). In 2021, the State Council of China issued the "Overall Plan for the Construction of the

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Guangdong-Macao In-Depth Cooperation Zone in Hengqin". This plan aims to develop Hengqin into a new platform that promotes moderate diversification of Macao's economy (Central Committee of the Communist Party of China, 2021). Under the "One Country, Two Systems" framework, the joint governance of Guangdong and Macao has led to the development of Hengqin as a distinctive cross-border area managed by two different systems. The distinct systems have led to diverse planning approaches on either side, resulting in contrasting metropolitan areas. Various urban development objectives, infrastructure, residents' lifestyles, and other urban planning factors affect Hengqin's urban development and impede cross-border exchange between Hengqin and Macao.

Without a coordinated mechanism between Hengqin and Macao, these disparities will persist, hindering urban vitality in Hengqin and presenting a substantial obstacle to urban growth. However, obstacles inherently introduce new possibilities. When conflicting ideas are resolved and barriers are overcome, the convergence of the two systems will generate a fresh impetus for Hengqin's advancement. Thus, well-organized collaboration between the Hengqin and Macao urban planning systems is necessary to address the obstacles related to systems, institutions, and standards, thereby facilitating cross-border collaboration.

This study examines the features of the existing urban planning systems in Hengqin and Macao, identifies inconsistencies in their implementation, and evaluates the need for cross-border planning cooperation between the two regions. This is accomplished by examining national policies, gathering data from the National Bureau of Statistics, conducting field research between 2021 and 2024, and conducting and analyzing 14 structured and semi-structured interviews with relevant groups. Furthermore, an analysis of the current urban planning systems in Macao and Hengqin, coupled with international case studies, highlights that a cross-border coordination strategy based on effective communication is among the most effective approaches to fostering practical cross-border cooperation. This study provides strategic recommendations to address existing contradictions and enhance the coordination of urban planning systems in Macao and Hengqin.

Cross-border planning coordination

Cross-border planning coordination has been the subject of extensive research since the establishment of the first cross-border zone at the Dutch-German border in 1958. Cross-border spatial planning is defined as the coordination of land development across national borderlands (Medeiros, 2018) to address the socioeconomic challenges faced by border regions and foster sustainable development (Behradfar and Castanho, 2023). The process requires the coordination of activities at the intermunicipal, regional, and local levels to reduce disparities within urban planning systems. However, cross-border collaborations frequently encounter significant institutional, structural, and financial obstacles (Nyamwanza *et al.*, 2022).

In China, interjurisdictional planning has emerged due to rapid urbanization and the formation of urban agglomerations. Nevertheless, administrative boundaries impede the process of regional synchronization, resulting in the establishment of barriers between cities (Lin, 2009). To address these challenges, local governments have increasingly adopted coordinated planning across administrative boundaries to optimize resource allocation and address common regional issues. The key challenges identified in the literature include unbalanced economic development, spatial demand disparities, and fragmented governance in areas such as transportation, ecology, and infrastructure (Liu, 2022; Zheng, 2019).

Empirical research has examined cross-border cases through lenses such as development models, cooperation mechanisms, decision-making processes, and interregional relations, underscoring the centrality of effective communication. These findings provide robust evidence that coordination strategies rooted in communicative efficacy play a decisive role in the successful establishment of cross-border cooperation (Buursink, 2001; European Commission and AEBR, 1997; Fricke, 2015; Jańczak, 2017; Nelles and Durand, 2014; Perkmann, 2003; Zäch and Pütz, 2014). For instance, in the Bodensee region, informal

communication bypassed formal procedures and facilitated cooperation (Zäch and Pütz, 2014). Conversely, collaboration between the United States and Mexico demonstrates how communication can facilitate the harmonization of disparate legal systems to safeguard mutual interests (Oliveras González, 2016; Peña, 2007). Nevertheless, the failure of cooperation platforms, as evidenced by the example of Lille, demonstrates that inadequate communication can compromise the efficacy of cross-border governance (Nelles and Durand, 2014). As Tölle (2013) contends, when cultural and institutional factors impede communication, even minor discrepancies within the system can lead to failure (Figure 1).

The Guangdong-Macao In-Depth Cooperation Zone in Hengqin is a strategic initiative aimed at promoting economic diversification in Macao and enhancing regional integration. This suggests a trajectory toward a more profound cross-border collaboration; however, Hengqin remains in the preliminary exploratory phase of Nelles and Durand's (2014) four-stage model of cross-border coordination, which encompasses the stages of "exploration, construction, preparation, and adjustment". Despite the implementation of favorable policies, inconsistencies in cooperation and conflicting interests have hindered progress (Decoville and Durand, 2021). The absence of a formal planning coordination mechanism has resulted in strategies based more on assumed rather than assessed needs. This has resulted in urban spaces that fail to meet the expectations of Macanese residents, particularly in terms of the availability of amenities. As one resident noted, although housing in Hengqin is affordable, the amenity gap compared to Macao remains significant. As Medeiros (2014) asserts, considerable systemic, economic, and institutional disparities between territories have the potential to render generalized models ineffective. This emphasizes the need for context-specific coordination strategies. In consideration of Hengqin's distinctive status within the "One Country, Two Systems" framework and the absence of a transferable cross-border planning model, a thorough examination of its planning system, collaborative mechanisms, and practical challenges is imperative to formulate efficacious cross-border coordination strategies.

Current urban planning system of Hengqin and Macao

Currently, Hengqin is included in China's territorial planning system, whereas Macao is scheduled to complete its urban master plan for the Special Administrative Region in 2022. There are several significant differences between the two, as outlined in the following.

Urban planning system of Hengqin

Urban planning is the governmental management of spatial resources, primarily focusing on the development and utilization of land. Effective urban planning can prevent the spontaneous and disorderly growth of cities and promote the balanced and sustainable development of urban areas (Hengqin New Area Administrative Committee, 2016).

Hengqin adheres to the regulatory framework of mainland China and implements the "one book, two certificates" system. The Hengqin regulatory system ensures the legality of

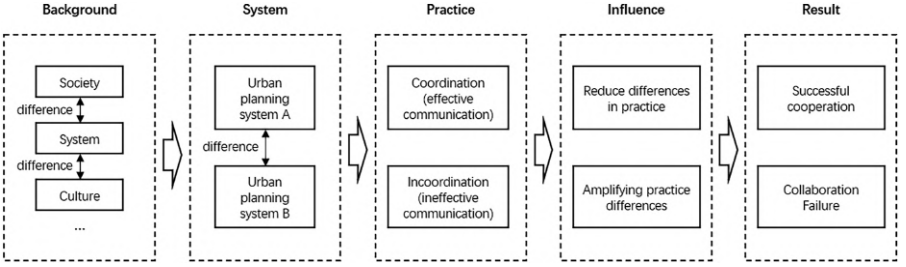

Figure 1. Cross-border planning coordination mechanism. Source: By authors

construction operations by implementing preliminary review and site selection opinions for construction projects, as well as construction land planning permits and construction project planning permits. Meticulous strategic planning regulates urban construction operations. The planning system is extensive and complex (Wu and Li, 2010).

In terms of planning and approval systems, Hengqin is part of China's territorial space planning system and technically part of Xiangzhou District, Zhuhai City. The planning standards, databases, and other content included in Zhuhai's territorial space planning at the county level also apply to Hengqin, which is currently at the provincial administrative level. Therefore, in the current process of creating an all-encompassing urban plan for Hengqin, only the urban space, agricultural space, ecological space, urban development boundary, permanent basic farmland, and ecological protection red line must be submitted to the appropriate authorities for approval. Hengqin is the authority responsible for developing and approving other content, with the Management Committee playing a prominent role. The Urban Planning and Construction Bureau is primarily responsible for this work. Hengqin has a significant level of autonomy and independence in the current planning process. However, the planning process in Hengqin varies from that in Macao in that it does not include legally protected procedures for public engagement and cross-departmental cooperation (Government of the Macao Special Administrative Region, 2014a, 2014b; Urban Planning and Construction Bureau, 2021).

In terms of basic technical planning indicators, Hengqin follows the comprehensive and mature planning system of the Chinese mainland. Land use is divided into 24 primary, 106 secondary, and 39 tertiary categories. Regarding land compatibility, there is no clear stipulation of the compatibility ratio, and considerable flexibility is allowed.

Urban planning system of Macao

Macao is currently undergoing a phase of urban development, with a specific emphasis on enhancing and revitalizing the existing urban environment. This is achieved in a manner that safeguards the rights and interests of the public and carefully regulates the content of construction during the execution phase (Government of the Macao Special Administrative Region, 2022).

The regulatory framework for urban planning in Macao primarily consists of the Urban Building Legal System, the Urban Planning Law, and supplementary administrative regulations, including the Detailed Rules for the Implementation of the Urban Planning Law and the Urban Planning Commission. Additionally, expert panels have been established (Government of the Macao Special Administrative Region, 2013, 2014a, 2014b). In Macao's current urban planning practice, apart from the detailed planning in the "East District-2'' area, the other districts rely on the government's internal "Design Guidelines" to establish the planning condition map for each plot. This map regulates urban construction activities. The planning condition map governs the plot ratio, street shadow area, and other relevant information. The indicators in question display significant variation across different places, and consequently, they have not yet been consolidated into a single, standardized framework.

In terms of the planning and approval system, Macao's planning places significant value on public and interdepartmental participation, and the approval process is relatively comprehensive. In practice, the Land, Public Works and Transport Bureau is the primary agency responsible for the overall planning of related matters. Two committees, established by legislation, have been introduced into the preparation process to balance the interests of all parties. The Interdepartmental Committee coordinates the relationships between government departments, including the Construction and Development Office, Transport Bureau, and Tourism Bureau. The Urban Planning Committee coordinates public interests and includes 34 professional members and 27 outstanding individuals recognized by society. Furthermore, the comprehensive and detailed planning of Macao necessitates a period of 60 to 100 days, respectively, for soliciting stakeholder and public opinion, which are then collated to form a public opinion analysis report. Concurrently, a system of observation is established for specific

planning-related meetings, allowing residents of Macao to observe the proceedings after applying for permission to do so (Government of the Macao Special Administrative Region, 2013, 2014a, 2014b). Consequently, the characteristics of Macao's planning and approval system are that the cycle is longer but has the advantages of being fairer, more transparent, and in line with the interests of residents.

Macao's current planning technical indicator system primarily focuses on construction engineering and design, with limited coverage in the field of urban planning, mainly due to delayed initiation. Moreover, the issuing procedure has not been streamlined and is somewhat intricate. The land-use classification is divided into three hierarchical levels: primary, secondary, and tertiary. The main category is further divided into eight subcategories, whereas the secondary category is further divided into 20 subcategories. Additionally, a distinct secondary classification of land dedicated to tourism and entertainment has been created. Land compatibility categorization employs a dual control approach, which encompasses compatible categories and proportions, as well as more detailed requirements (Table 1 and Figure 2).

Differences in planning practices between Hengqin and Macao

The disparities between the two planning systems have already exerted a substantial influence on planning practices in Hengqin, rendering urban spaces incapable of meeting the current living needs of Hengqin residents and those in Macao. Moreover, these inconsistencies could affect the movement of individuals between the two regions. This is particularly evident in two key domains.

The primary distinction lies in the disparities within the transportation system, which are evident in three crucial areas. First, the movement of goods across borders is limited by customs clearance regulations and procedures. For example, the rail transportation system connecting Hengqin and Macao is not fully integrated, which means that passengers must switch at Hengqin Port. Customs clearance examinations are mandatory for cars crossing borders. The requirement for customs clearance processes inevitably leads to a substantial increase in travelers' time expenditure, which may cause them to abandon their planned journey.

Second, there are significant disparities in the core technical indices of the transportation networks in both regions. For instance, Macao uses right-hand drive vehicles (steering wheel on the right) with a left-hand traffic system and a compact road network. Conversely, Hengqin employs left-hand drive vehicles (with the steering wheel on the left) under a right-hand traffic system, supported by extensive road infrastructure that enables high traffic capacity. Data from the Statistics and Census Service of Macao and the Statistics Bureau of Guangdong-Macao In-Depth Cooperation Zone in Hengqin reveal that the road network density in Hengqin's built-up area is 3.95 km/km^2, significantly lower than Macao's 15.22 km/km^2.

Third, there is a disparity in travel patterns between the two regions. Macao locals are usually more familiar with a 5-minute walking distance, whereas Hengqin is usually designed for a 15-minute walking radius. Although the travel habits of Macao residents have been considered, the current planning process in Hengqin has led to a strategy of utilizing extensive and all-inclusive service facilities to cater to the residents' requirements. However, this approach has resulted in a lack of ease of access and adaptability among the associated facilities. An example of an optimal public transportation strategy from the New Neighborhood, a significant residential project in Hengqin that collaborates with Guangdong-Macao, is to take a 3.7 km bus journey and then walk 1.2 km to reach the nearest large-scale comprehensive supermarket. This journey takes approximately 30 minutes. In comparison, driving the same distance would take approximately 10 minutes, but this would not meet the expectations of a five-minute living circle. Even when compared to the relatively loose urban spatial layout of the Taipa Peninsula in Macao, the compactness of Hengqin's infrastructure layout remains inadequate to meet the living needs of Macao residents. The number of bus stops and their coverage are significantly lower than those in Macao (Figure 3).

Table 1. Characteristics and differences of the Hengqin-Macao planning system

	Goal	Focus	Regulations	Preparation and approval	Technical specifications	Urban design logic
Hengqin	Economic growth; cooperation	Urban landscape; large space; comprehensive control	one book, two certificates	Process streamlining: fast and short	Mature and comprehensive; land compatibility is more flexible	Large-scale, integrated and comprehensive supporting service system
Macao	Urban renewal	Public interest; human scale; meticulous control	Planning condition map	Process improvement: slow and long	Relatively weak; land compatibility regulations are clear	Small-scale, flexible supporting service system

Source: By authors

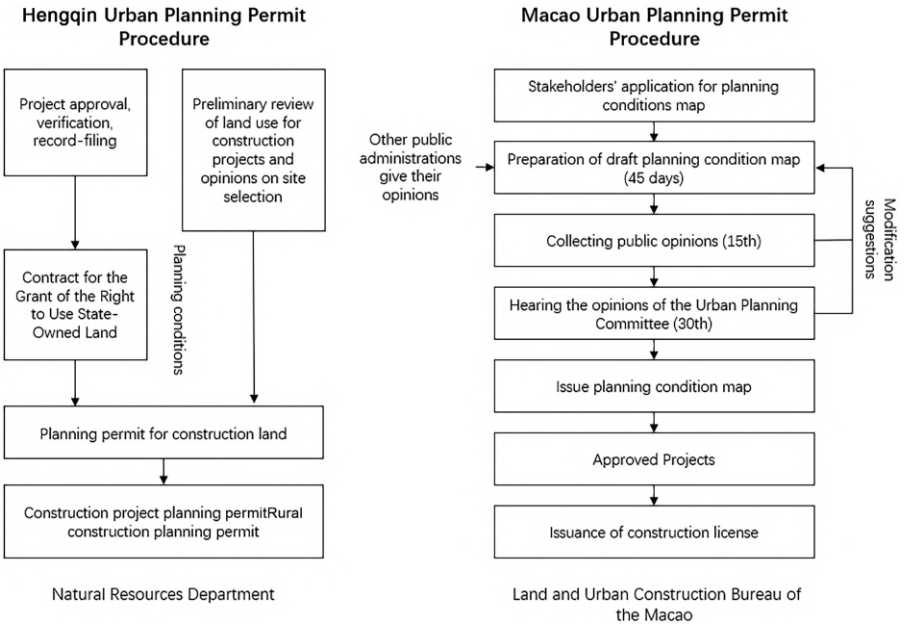

Figure 2. Differences in planning processes between Hengqin and Macao. Source: By authors, based on the 2023 Implementation Assessment of Hengqin's Urban Planning and Land Use Master Plan

The second distinction pertains to public facilities. The establishment of numerous small and flexible pocket parks, markets, public libraries, and urban squares characterizes Macao's approach to public needs. By contrast, Hengqin tends to establish expansive urban green spaces and community activity centers that are accessible and concentrated. The design logic of the two approaches is strikingly divergent. As previously stated, numerous Macao residents assert that Hengqin lacks sufficient facilities for leisure and relaxation. This has led to noticeable differences in the living habits of residents in Macao and Hengqin.

The previous planning methods illustrate a significant difference between Hengqin and Macao in the core principles of urban spatial design. Unlike the extensive spatial layout of Hengqin, Macao prefers to create compact and scattered small-scale areas that cater to the everyday requirements of the general population. This design offers greater flexibility and enhanced consideration of human needs.

Current status of cross-border planning and coordination between Hengqin and Macao

Independent planning and lack of communication

The current coordination and communication between Hengqin and Macao remain insufficient and require significant improvement. Hengqin and Macao have previously engaged in in-depth deliberations on the concept and execution of cross-border collaboration. This study's findings suggest that the urban planning process in Hengqin has begun to integrate and coordinate with Macao's overall urban planning. However, there is still no official institutional structure for such integration. The implementation of "Hengqin-Macao coordination" throughout the development of Hengqin's urban plan is primarily unidirectional, with a notable absence of authentic communication and collaboration with Macao. Hengqin has unilaterally responded to Macao's urban planning by implementing several measures. For instance, in addressing the concerns outlined in the comprehensive plan for Macao, which involves improving tourism and optimizing public service facilities,

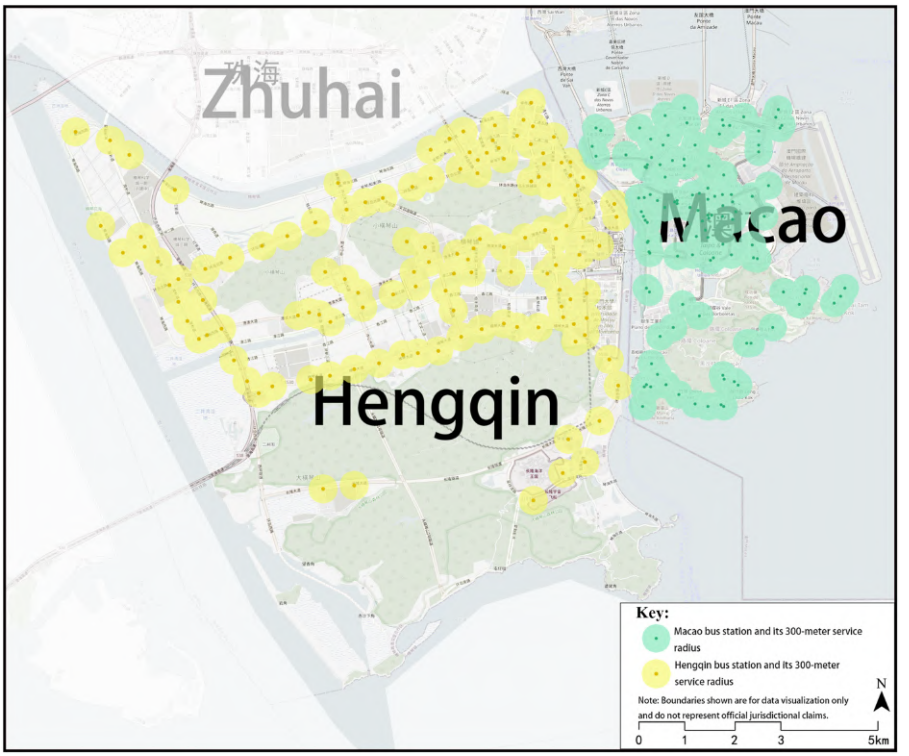

Figure 3. Comparison of public transport stops and 500-meter coverage in Hengqin and Macao's Taipa district. Source: By authors, based on OpenStreetMap and public transport stop data from the Hengqin and Macao government websites.

Hengqin has considered Macao residents' travel habits in its planning. It has implemented a plan that ensures that all necessary amenities are within a 5-minute walking distance and has also set aside areas for potential future cross-border transportation connections. Although some Hengqin planners support a stronger integration of Hengqin's urban planning with that of Macao, the majority of the "Macao demand" information comes from Macao officials who serve on the Hengqin Executive Committee (around 50 percent), unofficial professional discussions suggested by the Macao Planning Institute, and letters sent to Macao's planning department for consultation once the plan is mostly completed. This reflects the absence of organized and official communication. The planning of Hengqin is solely the responsibility of the Hengqin authorities, and the planning department in Macao is not authorized to have any influence beyond the border. Although important issues have been discussed, there is currently no clear or systematic procedure for consultation in the field of urban planning. Conversely, the master plan for Macao was established without the necessary authorization to plan the border area and without considering the viewpoints of Hengqin residents. Therefore, the urban layout operates as a closed-loop system.

Although there are presently no collaborative planning initiatives between Hengqin and Macao, planners from Macao have emphasized the need for coordination and compatibility in Hengqin's urban planning, design, and regional policies. They have highlighted that, without such an alignment, conflicts of interest and detrimental competition may arise, hindering the desired integration between the two areas. Regarding public participation in the planning system, which is the most distinct difference between the two sides, one interviewee stated:

"Even if the actual concerns raised by the public are not resolved, Hengqin still requires public participation."

The government should provide the public with a comprehensive explanation of the ongoing development plan, including implementation strategies and project work schedules. Once Macao citizens become accustomed to the public participation process, they will refuse to accept any planning methods that lack transparency.

Start learning from each other

Hengqin has initiated efforts to leverage Macao's urban planning advantages during the ongoing process of formulating a comprehensive urban plan and establishing connections with it. Regarding land-use classification, the categorization of land-use functions in Hengqin aligns with those in Macao. Nevertheless, there are still variations in the precise interpretation of the classification. For instance, Hengqin has implemented the tourism land use category seen in Macao, but it prohibits the development of commercial establishments, such as hotels, for tourism purposes, unlike Macao.

Cross-border coordination is required between the two parties

During interviews with planners from both sides of the research team, it was evident that both groups emphasized the necessity and aspirations for cross-border planning collaboration between Hengqin and Macao. Hengqin's planners aim to leverage the benefits of Macao's efficient land use and compatibility to expedite the turnover of industrial land. Furthermore, the three control lines governing Hengqin's ecological protection, permanent basic agriculture, and urban development borders are expected to be linked to both the urban and non-urban regions of Macao. This would enable the coordinated planning of rural areas throughout the region, including Macao. Planners in Macao aim to address the absence of consistent standards in Macao's planning by utilizing the well-developed planning index system of Hengqin.

Regarding the increased collaboration between Guangdong and Macao, Hengqin's urban planning has not yet fully incorporated the concept of cross-border planning coordination. Additionally, the region lacks a cohesive strategy for designing with the Macao side. Nevertheless, owing to its status as a cross-border region, the objective of the development planning in Hengqin is to facilitate the integration of Guangdong and Macao. The planning community in Hengqin and Macao, along with the demands of the local population, underscore the need for a comprehensive cross-border planning coordination mechanism in Hengqin. This mechanism would serve to eliminate any obstacles that arise in the urban space of Hengqin owing to its cross-border nature, enhance connectivity between the cities, and ultimately achieve more seamless integration and development of Hengqin and Macao.

Discussion and conclusion

The research team analyzed the planning systems in Macao and Hengqin, identifying their key features by incorporating the existing state of practice. First, the primary objective of Hengqin is to promote moderate diversification of the Macao economy while improving the lives and employment opportunities of Macao residents. The development of a unique cross-border platform for Guangdong and Macao to engage in joint discourse and governance underscores the necessity of cross-border planning and coordination. Nevertheless, significant discrepancies in emphasis, regulatory controls, preparation and approval processes, technical indicators, and design logic within the current planning systems of both sides have led to substantial differences in transportation and public facilities, thereby hindering Hengqin's ability to integrate the bilateral space effectively.

Significant disparities exist between Hengqin and Macao's current planning systems. Differences in planning priorities, regulatory measures, preparation and approval processes,

technical criteria, and design principles have led to significant variations in both parties' planning approaches, particularly in relation to transportation and public infrastructure. Overall, the current planning system in Hengqin offers several advantages, including thorough management of planning materials, efficient approval processes, and a comprehensive planning framework. By contrast, the planning system currently in place in Macao stands out because of its strong emphasis on public rights and interests, its prioritization of cross-departmental collaborative reviews, and its advanced planning management. In reality, Hengqin prioritizes the development of comprehensive support service facilities to cater to the needs of urban residents. Conversely, Macao focuses on the advancement of small-scale, compact, and dispersed areas, specifically planned to meet the everyday needs of the general population. Unlike Hengqin, Macao's urban design concepts are characterized by greater adaptability and a focus on human well-being.

Second, despite efforts to foster collaboration, systemic and conceptual discrepancies, along with intrinsic conflicts of interest inherent in cross-border cooperation, have hindered genuine exchanges between the two parties. Consequently, their coordinated interactions remain superficial and fail to address practical issues effectively. Despite the need for Hengqin to consider the living habits of Macao residents during the planning process, the existing system and traditional concepts have resulted in the persistence of traditional planning and design concepts in most urban construction projects aimed at achieving this goal. This approach sometimes presents a one-sided view, reflecting the needs of Macao citizens as envisioned by Hengqin city planners, which may not accurately represent their actual desires. This method may not align with the expectations of Hengqin citizens and could potentially result in the unintended outcome of "harming with good intentions." Thus, the construction of a formal cross-border planning coordination system is crucial in the context of urban planning for Hengqin. This approach would enable seamless communication between planners, planning departments, and citizens at both ends, fostering a deeper understanding of the disparities and needs of the two parties. A comprehensive understanding is crucial for formulating efficient resolutions through negotiations.

Achieving cross-border planning coordination between Hengqin and Macao

In light of the aforementioned characteristics and issues, this study proposes the following recommendations to facilitate the establishment of a cross-border planning coordination framework between Hengqin and Macao in the future.

First, the centralized coordination provided by the "One Country, Two Systems" policy must be leveraged to establish a formalized cross-border coordination platform and mechanism. The central government plays a crucial role in coordinating and guaranteeing efforts, representing a distinctive advantage granted by the policy to Hengqin over other cross-border regions. On the one hand, it can coordinate and safeguard the interests of both Hengqin and Macao. On the other hand, it can effectively guide actions and resolve disputes in a stable and equitable manner, ensuring fairness, a forward-looking approach, and a proactive stance in urban planning and design.

Second, the establishment of a platform and the implementation of a cooperative policy serve to unify the primary planning entities and enhance effective communication. By bringing together decision-makers, planners, the public, and relevant government departments from both sides for multilevel and multiformat exchanges, traditional conceptual and systemic inertia on both sides can be overcome. These exchanges need not be confined to formal or planning-related topics; informal, non-planning-related exchanges involving cultural customs, living habits, concepts, and values can also play a significant role in fostering comprehensive integration between Hengqin and Macao, thereby laying a robust foundation for collaboration. Coordination based on the effective communication described above provides an efficient approach to breaking down administrative barriers, thus ensuring the smooth and high-quality development of cross-border regional planning, investment, construction, and other core development strategies.

Finally, a key enabler of institutional innovation in the Hengqin–Macao integration process is the "forerunner" policy, which plays a pivotal role in facilitating cross-border coordination and legal adaptation. The establishment of the Shenzhen Special Economic Zone and the Hainan Free Trade Port demonstrates the effectiveness of this policy, which provides administrative flexibility and serves as an experimental platform for piloting innovative legal frameworks, spatial planning instruments, and governance models that diverge from conventional systems. In the case of Hengqin, the forerunner policy has facilitated the convergence of heterogeneous urban planning systems in both Hengqin and Macao within a shared spatial domain. This convergence presents significant challenges due to legal and institutional disparities, but simultaneously offers valuable opportunities for integration and mutual learning. The existence of two discrete planning paradigms within a single region requires negotiation, adaptation, and innovation by both parties to achieve effective coordination. For instance, the establishment of the dual directorship of the Hengqin Cooperation Zone Management Committee, alongside the system for officials with Macao backgrounds to work in Hengqin, illustrates the potential for institutional experimentation. Furthermore, it encourages real-time coordination, iterative policy refinement, and the alignment of infrastructure investment priorities. Furthermore, Hengqin's symbolic function as a testbed has bolstered stakeholder confidence and prompted administrative actors to adopt a risk-averse approach. This phenomenon remains uncommon in other regions characterized by more stringent regulatory frameworks. Consequently, the forerunner policy not only facilitates local experimentation but also plays an active role in shaping the institutional culture of cross-border governance, thereby laying the groundwork for more ambitious and scalable regional integration models.

Specific coordination content

The precise nature of coordination in practical applications is more intricate than it may initially seem. First, to prevent conflicts arising from differences in systems and laws during the cooperation process, the specific content of planning and construction regulations in the cooperation zone must be clearly defined. This includes identifying user groups, application scope, regulatory authorities, jurisdictions, and other relevant factors. Second, in terms of the planning and authorization process, the future development of Hengqin, which aims to improve the quality of life and job prospects of Macao residents, must integrate public involvement and collaboration between different government departments during the preparatory phase. This would increase its appeal to Macao. The flexibility of the planned revision process must be maintained to prevent getting caught up in a complicated review and editing procedure similar to that encountered in Macao. Third, the technical standards used in the planning phase must be ensured to align precisely with the existing technical indicators of both parties. This is necessary to prevent any possible misunderstandings or errors during implementation. However, the current technical planning indicators for Hengqin are complete. Based on these indicators, planning coordination can be achieved using Macao's expertise in maintaining a high-quality living environment. This will result in the creation of a macro-micro cooperative zone planning technical indicator system. Ultimately, it is essential to prioritize the sharing of information, ideas, and experiences between the two parties in all planning practices, at both formal and informal levels. This interaction can foster trust and comprehension between the two parties, consequently diminishing the likelihood of misunderstandings arising from divergent thought processes. It is vital to quickly incorporate and merge the sophisticated and human-centered urban design principles of Macao into urban design. It is also crucial to accomplish the strategic goal of serving Macao and fully transition the design rationale from large-scale to a more human scale. As a cross-border region, Hengqin should strive to achieve greater integration between the two sides by overcoming the limitations of conventional planning concepts. For instance, the boundary river, which defines the border between the two sides, can be designed as an inland water landscape corridor, thereby enhancing connectivity and facilitating circulation between Hengqin and Macao.

Building on these ongoing efforts and future aspirations, the Hengqin-Macao case offers valuable insights into cross-border planning coordination within the "One Country, Two Systems" framework, illustrating how top-down policy incentives can shape urban space in complex cross-border collaborations, while also nurturing bottom-up cooperation through the creation of spatial environments conducive to cross-border activities. Future research on the influence of Hengqin's distinctive legal and planning regimes on cross-border metropolitan development could yield important implications, particularly for addressing governance asymmetries in regions such as the Qianhai–Hong Kong interface. More broadly, such insights may inform the design of institutional mechanisms and planning strategies in other transboundary areas, particularly those emerging within the broader context of the Belt and Road Initiative. In this regard, Hengqin is a significant testbed for scalable and adaptive models of cross-border governance and regional integration.

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Ethical statement:

This study was approved by the Ethics Committee of Insitute of Urban and Sustainable Development, City University of Macau (Approval No. RE-IUSD-202501). All procedures were conducted in accordance with the Declaration of Helsinki, and written informed consent was obtained from all participants prior to data collection.

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Striking the balance between academic profession and family: a study of female academics in universities in the Greater Bay Area

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Abstract

Purpose – This article focuses on female academics working in the universities located in the Greater Bay Area (GBA) and examines their experiences and strategies to balance academic profession and motherhood.
Design/methodology/approach – Adopting qualitative research method, twenty female academics working in the GBA's universities were interviewed. The participants were classified into two categories: professorate track and teaching track. Using thematic analysis, several themes emerged from the interview data.
Findings – For the group on the professorate track, three key themes are highlighted: persisting in professional pursuits, taking up research responsibilities, and achieving work-family balance. Correspondingly, for the group on the teaching track, three themes are also found: struggling for a PhD degree, surviving at the workplace, and seeking work-family balance. Furthermore, the findings reveal the significance of a supportive family structure in the practice of career path as well as motherhood practice, regardless of the professional stages they are in.
Originality/value – This article contributes a collective portrait of academic mothers in the GBA's higher education institutions. It reflects their challenges and strategies for balancing dual roles and provides pragmatic advices for policymakers and higher institutions to enhance workplace conditions for female academics.

Keywords Academic profession, Motherhood practice, Female academics, Greater Bay Area, Hong Kong, Macao

Paper type Research article

Introduction

Motherhood influences women's identities, practices, and experiences in all spheres of their lives (McMahon, 1995; Arendell, 2000; Pillay, 2009). Compared to the social expectations toward being fathers, being a mother generally means more responsibilities and commitments (Romanin and Over, 1993). Many studies have explored the issue of work-life balance among female academics whose jobs require performing diverse duties, including teaching, research, and social services (Ismail and Rasdi, 2008). Most studies suggest that female academics struggle with juggling motherhood and an academic profession. Strict work expectations and heavy household responsibilities often lead to several negative chain effects, such as health problems and depression in their personal lives (Dam and Daphtardar, 2012).

Unlike past studies that only highlight the conflicts and tension between the academic profession and family, this paper examines how female faculty cope with work-family issues in practice, involving both positive and negative stories. This study aims to gain an overall understanding of the challenges, hardships, and potential benefits that female academics

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encounter. In addition, it focuses more on how the family helps reshape the identity of professor mothers. The following questions will be addressed: (a) How do female faculty perform in their academic professions? (b) How do they deal with the work-family balance issue? and (c) How do they perceive their academic profession and identity of being professors as well as being mothers?

Literature review

Female academics in motherhood

Motherhood refers to cultural expectations of mothers that vary over time and space. As women enter the labor market, tensions emerge between mothering expectations and employment (Bailey, 1999). Hays (1996) introduced the concept of the intensive mothering model imposed on females to illustrate an image of good mothers. It is mainly influenced by contemporary neoliberal rationality, emphasizing individual responsibility, risk management, self-surveillance and control (Shirani *et al.*, 2012). However, Kerrane *et al.* (2022) claim that intensive mothering prioritizes child well-being and implies that caregiving is incompatible with paid employment. Working mothers suffer a "motherhood penalty" and "maternal wall" regarding hiring and promotion (CohenMiller, 2020).

More specifically, an increasing amount of research explores the experiences of female faculty, and how motherhood shapes or constrains women's careers. The bulk of care work hinders academic mothers from career advancement (Acker and Armenti, 2004; Wilton and Ross, 2017). Academic mothers reported that maternity and parental leave for infant care would cause the loss of productivity, collaboration, and publications, even the tenure track (James *et al.*, 2021; Williams, 2004). Some academic mothers may seek external help to maintain balance. For example, Jenkins (2020) has mentioned that a professor mother relied on a network of other people, including grandparents or paid childcare, for overseas fieldwork.

On the other hand, some female academics consider motherhood as a joyful experience, which can benefit both their personal lives and their academic careers, including added income, broadened perspectives, greater social support, and increased self-esteem (Barnett and Hyde, 2001). The academic accomplishments achieved by professor mothers can buffer them from consuming stress at home (Ward and Wolf-Wendel, 2004). In return, family support, such as a supportive husband, could help them achieve a better work-life balance (Jakubiec, 2015).

However, literature about the positive aspects of academic motherhood is relatively rare, while the negative effects brought by motherhood have been overemphasized. There is an unbalanced view on this issue. From this perspective, this paper aims to fill the gap and present a more comprehensive image of academic mothers.

Female academics in academia

A diverse literature on women professors suggests that socio-cultural influences and organizational politics affect female faculty's academic careers. It reveals that women professors encounter various barriers to achieving promotion, pursuing the tenure track, and taking on leadership positions.

Both an American study (Sax *et al.*, 2002) and a Chinese study (Tang and Horta, 2021) noted that in the 20th century, the proportion of women represented in higher education remained quite small. This could be attributed to the absence of women-friendly working environments and inadequate perception of obtaining a professorship as a woman (Sanders *et al.*, 2009). Despite a growing awareness of feminism, hidden gender discrimination in academia still influences female scholars' career development, as it is generally viewed as a men's domain (Pease, 1993; Kataeva and DeYoung, 20171993). Pease's study (1993) revealed that, when categorizing the work of teaching and research divisions at a research university, undergraduate teaching was usually labelled as "women's work". Heijstra *et al.* (2017) coined

the term "academic housework", which refers to all academic service work within the higher education institution. Female professors are more likely to be assigned to this kind of work (Aiston, 2014).

In addition, organizational politics for promotion may weaken female academics' willingness to promote (Ward and Wolf-Wendel, 2016). To pursue high-quality academic production, the working norm is often set to be "working all the time". This naturally sacrifices the family bonding and even threatens the well-being of academics (Göktürk and Tülübaş, 2021). For some professor mothers, pursuing the tenure track is an optional choice rather than a compulsory requirement (Ward and Wolf-Wendel, 2016). From this perspective, being an ideal professor mother is hard in a competitive working culture (Sutherland, 2010). In fact, supportive policies can help female academics better cope with their work-family issue. The autonomy granted by departments and universities brings more freedom (Francis and Stulz, 2020). A study has confirmed that female faculty who can effectively integrate work and family issues experience greater flexibility in their career development (Wolf-Wendel and Ward, 2015).

Academic profession

Academics are viewed as producers of knowledge and practices, especially across generations (Larson, 1977). Academic profession mainly refers to careers as teachers and researchers within higher education institutions. Consequently, it emphasizes two key responsibilities: knowledge transfer and research scholarship in universities (Williams, 2008).

Within the tenure track system, research productivity is undoubtedly more important for promotion and tenure decisions (Cummings and Finkelstein, 2013). Beyond external tenure systems, academics also hold subjective understandings of their careers. These perspectives shape their work attitudes, overall satisfaction, and desire for professional development. Hermanowicz's study (2016) suggested that faculty in specific academic environments and career stages made different career decisions. By evaluating work satisfaction at the micro level and the university environment at the macro level, he identified three elements of the academic profession: rising career expectations, an intensified competitive work climate, and greater difficulty in achieving professional goals. How female academics navigate this changing and competitive academic landscape is a key focus of this study.

Methodology

Project context

This study is based on a longitudinal research project about career development and identity construction of female academics in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA). The fast urbanization process in the GBA contributes to the development of an international higher education hub (Liu and Hamish, 2024). The project is devoted to investigating the career path and practical strategies of female faculty working in the GBA. This study, as a branch of the project, more specifically explores the ways in which female academics strive for work-family balance and career development.

Sampling

Adopting a qualitative research method, this study interviewed 20 female academics working in universities located in the GBA (Table 1). Due to the academic network of the researcher, convenience sampling was adopted. Participants mainly majored in education, humanities, and social sciences. Most of them have earned PhD degrees, while a minority are still in the process of pursuing their PhDs. Regarding the academic rank, twelve participants are from the professorate track, entitled professor (n=4), associate professor (n=4), and assistant professor

Table 1. Particular details of the participants of this study

No.	Pseudonym	Location	Academic title*	Discipline	PhD degree*	Years of teaching*	Number of children	Career track*
P1	Helen	Guangdong	Professor#	Education	No	15	1	Professorate
P2	Joy	Guangdong	Professor	Humanities	Yes	22	1	Professorate
P3	Lisa	Macao	Professor	Humanities	Yes	26	1	Professorate
P4	Rose	Guangdong	Professor	Education	Yes	29	1	Professorate
P5	Anna	Macao	Associate professor#	Humanities	Yes	23	1	Professorate
P6	Dora	Hong Kong	Associate professor	Education	Yes	18	1	Professorate
P7	Jade	Hong Kong	Associate professor	Education	Yes	23	1	Professorate
P8	Luna	Guangdong	Associate professor	Education	Yes	14	1	Professorate
P9	Cindy	Macao	Assistant professor#	Education	Yes	7	1	Professorate
P10	Holly	Hong Kong	Assistant professor	Education	Yes	12	1	Professorate
P11	Linda	Macao	Assistant professor	Education	Yes	19	1	Professorate
P12	Wendy	Macao	Assistant professor	Education	Yes	18	1	Professorate
P13	Mary	Hong Kong	Senior lecturer#	Education	Yes	22	1	Teaching
P14	Carly	Guangdong	Lecturer#	Social Sciences	Yes	5	2	Teaching
P15	Clara	Guangdong	Lecturer	Education	pursuing	13	1	Teaching
P16	Faye	Guangdong	Lecturer	Humanities	pursuing	12	1	Teaching
P17	Hannah	Guangdong	Lecturer	Education	pursuing	9	1	Teaching
P18	Julia	Guangdong	Lecturer	Humanities	pursuing	10	2	Teaching
P19	Laura	Guangdong	Lecturer	Social Sciences	Yes	10	2	Teaching
P20	Yana	Guangdong	Lecturer	Education	Yes	9	1	Teaching

*(*These categories of information were the conditional facts when the interviews were conducted.)*
(#Professor is abbreviated as Prof., Associate professor is abbreviated as Asso.Prof., Assistant Professor is abbreviated as Assist.Prof., Senior lecturer is abbreviated as Senior Lect., Lecturer is abbreviated as Lect.)

Source: By authors

(n=4); while eight interviewees are from the teaching track, entitled senior lecturer (n=1) and lecturer (n=7). In terms of family conditions, all participants have one or two children.

Data collection and analysis

Narrative data were collected via in-depth, semi-structured interviews conducted either face-to-face or online. Each interview lasted from one to two hours. The interview guide included questions and prompts regarding teaching work, research work, career development, difficulties and successes in work, as well as family issues. Most interviews were recorded with the participants' approval. The names of participants were replaced with pseudonyms to ensure privacy protection. The audio recordings of interviews were transcribed verbatim after fieldwork.

The data were analyzed using a grounded theory approach, which generates a series of key themes (Charmaz, 2006). First, line-by-line open coding was conducted to analyze the interview transcripts. Particular codes emerged consistently across both the professorate track and the teaching track. Second, focused coding was applied by identifying the most significant and frequent codes to explain and categorize larger segments of data (Charmaz, 2006). Third, new concepts were generated to explain themes in different groups. For participants on the professorate track, three key themes emerged: persisting in professional pursuits, taking research responsibilities, and achieving family-work balance. For the teaching track group, three key themes emerged: struggling for a PhD degree, surviving at the workplace, and seeking family-work balance. Finally, coding comparisons were made by different researchers to ensure trustworthiness and reach theoretical saturation (Creswell, 2008).

Findings

In this study, two distinct groups were identified based on their career systems: the professorate track and the teaching track. The former group includes participants entitled as professors, associate professors, and assistant professors. They reported three key themes: persisting in professional pursuits, taking research responsibilities, and achieving work-family balance. The latter group is mainly composed of lecturers, who emphasized struggling for a PhD degree, surviving at the workplace, and seeking work-family balance.

Female academics on the professorate track

1. Persisting in professional pursuits

In this study, professional pursuits involved career aspirations, career expectations, educational beliefs, and career attitudes. All these terms were more frequently mentioned by interviewees within the professorate track. They have gone through hardships in the academia and accumulated rich experience to achieve a smoother career stage. In this process, they usually persist in a deeply spiritual pursuit. Their passions and aspirations toward academic work guide them to move forward. *Rose*, *Helen* and *Linda* all mentioned their educational beliefs:

> I'm eager to learn new things, rather than staying in a comfort zone without any progress. My colleagues may think what I do is arduous and fruitless, but I know the challenging life is what I want to have. (P4-Rose-Guangdong-Prof.)

> I have clear and strong career aspirations and educational beliefs. It works as a blueprint for my career plans, including the future of my students and my working team. (P1-Helen-Guangdong-Prof.)

> I am assertive in my own educational beliefs. That is why I publish small essays based on my thinking, even if they will not be counted in annual appraisal. (P11-Linda-Macao-Assist.Prof.)

Although strongly eager for academic achievements, they still accept that reaching success will be a long journey. Therefore, they often choose to work at their own pace. *Helen* shared her attitude towards her career, explaining that *success naturally comes after step-by-step hard work*.

One more point highlighted is that academic autonomy can help strengthen the educational beliefs of female faculty, thereby shaping their professional pursuits. *Holly* reported how teaching autonomy inspired her:

> I really enjoy working at the university because I like the autonomy in teaching. I can freely arrange the teaching content. This kind of freedom allows me to teach in my way. (P10-Holly-HongKong-Assist.Prof.)

2. Taking research responsibilities

Almost all interviewed participants on the professorate track show strong academic and social responsibility in teaching, doing research, and even leading research teams.

Most of them persist in their belief in being a good teacher and continually improve their teaching skills. High-quality preparation and curriculum design are frequently emphasized. They value the significance of delivering useful and practical knowledge to students and pay more attention to well-designed classroom instructions.

> I deeply cherish the university job, so I am very enthusiastic about my teaching work. I often use different colors and fonts to show the key parts in the PowerPoint slides. This can provide useful and practical guidance for my students. (P7-Jade-HongKong-Asso.Prof.)

They really cared about students' feedback and learning outcomes. Therefore, they kept close interactions and used diverse strategies to engage with students in class.

> I think teaching involves responsibilities. Students must learn something useful in my class. I always encourage them to participate in class discussions. (P5-Anna-Macao-Asso.Prof.)

> Since I am a new teacher, I think teaching is the most important issue now. I need to stay humble to do preparations for teaching, so as to make sure the students understand what I am talking about. (P9-Cindy-Macao-Assist.Prof.)

Although some participants admitted that teaching really drains a lot of energy and time, they are willing to dedicate themselves to teaching work.

> In fact, there is no time boundary for teaching work. The preparation is time-consuming and even sacrifices holidays. But this is my work. I need to be responsible for students. (P8-Luna-Guangdong-Asso.Prof.)

In general, this group of women faculty presented a collective image of responsible and self-disciplined female academics. They emphasized their identities as teachers. Although juggling multiple work tasks may sacrifice their personal lives, they still prioritize their teaching duties.

Moreover, the participants also seriously highlighted their identity as researchers, especially the social influence of their research. Although publications are necessary in the evaluation for the tenure track, they are not the only motivation for conducting research. They prefer to do "useful research" that brings social benefits, rather than doing "right research" solely for more publications.

> I always choose valuable research topics that are worth exploring, even maybe they are not easy to publish. (P12-Wendy-Macao-Assist.Prof.)

> I think the value of doing research is to investigate social issues rather than only getting publications. (P6-Dora-HongKong-Asso.Prof.)

> Although I am suffering from heavy pressure on publication, I am still insisting on doing meaningful research. Otherwise I will lose the initial motivation to do research. (P10-Holly-HongKong-Assist.Prof.)

On the other hand, some participants also paid attention to the pragmatic impact of their research work, particularly for disadvantaged groups.

> I am not good at using electronic devices, but my current research is linked to the development of a kid app. I really hope my research can bring benefits to children with special learning needs. (P7-Jade-HongKong-Asso.Prof.)

In this study, some female faculty members have taken leading positions in their departments. One common trait is their strong willingness to bring benefits to their team. *Rose* and *Joy* both mentioned that they would like to do more for the team, even at the expense of their personal time.

> I often stay with my colleagues and am willing to make contributions for them. I think it is more worthwhile than fighting for myself. (P4-Rose-Guangdong-Prof.)

In addition, they all tried to create a friendly and supportive working atmosphere for their colleagues.

> As the leader of the department, I try my best to maintain a good working atmosphere and provide sufficient support for my colleagues and students. (P1-Helen-Guangdong-Prof.)

> I have been working as the team leader for many years, nearly giving all my time to my colleagues. I always work with them. (P2-Joy-Guangdong-Prof.)

3. Achieving work-family balance

The academic mothers often experience significant time constraints as they juggle professional responsibilities with family life. In addition to caring for young children, some also need to take care take of their ageing parents. In this study, most participants mentioned the necessity of properly allocating their time for both career and family obligations.

> One important and useful working strategy is to follow a specific timeline. During working hours, I entirely concentrate on my work. Then, I immerse myself in family issues. (P4-Rose-Guangdong-Prof.)

> Time division is very important for me. Work, study, and looking after my daughter even drive me crazy. But I still appreciate my working situation and try to balance everything. (P8-Luna-Guangdong-Asso.Prof.)

> My time is mainly divided into three parts: teaching work, physical care, and family things. Even though my son has grown up, I still pay attention to family time. Family is important. (P5-Anna-Macao-Asso.Prof.)

In this study, most female academics mentioned that family support played the most important role in their lives. Some considered their husbands as good partners, sharing a large portion of family responsibilities. Other family members or friends also helped a lot.

> I really appreciate my family. They are fully supportive. My husband does almost all the housework. My sister also helps me a lot. (P2-Joy-Guangdong-Prof.)

> Now I take my daughter to live in Macao. Although my husband works in the Mainland, fortunately, my mother has come to help us. Sometimes, my friends also help to pick up my daughter from school. They take my worries away. (P9-Cindy-Macao-Assist.Prof.)

In some cases, childcare service was chosen to exchange for extra time dedicated to work. More importantly, family provides strong mental support for them to pursue their academic careers.

> When my son was a baby, my husband was mainly in charge of looking after him. After he was sent to nursery, we hired a nanny. I would say that, without the help of my husband and the nanny, I wouldn't be able to work at all. (P12-Wendy-Macao-Assist.Prof.)

> Now I don't need to worry about my daughter, instead, she becomes more considerate. Without the full support of my family, it is too difficult to pursue academic careers. (P2-Joy-Guangdong-Prof.)

> I work in Macao alone. My husband and my child live in the Mainland. I can fully commit to my work. During the holidays, we will be together. My husband really gives me a lot of support and love. (P11-Linda-Macao-Assist.Prof.)

In addition, they have developed a series of work strategies to help achieve work-life balance. Accumulated experience and collaborative teamwork were perceived as crucial for coping with stressful research work and improving publication output.

> In fact, I certainly agree that research needs cooperation. Nowadays, no one can do research just individually. (P6-Dora-HongKong-Asso.Prof.)

> Doing research needs sharing. It is impossible to do research only by yourself. I even don't mind sharing data with others. (P10-Holly-HongKong-Assist.Prof.)

> Regarding doing research, I have some personal beliefs and strategies. First, I mainly focus on the research topic that interests me and will explore it for a long time. Second, research needs teamwork. I often work with different colleagues based on research expertise. Third, accumulations are needed. Success would finally come in the end. (P11-Linda-Macao-Assist.Prof.)

Attending academic conferences was reported as an alternative strategy to maintain publication records.

> I am a little bit special. I almost do not apply for any funded projects. But I try to attend international conferences every year. This motivates me to do research in my own way. (P3-Lisa-Macao-Prof.)

Female academics on the teaching track

1. Struggling for a PhD degree

Different from the participants on the professorate track, female faculty on the teaching track displayed more intensive work and life pressures. In this study, there are four lecturers who are still striving for their PhD degrees. At the same time, they also need to undertake teaching and administrative duties. *Clara* and *Faye* mentioned that they usually suffered from severe time clashes due to their heavy workload.

> In fact, working as a class coordinator in the university is very stressful. My mobile phone needs to be turned on 24 hours to cope with all matters of students in my class. (P15-Clara-Guangdong-Lect.)

> I am extremely busy, dealing with administrative and teaching work, looking after my child, and studying for my PhD degree. (P16-Faye-Guangdong-Lect.)

Except working pressure, some participants also highlighted the countless pressure brought by their PhD dissertations. They spent lots of time studying and gave priority to the writing of their dissertations.

> I think the process of pursuing a PhD is accompanied by fighting against various pressures. During this process, I experienced emotional collapses. Sometimes, I would suddenly burst into tears in my car. After crying, everything was going on. Now, I finished my dissertation. My capacity to work

under heavy pressure has really improved. Moreover, the academic training I received during the PhD study is quite valuable. (P20-Yana-Guangdong-Lect.)

I prioritize my dissertation in any case. Pursuing a PhD is so stressful. If I don't finish it, it seems like everything is messed up. (P17-Hannah-Guangdong-Lect.)

2. Survival at the workplace

The female academics on the teaching track are still on the way to meeting their career requirements. First, most of them attached importance to teaching. Accumulation of teaching experience and interactions with students were especially emphasized.

In fact, teaching is also a process of learning. I continually read books to prepare for the class. It is even more challenging than writing a research paper. (P14-Carly-Guangdong-Lect.)

I feel very lucky, because I have gained fruitful benefits of teaching in the past years. My students give me a lot of positive feedbacks and push me to be mature in teaching. (P17-Hannah-Guangdong-Lect.)

Some self-driven factors motivate the participants to actively engage in their work. *Julia* mentioned that she was unwilling to be a lecturer without career pursuits, and she expected to attain career success. Besides, she also believed that academic autonomy allowed her to pursue potential career development.

In fact, I go to study for a PhD simply because I am not willing to stay in the comfort zone. I have some colleagues who are satisfied with their conditions. But I want to learn more, so I chose to study for a PhD. (P18-Julia-Guangdong-Lect.)

On the other hand, I am also very lucky, because teaching and learning are related. Positive feedback from students gives me a lot of confidence. (P18-Julia-Guangdong-Lect.)

3. Seeking work-family balance

Female faculty on the teaching track often experience more stress in their work. They need to put more effort into getting promotion. Family often serves as a temporary escape from the busy work.

Although I need to spend more time working, I would like to leave some time for my family. I really enjoy family time which is worthful. (P19-Laura-Guangdong-Lect.)

My husband is very supportive. When I was very busy with my research work, he was the only one I could rely on. (P19-Laura-Guangdong-Lect.)

In order to better handle academic work and family issues, they are more likely to move on at a slow pace. *Laura* and *Carly* both mentioned that they were not hurried to get promoted. Instead, they wanted to work at their own pace.

In the past, my work sacrificed my health a lot. Now I would allocate more time to family and health. That's why I choose to be a senior lecturer rather than a tenure track. It is my way of easing the tension. I can do research with great autonomy. Publication is not a compulsory requirement. (P13-Mary-Hong Kong-Senior Lect.)

I think doing research is a long journey and requires a lot of patience, so I would rather slow down my working pace, and choose research topics that deserve to be studied. (P14-Carly-Guangdong-Lect.)

I am quite satisfied with my current mood. My working experience and professional qualifications have been enough to apply for a promotion. But I think it requires more dedication to work. My children are still very young. Is it worth sacrificing the time of parenting? I don't think so. (P19-Laura-Guangdong-Lect.)

In addition, participants on the teaching track prefer to spend more time in their leisure activities to recharge themselves.

> I have two methods to relax. I like reading best-selling books, not for work or writing papers, purely for interests. I also like playing badminton with my friends. It is relaxed (P20-Yana-Guangdong-Lect.)

> I like watching TV and reading novels in my leisure time. Sometimes, I will catch up with one drama, even using two iPads to rotate, which sounds a little crazy. In addition, I like reading novels, especially some original ones. (P19-Laura-Guangdong-Lect.)

In summary, the participants of this study, on the professorate and teaching tracks respectively, present individualized work norms and implement various strategies to cope with their intensive working pressure (Figure 1). More importantly, a supportive family structure is highlighted as essential in achieving work-family balance.

Specifically, female faculty on the professorate track attach great importance to research work, emphasizing its pragmatic meaning and social contributions, which largely reflects their personal interpretation of the academic profession. However, those on the teaching track often experience a more struggling career life, where a PhD degree is considered as the starting point. At the same time, their teaching workload is heavy, leaving limited time for research. Research work is usually arranged in a flexible way, such as avoiding time-consuming research projects, or combining teaching and research activities.

Furthermore, a strong sense of responsibility in teaching can be observed in almost all participants. Besides, a supportive family structure is fundamental in the formation of their academic profession, as it provides essential emotional support and alleviates pressures associated with motherhood.

Discussion

This study examines the lived experiences of female academics on both professorate and teaching tracks. Our findings showed that women faculty on the professorate track emphasized their responsibilities in academic work and pursued the tenure track at their own pace. In contrast, female faculty on the teaching track suffered much more from greater intensity in their work, including the hardship of pursuing a PhD degree and adapting to academia. These findings align with the research of Ward and Wolf-Wendel (2012), which suggests that institutional context significantly shapes the daily experiences of junior female faculty, while senior faculty tend to achieve greater stability and encounter less stress.

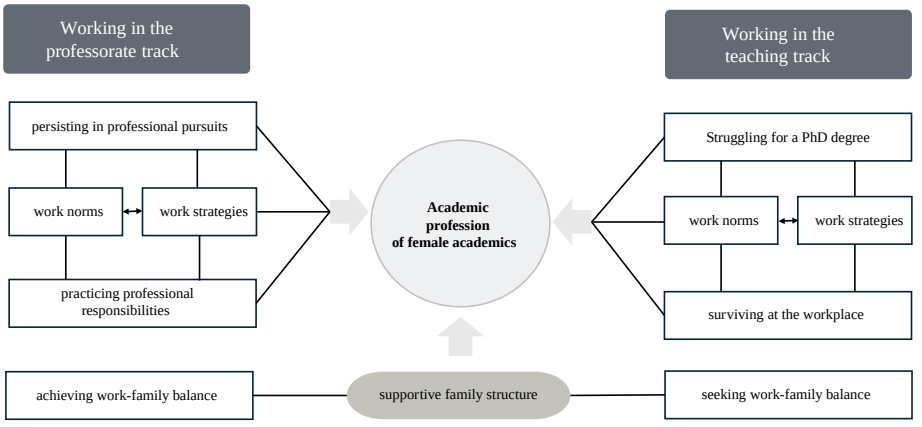

Figure 1. Conceptual Framework. Source: By authors

Additionally, this study presents positive portraits of female academics who hold strong educational and academic beliefs. Previous studies (James *et al.*, 2021; Ward, 2019) suggested that intensive motherhood places academic mothers at a disadvantaged position. Limitless family duties and stressful academic work usually form an imbalanced situation. Some other studies also indicated that inadequacies of family support can reduce academic achievement (Ward and Wolf-Wendel, 2016). Likewise, this study reveals that sufficient family support assists the busy academic mothers as supportive family members not only undertake more housework but also provide emotional support (Ward and Wolf-Wendel, 2004). Beyond family support, the childcare system also helps academic mothers, especially in Hong Kong and Macao. Employing foreign domestic helpers to look after children prevails in these two regions (Ma *et al.*, 2020). Macao also offers childcare service covering children from three months to three years old, which serves as an important resource (Vong and Vong, 2017). In contrast, in Guangdong, childcare primarily relies on family members, especially grandparents, due to the limited availability of public childcare institutions and high cost of employing helpers in Mainland China (Zhong and Peng, 2020).

Moreover, the institutional framework in academia is essential for female faculty seeking work-family balance, particularly influencing the processes of getting tenure and promotion, as well as how faculty members view their jobs (Ward and Wolf-Wendel, 2012). Compared to their male colleagues, female academics are more likely to be assigned to undertake "academic housework" (Heijstra *et al.*, 2017). Consequently, they often publish fewer papers, receive less funding, and devote more time to teaching (Aiston, 2014). Additionally, women faculty tend to get tenure or promotions later than male counterparts, due to maternity leave and caregiving duties. They may even give up research opportunities such as conferences, fieldwork, and international collaborations due to family duties and limited free time (CohenMiller, 2020). To cope with the uncertainties and ambiguities of tenure, a women-friendly working atmosphere and flexibility granted from departments enable female faculty to better balance multiple roles (Francis and Stulz, 2020; Wolf-Wendel and Ward, 2015). For example, flexible working hours can facilitate more effective time management (Jakubiec, 2015). Conversely, the absence of supportive institutional policies can hinder the career advancement of academic mothers (Hillier, 2023; Ward and Wolf-Wendel, 2012).

Nevertheless, in this study, most participants adapted by developing their individualized working styles. They maintained academic autonomy, which strengthened their professional pursuits and enhanced their resilience in universities. The differences of academic promotion systems across Guangdong, Hong Kong, and Macao illustrate the specific challenges female academics face in the GBA. In Guangdong, working in universities typically involves a tenured system with regular appraisals. Some new doctorates may be assigned to an independent system characterized by "up-or-out" policy (Wang and Wang, 2024). In contrast, Hong Kong and Macao exhibit internationally benchmarked promotion standards and high institutional autonomy. Universities in Hong Kong, in particular, emphasize intensive research output and rigorous academic reviews (Chao and Postiglione, 2017).

Previous research suggests that maternal guilt caused by the responsibility of motherhood deeply bothered some academic mothers (Hillier, 2023; Sutherland, 2010; Ward and Wolf-Wendel, 2004). Some female professors even hide their maternal identities in academia due to potential gender biases. In contrast, fatherhood is often viewed positively, enhancing perceptions of men as more responsible, stable, and committed. Male academics can freely integrate their identity as a father without fear of professional devaluation or negative judgments (CohenMiller, 2020). Some academic mothers find themselves caught in a tension between demonstrating commitment to their families and their dedication to their academic profession. However, in this study, responsibilities associated with motherhood are linked to positive meanings of being mothers, teachers, researchers, and leaders. Their understanding of academic professions helps maintain a balanced recognition of their identities. Hermanowicz (2016) introduced the notion of "subjective career pattern" to interpret how academic faculty create meanings of their careers, classifying three academic worlds: elite, pluralists, and

communitarians. In this study, most participants identify as elites or pluralists, recognizing the importance of their academic profession in their lives.

Conclusion and implications

The findings suggest that family plays a positive and significant role in female faculty's academic career. A supportive family structure provides strong emotional support, alleviates pressures from heavy academic work, and facilitates work-family balance. The coherence between academic and family life contributes to a better understanding of being an academic mother and achieving a sense of wholeness of oneself (Pillay, 2009). To some extent, motherhood helps reshape the identity of female academics (Pillay, 2009).

Furthermore, the professional pursuits of women faculty should not be overlooked. In this study, female faculty in the GBA consider their academic profession as a mission to contribute to society. They continuously accumulate experiences and explore their unique approaches to teaching and research. Their professional aspirations, commitment to high-quality teaching, and academic leadership encouraged them to persist in their career goals. At the same time, their family provides psychological support. Their perceptions of academic professionalism continually guide them to search for work-life balance in an active way.

The findings provide important practical implications for female academics, including the provision of helpful training programs, ensuring sufficient academic autonomy, reconsidering the norms of tenure and promotion, and developing multifaceted evaluation systems. This study analyzed how academic mothers navigate the academic world by adjusting themselves to ideal work norms and the challenging tenure track. Universities could consider how institutional environment can accommodate academic mothers, such as offering flexible working hours, supportive childcare service, a motherhood-friendly environment, and multiple accesses to different career paths.

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Public Administration and Policy

Revolutionizing higher education: rethinking funding and global models with an Indian lens

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Abstract

Purpose – This paper highlights the critical challenge of India's higher education sector being overly reliant on government funding. It underscores the need to explore alternative and sustainable financial sources to reduce this dependency and ensure robust support for academic institutions in a broader global context.

Design/methodology/design – The study employs a cross-national comparative approach grounded in the review of existing literature based on secondary data from official publications, research studies, and prior analyses to evaluate financing practices and policy frameworks across countries. Basic statistical tools are used to support the comparative analysis relevant to India.

Findings – While the research on higher education in India is multidimensional, it does not adequately focus on self-sustained finance and developing models having linkages with a market economy. This paper suggests innovative instruments for financing higher education and proposes the reform measures to achieve this goal. The new approach to revitalizing financing must be supported by transformative changes, including reforms in the legal framework, enhancements to internal systems, increased project management awareness, controlled massification, thoughtful privatization, financial management skills, and improvements in the products offered by higher education institutions.

Originality/value – This paper addresses a critical gap in higher education finance by proposing self-sustaining, market-linked funding models. It offers innovative financial instruments aimed at reducing dependency on state support.

Keywords Higher education, Funding models, Innovative financing, Indian higher education system, Challenges, Reforms

Paper type Research article

Introduction

In India, knowledge is revered as the highest form of wealth, and the nation has long prioritized nurturing this asset through education. Quality post-secondary education is widely recognized for enhancing employability, income potential, and resilience against economic uncertainties. College graduates in India experience significant economic returns, with earnings increasing by 17 percent per year of schooling, higher than the 10 percent return for primary education. Beyond personal gains, higher education fuels innovation and sustainable economic growth, making it a cornerstone of national development.

The rising demand for higher education globally, especially in developing countries like India, stems from economic growth and demographic shifts. With the global population projected to reach 9.8 billion by 2050 (United Nations, 2017), India's youthful demographic presents both a challenge and an opportunity. Investment in higher education yields societal benefits, fostering optimal development (McMahon, 2018) and contributing to all Sustainable Development Goals (McCowan, 2019). However, financing higher education must move beyond economic metrics to embrace a rights-based approach. Education should be viewed as a public service that empowers individuals and societies, aligning with the universal right to lifelong learning. This perspective has profound implications for policy and funding strategies.

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Globally, participation in tertiary education has grown by 4 percent annually since 1995, with enrolment projected to reach 660 million by 2040 (Calderon, 2018). By 2030, 70 percent of tertiary-educated youth will come from non-OECD G20 nations, including India (OECD, 2015). Yet disparities persist; India must address challenges in access, equity, and financing. Countries worldwide grapple with funding models, from student debt in the U.S. (Federal Reserve Bank, 2020) to mixed systems in Vietnam and Romania (Altbach and de Wit, 2021). India must balance public and private funding while ensuring quality and inclusion. Adopting frameworks of capability (Sen, 1991) and lifelong learning (UNESCO Institute for Lifelong Learning, 2020) is essential to uphold the 2030 Agenda's pledge to "leave no one behind".

Literature review

Higher education financing in developing countries is under pressure as traditional government models face increasing strain. To ensure sustainability and quality, nations are exploring diversified strategies. Globally, three dominant models, bureaucratic, collegial, and market-based, are employed, with rising private sector participation. In the contexts of developing countries, universities are adopting endowment funds, income-share agreements, and public-private partnerships (PPPs). Endowments have gained traction in Nigeria, Kenya, and Brazil, enabling institutions to generate income from invested assets amid limited government budgets.

India's higher education system, shaped by the Radhakrishnan Commission (1949) and Kothari Commission (1966), is now evolving. The National Education Policy (NEP) 2000 (MHRD, 2020) calls for financial innovation and institutional autonomy. Tilak (2004, 2005) critiques over-reliance on public funding and warns against unchecked privatization, which can deepen social inequalities. He argues that public investment is a moral and developmental imperative, and while private participation can supplement efforts, it must not replace the state's responsibility to fund education as a public good. Tilak's analysis highlights the inefficiencies of treating education as a market commodity, advocating for financing rooted in social justice and inclusive growth. Sen (2014) reinforces the need for equitable and inclusive mechanisms.

International frameworks such as the Global Challenges Research Fund and the Newton Fund emphasize the role of development aid and research-based funding in supporting higher education in low- and middle-income countries. These models offer valuable lessons for India. Innovative instruments and diversified strategies can reduce dependence on government funding, enhance institutional autonomy, and create self-sustaining financial ecosystems. Adequate financing of higher education is essential for India's socio-economic transformation and for achieving inclusive development across middle-income nations.

Evolution and status of Indian higher education

At the time of independence, India's higher education system consisted of just 17 universities and 636 colleges, accommodating approximately 238,000 students. However, the post-independence era has witnessed extraordinary growth across these metrics. Now, India has 1,168 universities with 46,000 affiliated colleges. These universities account for 81 percent of total student enrolment, making higher education accessible across India. The number of degree-awarding universities and institutions has increased by 42.35 times, while the number of colleges has grown by 82.87 times. Student enrolment in the formal higher education system has surged by over 135.64 times compared to the figures from the year of independence. This remarkable rise in enrolment would not have been achievable without a corresponding expansion in the number of higher education institutions and the enhanced intake capacity of courses. These trends underline the progress toward achieving the 30 percent Gross Enrolment Ratio (GER) target by 2030 (Figure 1).

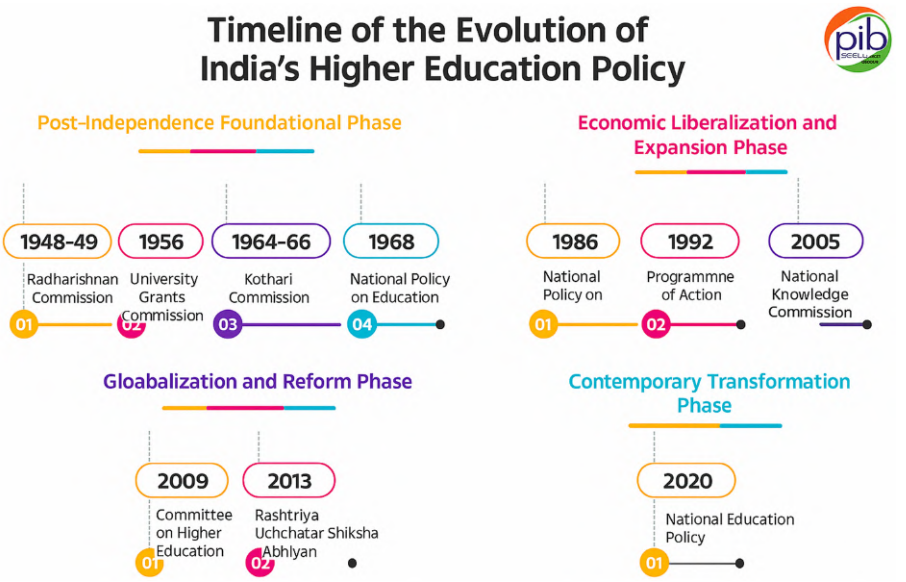

Figure 1. Evolution and Expansion of India's Education System. Source: Research Unit, Press Information Bureau (2025)

India's higher education sector has experienced a significant transformation in recent years. According to the latest All India Survey on Higher Education (AISHE) 2021-2022, the total enrolment in higher education reached 43.3 million students, marking a substantial increase from 41.4 million in 2020-2021. Female enrolment rose to 20.7 million, reflecting steady progress in gender parity within the sector (Ministry of Education, 2024).

The GER has risen to 28.4 percent, with female GER surpassing that of males for the fifth consecutive year. Furthermore, there has been a significant increase in the enrolment of students from marginalized communities, including Scheduled Castes (SC) and Scheduled Tribes (ST), with SC enrolment growing by 44 percent and ST enrolment by 65.2 percent since 2014-2015. The NEP 2020 seeks to further improve accessibility and quality, setting an ambitious target of achieving a GER of 50 percent by 2035 (Figure 2).

India's higher education landscape has expanded significantly over the decades and now comprises 1,168 universities, 46,000 colleges, and 12,002 stand-alone institutions that are not affiliated with any university, typically offering Diploma or certificate programs, regulated by professional bodies such as the All-India Council for Technical Education, the Indian Nursing Council, and the National Council for Teacher Education (Figure 3).

The problem of financing

According to the NEP 2020, India's public expenditure on education in 2017-18 accounted for 2.7 percent of GDP (MHRD, 2020). The target of allocating 6 percent of GDP to education, first outlined in the 1969 Policy and reiterated in the 1986 Policy and the 1992 Programme of Action, has consistently remained unmet. In comparison, countries like Bhutan, Zimbabwe, and Sweden allocate 7.5 percent of GDP, while Costa Rica and Finland spend 7 percent. Nations such as Kyrgyzstan, South Africa, and Brazil allocate 6 percent, with the United Kingdom, Netherlands, and Palestine spending 5.5 percent, and Malaysia, Kenya, Mongolia, Korea, and the U.S. at 5 percent. Bridging this gap and elevating India's education expenditure to the level of leading countries remains a pressing challenge.

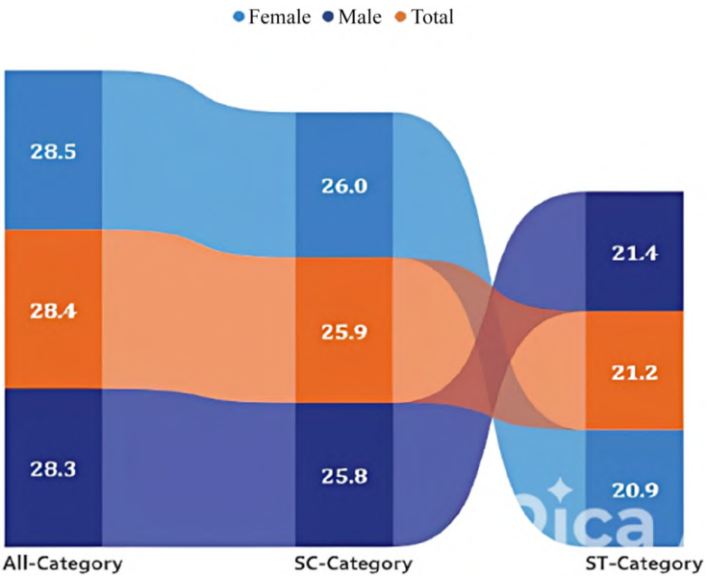

Figure 2. Gross Enrolment Ratio Social Categories and Gender-wise. Source: Ministry of Education (2024)

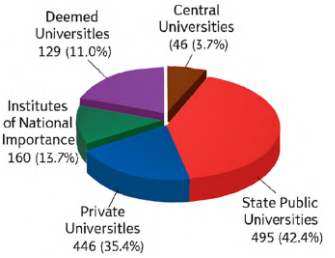

Figure 3. Type-wise Distribution of Higher Educational Institutions in India. Source: Ministry of Education (2024)

One key factor contributing to India's underperformance in this area is the conventional reliance on government funding alone. Another challenge is the classification of higher education funding (Docampo, 2007). While education spending is undeniably crucial for development, it does not receive a higher priority within India's financial system when economic resources are distributed. While India spends 0.7 percent of its GDP on higher education, higher education spending as a share of GDP in selected countries for 2021 was 2.4 percent in Chile, 2.4 percent in the U.S., 2 percent in Canada, 1.9 percent in South Korea, 1.8 percent in Norway, 1.3 percent in the United Kingdom, 1.1 percent in Germany, 0.9 percent in Japan, 0.3 percent in Saudi Arabia.

Financing alternatives

To explore new funding instruments, a comprehensive perspective is essential. In other words, Higher Education Institutions (HEIs), their regulators, and the government, acting as the super-regulator, must focus on fostering connections with capital markets and financial institutions. Given their vast scope, rapid pace, global interconnectedness, and technological

advancements, this discussion narrows its focus to capital markets and non-budgetary resources.

HEIs may need to reconsider and restructure their legal and organizational frameworks. This new "entity" would demand a slightly altered approach from entities such as the Department of Financial Services, Ministry of Finance, Government of India, the Stock Exchanges, and the Securities and Exchange Board of India. Policy-level deliberation is crucial for reorganizing the HEI system at various levels. Reorganization and continuous adaptation are urgently required. By making appropriate adjustments to regulations on foreign direct investment, tax systems, investment incentives, and the sociological and anthropological contexts of the population, significant resources can be unlocked.

Allocating 6 percent of GDP to education should not be confined solely to government spending. The composition of this 6 percent allocation needs to be redefined. The primary approach to funding higher education in India should focus on resource diversification. The Resource Diversification Matrix (Figure 4) highlights significant opportunities to broaden the range of resources available to support higher education.

According to the National Center for Education Statistics (NCES, 2022), bachelor's degree programs offered by public institutions in the U.S. receive approximately 28 percent of their total revenue from state governments, with an additional 10 percent from federal sources, which is a total of 38 percent from government subsidies.

Transforming the HEI model of financing

India has adopted an ineffective model of granting full autonomy without corresponding financial independence. Currently, the universities are categorized as Central Universities, State Public Universities, Institutions of Eminence, Deemed Universities, Private Universities, Indian Institutes of Management (IIMs), Indian Institutes of Technology (IITs), and Agricultural Universities. The idea of autonomous finance is highly relevant to all these institutions. The financial indicators for both domestic and foreign universities are shown in Table 1.

	Government (Taxpayers)	Students and/ or parents	Industries Services	Alumni and other philanthropists	International Cooperation
1. Direct Institutional Contribution	X				
2. Indirect contributions via Financial Assistance and Subsidized Loans	X				
3. Tuition Fees					
3.1 Degree Programs		X			
3.2 Non-Degree Programs		X	X		
4. Student Loans and Graduate Taxes					
4.1. Subsidized	X	X	X		
4.2. Unsubsidized		X			
5. Productive Activities					
5.1 Services					
5.1.1 Consulting	X		X		X
5.1.2 Research	X		X		X
5.1.3 Laboratory Tests	X		X		
5.2 Production of Goods					
5.2.1 Agricultural Products			X		
5.2.2 Industrial Products			X		
5.3 Rental of Land and Facilities			X	X	
6. Donations					
6.1 Direct			X	X	X
6.2 Indirect (lottery)				X	

Figure 4. Resource Diversification Matrix. Source: Johnstone *et al.* (1998)

Table 1. Financial Indicators

The Model	Revenue (in percent)	Source	Capital/Reserves (in percent)	Source
India	85-95	Government	5-15	Non-Government
US	30-35	Self-Financing	65-70	Self-Financing
British	60	Government	40	Non-Government
OECD/EU	50	Government	50	Non-Government

Sources: Data compiled from international sources, including OECD (2023), NCES (2022), UK DfE (2022), and India's Ministry of Education (2022).

HEIs abroad can generally be categorized into three models: the U.S. Model, the British Model, and the OECD/EU Model (Zatonatska *et al.*, 2020). The U.S. Model includes institutions such as, Stanford, the University of Pennsylvania, the Massachusetts Institute of Technology, the California Institute of Technology, the University of Chicago, Princeton University, Yale University, and Cornell University. The British Model features universities like Cambridge, Oxford, Wales, Edinburgh, London Business School, Manchester Business School, Glasgow, Birmingham, Strathclyde Business School, Columbia University, Johns Hopkins University, and Northwestern University. The OECD/EU Model comprises HEIs in countries such as Denmark, Sweden, Finland, France, and Germany.

As an example of the U.S. Model, Harvard University demonstrates its approach to autonomous finance through its sources of operating revenue for the fiscal year 2021. Student fees account for at least 22 percent of its operating revenue, endowments contribute 37 percent, and sponsored support provides 17 percent. Comparatively, Indian HEIs still have considerable progress to make in adopting similar financial autonomy (Figure 5).

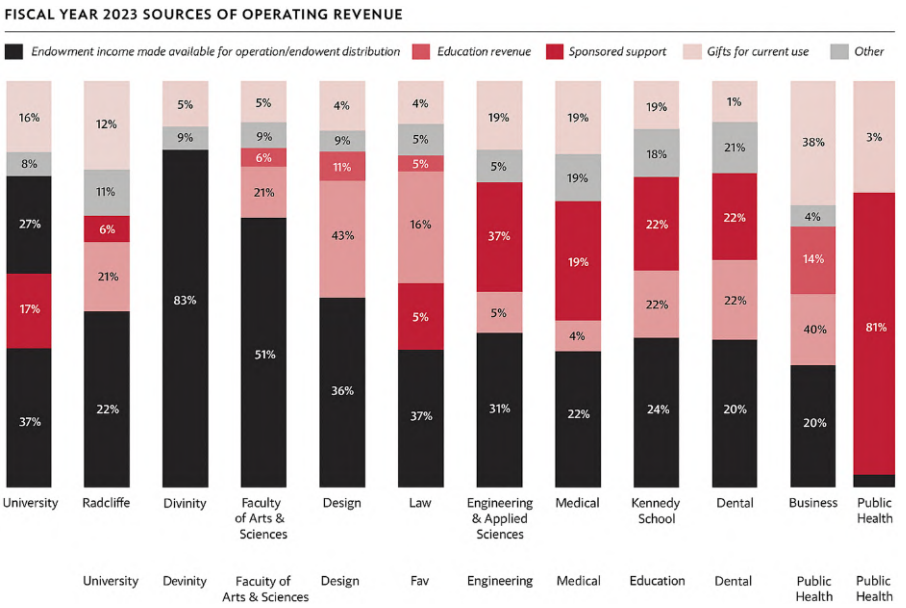

Figure 5. Fiscal Year 2023 Sources of Operating Revenue. Source: Harvard University (2023)

The operating expenses reveal a similar pattern when comparing Indian HEIs to Harvard University (Figure 6). While Indian HEIs allocate 85-95 percent of their operating revenue to salaries and maintenance, Harvard University dedicates approximately 52 percent. As a result, there is minimal funding left for comprehensive maintenance, research and development, and capital expenditures. This funding model, while ensuring broad access, also constrains institutional autonomy, innovation, and responsiveness to market needs. Several key policy documents and international comparisons shed light on the need for gradual reform. The NEP 2020 explicitly acknowledges the need to diversify funding sources. It recommends increasing public investment in education to 6 percent of GDP, with a strong emphasis on higher education, encouraging philanthropic and private sector participation, promoting financial autonomy for institutions, including the ability to raise resources through alumni networks, endowments, and research commercialization. The National Institution for Transforming India (NITI) Aayog's 2025 report, provides a detailed roadmap for funding reform (NITI Aayog, 2015). Although government funding remains the backbone, the report urges diversification through fee autonomy for select institutions, alumni, and Corporate Social Responsibilities (CSR) contributions, and performance-based grants. The report recommends short, medium, and long-term reforms, including self-financed programs, digital infrastructure, and international collaborations.

Jawaharlal Nehru University (JNU), a prominent public university in India, is examined as compared with Harvard University. According to the Ministry of Education Annual Report (2022-23) and NITI Aayog's Higher Education Report (2025), JNU's financial structure is predominantly reliant on public funding, with over 80 percent of its operating budget sourced from government grants. In contrast to Harvard's diversified revenue streams, where

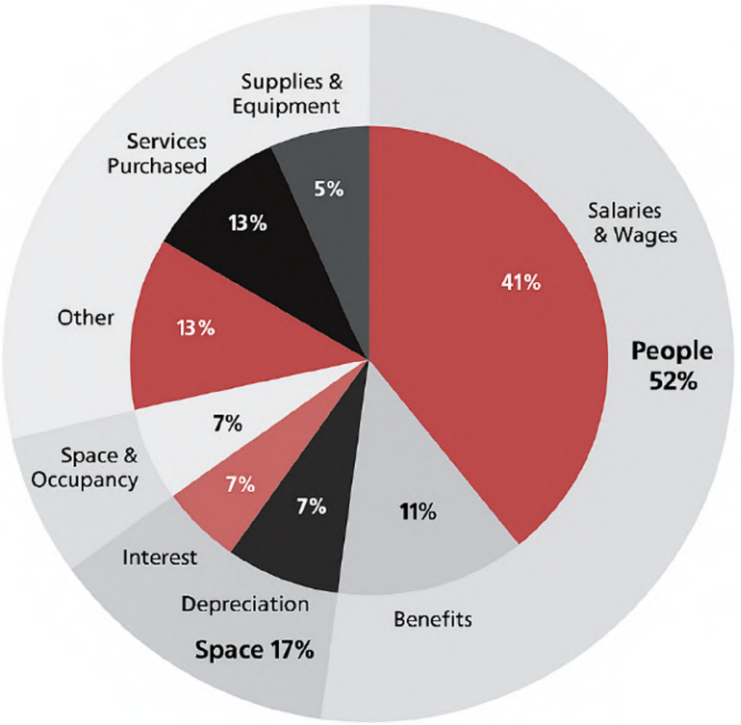

Figure 6. Fiscal Year 2023 Operating Expenses. Source: Harvard University (2023)

endowments (37 percent), student fees (22 percent), and sponsored research (17 percent) play significant roles, JNU's capacity for independent revenue generation remains limited.

This contrast underscores the structural differences in financial autonomy. While Harvard leverages its endowment and alumni networks to sustain long-term financial independence, Indian public universities like JNU operate within a centrally regulated funding framework, with limited discretion over tuition fees, fundraising, or investment strategies. Moreover, policy constraints and bureaucratic oversight often restrict Indian HEIs from pursuing market-responsive financial models.

Effecting a quantum jump in financing for higher education

The financing of higher education in India is a multifaceted and ever-evolving challenge that demands immediate attention and creative solutions to ensure equitable access for all students. Shaped by colonial legacies and regional disparities, the current landscape faces critical issues, such as escalating tuition fees, systemic inequities, and the pressing need for reforms in financing models. Recent initiatives by the Indian government, including the NEP 2020, aim to tackle these challenges by encouraging greater investment in education and enhancing accessibility. However, disparities in implementation across states remain a significant concern.

India's higher education financing mechanisms encompass a mix of traditional government-backed loans, private funding options, and innovative approaches like Income-Contingent Repayment schemes. These measures strive to improve access for students from diverse socioeconomic backgrounds, especially those from economically disadvantaged groups. Nevertheless, the country continues to grapple with significant issues, including enrolment disparities among marginalized communities and the far-reaching effects of the COVID-19 pandemic, which have exacerbated existing inequities in educational access.

The discourse surrounding higher education financing highlights the demand for a new paradigm, one that fosters collaboration between government entities, the private sector, and academic institutions. Stakeholders are advocating for funding models that are both sustainable and relevant, with a focus on multidisciplinary programs and advancing research. Such efforts are intended not only to equip students with vital skills for the future workforce, but also to ensure that higher education addresses critical societal challenges, including those brought about by rapid technological progress and climate change.

In conclusion, higher education financing in India requires transformative solutions to close the gap between existing practices and society's evolving needs. As conversations around effective policies and collaborative funding mechanisms progress, tackling these systemic challenges will be essential for creating a fair and inclusive educational environment for future generations.

The financing of higher education in India has undergone significant transformation over the years, influenced by a range of historical, economic, and policy considerations. Prior to the 1976 amendment to the Indian Constitution, individual states were solely responsible for shaping their educational policies, resulting in notable differences in educational standards and financing across the country. The 42nd Amendment brought education under the concurrent list, enabling the central government to propose policies while states retained autonomy in their implementation. This change exposed the disparities in educational financing, as states adopted varying policies and funding mechanisms tailored to their distinct socioeconomic circumstances.

The need for well-structured financing mechanisms became particularly evident in the post-independence period, as the demand for education surged alongside the global movement to democratize access to education. In 2011, the Indian government introduced the Model Education Loans Scheme to encourage banks to offer education loans, acknowledging the necessity for alternative funding sources in higher education. However, initiatives like PPPs

and the privatization of higher education, combined with insufficient allocations from both central and state governments, have left funding levels far below the target of 6 percent of GDP.

Linking with capital markets and accessing alternative sources

Bonds present a promising avenue for financing higher education. When assessing the suitability of bonds in the market, several factors should be considered, including the nature and necessity of the institutions, their financial history, and their ability to repay principal and interest. Examples such as bullet payment bonds and clip-and-stitch bonds allow for the repayment of the principal at maturity while interest is paid as it accrues.

Given their extensive asset base, most HEIs would benefit from entering the bond market. This approach would effectively monetize their assets without putting HEIs and their stakeholders at significant risk. Many HEIs, including colleges with substantial landholdings, engineering institutions, and public universities, could leverage secured bonds by mortgaging infrastructure and underutilized land. These bonds offer an effective financing solution for both investors and institutions, as the interest rates on secured bonds are generally lower than those on gilts or bank rates.

Why have Indian HEIs been reluctant to embrace bond funding as a means to sustain, grow, innovate, and establish new benchmarks? A noteworthy example highlighting the potential of such financing is XIME Bhubaneswar, where loan repayment was achieved within a year, with fee revenues doubling the borrowed amount. However, HEIs often display a mindset rooted in risk aversion, a strict adherence to traditional approaches, and a lack of innovative thinking.

Investing in HEIs can be perceived as an investment in sustainability, a notion strongly validated in Asia-Pacific nations. These countries have integrated higher education investments into the broader framework of Environmental, Social, and Governance (ESG) concerns. Having made significant advancements in this area, such investments are regarded as future-forward opportunities in the region. Social bonds, sustainability-linked loans, green bonds, green deposits, and sustainable bonds have gained substantial traction among investors in Asia-Pacific countries.

Looking ahead, sustainability bonds are set to capture significant attention from international investors. Japan leads the way, followed by Australia, Singapore, New Zealand, and Hong Kong. In terms of foreign direct investment (FDI), China currently outpaces India. However, by initiating projects specifically for HEI financing, India could enhance its appeal as an investment destination. Ultimately, scale matters and this would necessitate building essential financial expertise, fostering a new managerial culture, and committing to growth.

Partnerships with the public sector and equity investments

Equity investments present a promising avenue for financing HEIs. In countries like China, and other regions with international business schools, there is ample justification for supporting equity financing. Such investments can address campus development and infrastructure needs while ensuring a high rate of return for investors. In India, several private institutions have adopted this approach, and it could even be extended to public colleges. PPP offer a unique pathway for bidirectional financial flows, with management potentially following a similar model. Although PPPs are well-established in OECD and EU countries, this approach differs from the conventional understanding of PPPs and introduces innovative possibilities for HEI financing (Robertson, 2020).

Leveraging industry for higher education funding

Industry partnerships present a valuable avenue for funding HEIs. Harvard University stands out as a prime example, closely followed by Stanford University. This model is gaining recognition in India, with Mahindra University in Hyderabad serving as a notable example.

Patents, trademarks, and royalties: Foreign institutions are increasingly relying on royalties and patents as a significant source of revenue. The race to develop new patents and trademarks has intensified, with every laboratory striving to outdo its competitors. Indian HEIs should thoughtfully explore this funding option to tap into its potential benefits.

CSR funds: Education plays a transformative role in shaping individuals' perceptions of the world and themselves. It fosters the holistic development of personality by imparting knowledge, nurturing a scientific temperament, and equipping individuals with essential life skills. Education opens up numerous opportunities for a sustainable and fulfilling lifestyle while also contributing to personal growth and national progress. As a result, it is one of the most crucial social sectors underpinning the foundation of our evolving society (Mishra and Sarkar, 2020).

As per Schedule VII of the 2013 Companies Act, updated in 2016, listed companies are required to allocate 2 percent enrolment of their net revenue towards social expenditures under CSR guidelines. Among the key areas outlined in the schedule, "education" remains the most significant. The annual CSR expenditure is estimated to be around US$3.43 billion, with education traditionally receiving the highest allocation (Mishra and Sarkar, 2017). However, in 2020-21, health expenditure surpassed that of education, as the PM CARES Fund shifted priorities to counter the impact of COVID-19, disrupting the established dynamics of the education sector.

A striking aspect of this scenario is that out of approximately 28 million companies, only 8,500 are publicly listed. Since the Companies Act primarily governs public corporations, several highly profitable unlisted firms with substantial net worth per share remain exempt from its provisions. Additionally, the public sector has displayed greater engagement in CSR activities compared to the private sector.

According to CSR Box's 2024 statistics (CSRBOX, 2024), 301 leading companies collectively spent US$1.60 billion on CSR activities during FY 2024. The 2023-24 CSR Box report highlights that the education sector remains the largest recipient of CSR contributions. The top 80 companies in the education industry account for over 78 percent of the total CSR spending, with 91 percent of companies directing their CSR funds toward at least one educational project.

Securitization: Securitization refers to the process of pooling assets and converting them into securities. Many HEIs have expanded into large-scale organizations, but often utilize only 10 to 20 percent of their assets. Securitization serves as a highly effective method to transform these underutilized assets into a steady cash flow, thereby improving funding for HEIs. Before engaging in the valuation process, HEIs must first establish an asset register. This step should be followed by gaining an understanding of how the capital market operates concerning securities issuance. Unfortunately, most HEIs lack comprehensive knowledge of securitization and its procedures.

Should higher education be considered an industry? The classification of education as an industry in India has been a topic of ongoing debate. In today's context, education operates much like any other industrial activity, as it is guided by the same core elements: human resources, materials, and financial capital. This similarity makes it difficult to understand why banks and financial institutions hesitate to fund the education sector. Despite its potential, HEIs in India have accessed such funding only in a limited number of cases, typically for short- or medium-term needs.

Crowdfunding: Crowdfunding platforms and alternative financing models are gaining momentum, enabling students to raise funds for their education through community support. These platforms often rely on social media and online networks to connect borrowers with potential contributors, democratizing access to education and broadening the financing ecosystem.

Collaborative financing: Collaboration among key stakeholders, government bodies, private entities, and non-governmental organizations is crucial for addressing the skill gap and ensuring that funding is directed toward initiatives that promote employability and

entrepreneurship among the youth. Innovative financing models, including PPPs, can play a pivotal role in improving resource allocation and building a more robust and adaptive education system.

Future-oriented research funding: There is a pressing need for increased investment in research and development, particularly in emerging fields like artificial intelligence and sustainable practices. The creation of dedicated funding organizations, such as the National Research Foundation (NRF), represents a significant step toward aligning academic research with industry needs and cultivating a culture of innovation and problem-solving. NEP 2020 proposed the establishment of a new institution called the Higher Education Financing Agency (HEFA) to facilitate the funding of student loans and higher education projects. HEFA will focus on providing financial support for infrastructure development in higher education institutions HEIs and offering affordable loans to students for their educational needs. NEP strongly advocates for "Education not for profit".

Monetization of assets: As highlighted earlier, India's higher education ecosystem comprises 1,168 universities, 45,473 colleges, and 12,002 stand-alone institutions. These institutions possess vast assets, including land, laboratories, machinery and equipment, furniture, and fixtures, which thousands of dollars. While there is no available data on the historical valuation of these assets, their current worth is likely immense. Monetizing these resources could provide a substantial boost to higher education expenditure. However, achieving this would require academic leaders to extend their roles beyond traditional academic responsibilities, embracing the mantle of financial leadership as well.

Catapulting industry's contribution: Beneficiaries of higher education should play a significant role in contributing to the costs incurred per student. This would strengthen the relationship between industry and academia, thereby elevating the overall quality of higher education.

Internationalization of education: HEIs are inward-looking institutions. Taking a cue from many countries in the West and, in particular, from the U.S., HEIs in India need to open up to garner funding and enhance competitiveness. This can be done by collaborating with foreign institutions and promoting partnerships between Indian and top-ranking global universities for joint research, teaching collaborations, and faculty/student exchanges. High-performing Indian universities could establish campuses abroad, as the top 100 global universities have been invited to operate in India. Courses on Indian traditions, such as Yoga, AYUSH, and Indology, could attract global interest and promote "internationalization at home".

Sovereign fund for higher education: A sovereign fund dedicated to higher education could be established. Typically, 15 percent of such a fund could be allocated to capital expenditure, while the remaining 85 percent could be invested in securities under the sovereign fund framework. This fund could be replenished over time by reinvesting money initially provided to HEIs. Additionally, revenues from mineral extractions and license bidding could contribute to the fund. Students benefiting from higher education could also be invited to contribute. Research by Ferreira, Director at the International Inequalities Institute, London School of Economics, demonstrates that higher education substantially increases lifetime earnings (Ferreira, 2024).

Autonomy: NEP calls for autonomy for HEIs to innovate on the foundational aspects. It is worth noting that regulation of higher education has been too heavy-handed for decades and that the regulatory system needs a complete overhaul to re-energize the higher education sector and enable it to thrive. The NEP suggested the setting up of a Higher Education Council of India to integrate the various higher education regulatory bodies and remove fragmentation. It is expected that the setup of this body would provide HEIs further leeway to mobilize finance.

Conclusion

Investment in higher education in India remains critically low, impacting its ability to contribute meaningfully to national development. Graduates from HEIs are pivotal to

economic, social, and political transformation, yet funding allocations have declined alarmingly over the years (Ministry of Finance, 2025). To address resource constraints, institutions must diversify beyond tuition and government grants, embracing CSR contributions, crowdfunding, industry partnerships, asset monetization, and even sovereign wealth fund creation.

A revitalized financing approach must be underpinned by structural reforms: improved legal frameworks, stronger project management systems, controlled massification, skilful financial oversight, and quality enhancements in services and programs. Increased capital market engagement can supplement government spending.

Internationalization offers opportunities to access global funding and innovative financing models. Integrating various regulatory bodies under a single umbrella — the proposed Higher Education Commission of India, could enable streamlined governance and foster 'light but tight' regulation. This shift is essential to achieve the targeted 6 percent of GDP allocation toward education. Only by expanding funding sources and implementing transformative reforms can India's higher education system uplift its quality, meet future demands, and empower young graduates to shape the country's progress.

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Championing AI in healthcare: the impact of stakeholders on the adoption of Robotic Telesurgery Project in Indonesia

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Abstract

Purpose – This paper aims to analyze how key stakeholders, including the Ministry of Health (MOH), hospitals, universities, health polytechnics, and health industries, influence the adoption of the Robotic Telesurgery Project in Indonesia.

Design/methodology/approach – A qualitative approach was used to explore stakeholder roles, utilizing stakeholder theory and the Technology-Organization-Environment (TOE) framework. Interviews were conducted with 18 participants from relevant institutions and were analyzed thematically using NVivo.

Findings – The study identified four types of stakeholders based on their power and interest: Key Players, Keep Informed, Keep Satisfied, and Minimal Effort. Stakeholders influenced the adoption of robotic telesurgery through three mechanisms: technological, organizational, and environmental. These mechanisms include the technology's advantages, trust, communication, infrastructure readiness, regulatory support, and alignment of interests.

Originality/value – This study is pioneering in examining how different types of stakeholders contribute to the adoption of robotic telesurgery in a developing country. The findings provide practical insights into managing stakeholder collaboration for the effective implementation of advanced health technologies.

Keywords AI healthcare, Stakeholders, Technology adoption, Robotic telesurgery, TOE framework, Indonesia

Paper type Research article

Introduction

The adoption of Artificial Intelligence (AI) creates many opportunities for its application in the public sector to improve public service delivery, support for citizens, decision-making, and security issues (Henman, 2020; Wirtz *et al.*, 2019). Telemedicine is the main application of AI in the healthcare sector (Callens, 2023). Robotic telesurgery, a form of telemedicine that enables remote surgery using robotic systems, is emerging as a potential solution to overcome healthcare access barriers in developing countries. Meanwhile, access to healthcare remains the main challenge for providing health services in these countries, particularly surgical services (Meara *et al.*, 2015). According to the World Health Organization (WHO), more than five billion people worldwide currently do not have access to safe, timely, and affordable surgical and anesthetic services (Meara *et al.*, 2015). It is estimated that 9 out of 10 people cannot access even the most basic surgical services (WHO, 2017). Thus, surgical care is an essential part of health systems for all countries. Specifically, developing countries represent nearly half of the world's population, but comprise only 19 percent of all surgeons (Holmer *et al.*, 2015).

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Using robotics in surgical services can be advantageous in developing countries with limited healthcare resources since it can reduce surgeon burnout, lower the risk of surgical site infections, and shorten hospital stays (Mirbagheri and Aghanouri, 2022; Vitiello *et al.*, 2012). Previous studies show that robotic telesurgery can help reduce health expenditure (Marsilio and Mastrodascio, 2024), break down geographical barriers, and improve access to Minimally Invasive Surgery (MIS) (Mack, 2001; Vitiello *et al.*, 2012). However, developing countries are experiencing difficulties in adapting to advanced technologies, such as the use of robotic telesurgery, the transition from traditional open surgery to MIS, and the uncertainty of whether investing in this technology within the health sector will add value to healthcare (Drummond *et al.*, 2013). Therefore, the need to better understand the adoption of robotic telesurgery in developing countries is essential.

On the one hand, previous studies have explored various factors that determine the adoption of new technologies, including the characteristics of the technology, organizational factors, and surrounding environmental factors (Capestro *et al.*, 2024). These studies ignore the role of stakeholders during the adoption process. Some studies mention that policy entrepreneurs and users of new technologies have different potential to significantly influence the adoption of new technologies (Ruvalcaba-Gomez *et al.*, 2023). However, they do not classify different types of stakeholders or identify their different impacts on the adoption of advanced technologies. On the other hand, some studies have focused on the use of surgical robots in healthcare services (IFR, 2018), including the features and characteristics of robotic telesurgery (Yang *et al.*, 2024), and yet empirical research on the adoption of robotic surgery is scarce (Abrishami *et al.*, 2014). In fact, robotic surgery has been adopted as a feasible and viable option in developing countries such as Pakistan, Bangladesh, India, Ukraine, and Turkey. Some empirical studies have found that robotic surgery has the potential to train healthcare professionals, provide financial and technical support, and improve accessibility to healthcare (Ghazanfar *et al.*, 2019; Holmer *et al.*, 2015). With the increasing application of new technologies, such as the 5G network, the development of surgical robots has improved with telesurgery capabilities (Moustris *et al.*, 2023).

Given the limited research on adopting robotic telesurgery in both developed and developing countries, this study addresses two key research questions: (1) Who are the stakeholders involved in the adoption of robotic telesurgery in Indonesia, and (2) How do these stakeholders influence the adoption process? To answer these questions, stakeholder theory, particularly Mendelow's power-interest matrix, and the TOE framework were adopted. The focus is on a national initiative, the Robotic Telesurgery Project in Indonesia, which aims to introduce and scale robotic telesurgery as part of health system transformation.

Similar to most developing countries, the lack of access to surgical services and the shortage of surgeons are the main challenges in Indonesia's healthcare sector. Given such limitations in the capability to produce or use robotic technology, the government has decided to adopt the Robotic Telesurgery Project to improve access and quality of healthcare services for inaccessible areas in Indonesia. Hence, the implementation of this initiative in Indonesia serves as a valuable case study for examining the impact of stakeholders on the adoption of advanced technology. The findings in this case may be useful for other developing countries.

To our knowledge, this is the first empirical study to holistically examine the stakeholder landscape in robotic telesurgery adoption in Indonesia. The authors argue that understanding the interactions between stakeholders and adoption mechanisms is essential for informing effective implementation strategies in other developing countries facing similar challenges.

From a policy viewpoint, the study provides valuable insights for policymakers on the strategies employed by the government to facilitate the successful adoption of technology. Through analysis of a real case, it demonstrates the proactive measures taken by the government to involve stakeholders and manage organizational complexities that can impact adoption. Furthermore, it underscores the important role of stakeholders in preparing for technology adoption.

This paper is divided into the following sections. The first section reviews existing literature on the use of robotic telesurgery technology and identifies a research gap. The second section explains the methodology, research design, analytical frameworks, data collection, and data analysis. The third section presents the findings of the study, and the last section covers the discussion and conclusion.

Literature review

The TOE factors in AI adoption

The Technology-Organization-Environment (TOE) framework developed by Tornatzky and Fleischer (1990) explains that technology adoption in an organization is influenced by three main factors: technology, organization, and environment. Technological factors include technology availability and characteristics; organizational factors include size, structure, resources, and internal capacity; while environmental factors include government regulations, external pressures, and infrastructure support (Figure 1).

This framework is considered more comprehensive than other approaches, such as the Technology Acceptance Model (TAM) or the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003), because it considers organizational and environmental factors, not just individual perceptions. TOE is also more relevant for understanding public sector organizations in developing countries.

In the context of health technology adoption, several studies have highlighted the importance of technological factors such as compatibility, complexity, and relative benefits of a system (Sharma *et al.*, 2023). Organizational factors such as top management support and internal resource readiness also play an important role. Meanwhile, environmental factors such as government support and policy changes are determinants in the public health sector (Neumann *et al.*, 2022; Yang *et al.*, 2024). However, most TOE studies have not explicitly included actor analysis. In fact, in the practice of public technology adoption, especially in developing countries, collaboration across actors determines the success of new technology implementation.

Stakeholder and power vs interest theory

The term ‘stakeholder’ refers to any group or individual that can affect or be affected by an organization’s efforts to achieve its goals (Freeman and McVea, 2005). Engaging stakeholders means actively seeking input from a diverse range of individuals to foster mutual understanding and support in decision-making (Brugha and Varvasovszky, 2000; Deverka *et al.*, 2012). The involvement of stakeholders is crucial in implementing any system or project, as these various entities can significantly impact the project’s outcome, either

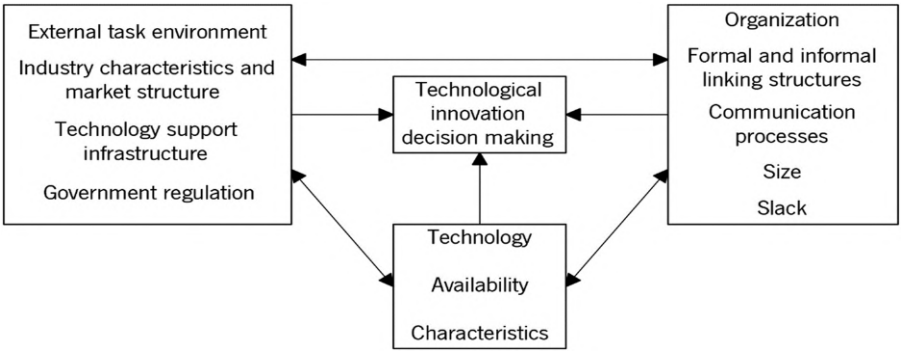

Figure 1. Technology-Organization-Environment (TOE) Framework. Source: Tornatzky and Fleischer (1990)

positively or negatively, based on their level of contribution and influence (Deverka *et al.*, 2012). There are numerous methods available for conducting stakeholder analysis using some of the guidelines that require activities (Jepsen and Eskerod, 2009), such as identification, characterization (Karlsen, 2002), and a decision about which strategy to use to influence each stakeholder (Brugha and Varvasovszky, 2000), which have been used in the fields of business, economics, health policy, and environmental science (Dutta and Das, 2020). However, it is not widely used in public administration or the adoption of advanced technologies (Van der Wal, 2020).

To further develop the principles of stakeholder theory, Mendelow (1991) introduced the power-interest matrix as a tool to analyze the influence of stakeholder groups by assessing power and interest levels. Power refers to the ability of stakeholders to exercise their influence and achieve goals (Jepsen and Eskerod, 2009). Interest refers to the impact of a project or policy on the stakeholder group (Guðlaugsson *et al.*, 2020). It is a useful method in mapping stakeholders into four categories, namely Key Players (high power vs high interest), Keep Informed (low power vs high interest), Keep Satisfied (high power vs low interest), and Minimal Effort (low power vs low interest). The stakeholder mapping concept is seen in Figure 2 (Johnson *et al.*, 2008).

First, the Key Players are recognized as having the highest level of power and interest in the decision-making process, significantly influencing policies or projects. Therefore, it is crucial to manage these stakeholders thoroughly (Maqbool *et al.*, 2022). Second, the Keep Informed category includes stakeholders with low power and high interest in a policy or project who are regularly consulted for their input and feedback on analysis, solutions, and final decisions (Maqbool *et al.*, 2022). Third, the Keep Satisfied category is found to have high power but low interest and thus needs to be kept actively involved throughout the entire process to anticipate their concerns and consistently meet their needs so that a policy or project can run smoothly without any difficulties (Amadi *et al.*, 2018). Last, the Minimal Effort category comprises stakeholders with low power and interest, making consistent engagement unnecessary (Maqbool *et al.*, 2022). By mapping different stakeholders, we can identify which stakeholder groups are crucial and how they may facilitate or hinder decision-making and effectively support public policy.

Gap in the literature: robotic telesurgery adoption in Indonesia

Studies related to telemedicine and robotic surgery in Indonesia are limited and generally descriptive. Some studies note that the utilization of robotics in healthcare has great potential to improve access and efficiency of surgical services, but not many have explored how local actors play a role in driving the adoption of this technology (Ghazanfar *et al.*, 2019; Holmer *et al.*, 2015).

In addition, there is a lack of empirical studies that systematically apply the TOE framework together with stakeholder analysis and the power versus interest theory to analyze

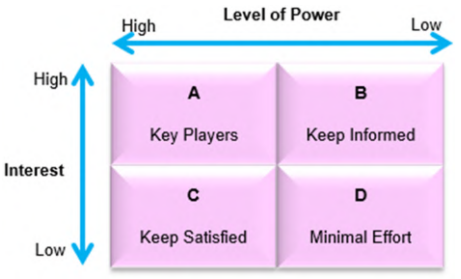

Figure 2. Stakeholder Mapping: The Power/Interest Matrix. Source: Johnson *et al.* (2008)

the dynamics of robotic telesurgery adoption in the context of developing countries such as Indonesia. This study addresses the gap by exploring key challenges, opportunities, and stakeholder dynamics influencing the adoption of robotic telesurgery, as well as practical implications for policy and decision-making in healthcare innovation.

Methodology

Research design and analytical frameworks

This research adopts a qualitative case study approach to understand how various stakeholders influence the adoption process of robotic telesurgery technology in Indonesia. This approach was chosen because it allows for in-depth exploration of complex social, political, and institutional contexts, which cannot be reached with quantitative approaches.

This study combines two analytical frameworks: stakeholder theory (Mendelow's Power-Interest Matrix) and the Technology-Organization-Environment (TOE) framework. The two frameworks were combined because each has complementary strengths. TOE helps explain the structural factors that influence technology adoption, while stakeholder theory highlights how the actors involved play a strategic role in the process.

The use of these frameworks addresses a gap in the literature, which has so far emphasized technical or organizational aspects without explicitly taking into account the power dynamics and interests of actors in the context of public policy in developing countries.

Data collection

Data were collected through semi-structured in-depth interviews with 18 interviewees representing different types of stakeholders in the Robotic Telesurgery Project. Respondents included officials from the Ministry of Health, hospitals (surgeons and nurses), the healthcare industry, health polytechnics, universities, the Ministry of Finance (MOF), telecommunication companies, and patients.

Interviews lasted 30-60 minutes, either online or offline, depending on the availability of the interviewees. The interviews explored topics such as project background, decision-making process, perceptions of the technology, adoption challenges, roles of each actor, and collaboration strategies between stakeholders.

Data analysis

Data were analyzed using the thematic analysis method based on Braun and Clarke's (2006) approach, using NVivo 14 software. This process includes reading and reviewing all interview transcripts, identifying and pre-coding relevant pieces of text, clustering the codes into key themes, developing an interpretive narrative based on the interrelationships between themes, and mapping the analysis results against the TOE framework and Power-Interest Matrix.

By combining stakeholder theory with the TOE framework, a comprehensive understanding of how organizations interact with their stakeholders on technology adoption and innovation can be gained (Ackermann and Eden, 2011; Freeman, 1984; Neumann *et al.*, 2022). In the next section, it analyzes how stakeholders affect the adoption of the project by the TOE framework (Figure 3).

Findings

Mapping stakeholders

Through mapping stakeholders, four groups are identified: (1) Key Players: Ministry of Health, healthcare industry; (2) Keep Informed: hospitals, health polytechnics, and affiliated universities; (3) Keep Satisfied: Ministry of Finance, telecommunication companies; and (4) Minimal Effort: patients and the general public. Each classification is described based on a combination of structural power (access to policy, budget, infrastructure) and importance to

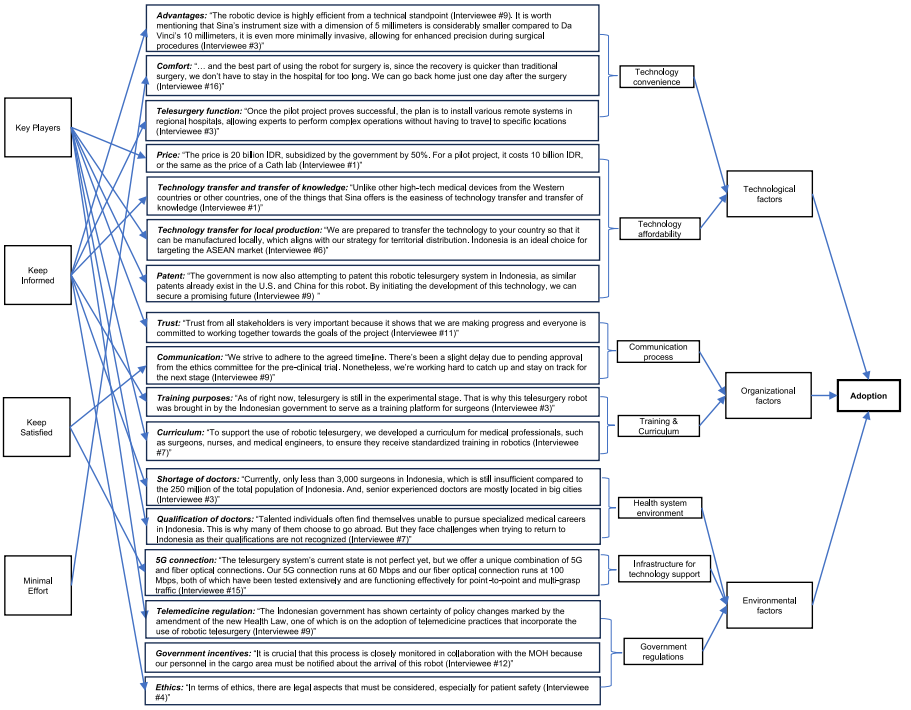

Figure 3. Stakeholders Influencing the Adoption of the Project. Source: By authors

project success. The Indonesian socio-political context is added to explain why certain actors have high or low power/interest. The findings were analyzed using the TOE framework, which includes three main mechanisms: technology, organization, and external environment.

Technological mechanism

In the technological context of stakeholder mechanisms, Tornatzky and Fleischer's (1990) TOE framework highlights key components related to technology availability and characteristics. Specifically, we will focus on technology convenience and the affordance of robotic telesurgery.

a. Technology convenience

Technology convenience refers to users expecting minimal effort when adopting new technologies, similar to ease of use, including time, location, and implementation (Yoon and Kim, 2007).

In the case of Robotic Telesurgery Project, the Key Players (MOH) and Keep Informed stakeholders (surgeons) influenced the adoption of the *Sina* robotic telesurgery over *Da Vinci* due to its convenience. Interviewee #3 noted:

> *Sina*'s 5mm instrument is significantly smaller than *Da Vinci*'s 10mm, making it more minimally invasive and enhancing precision (#3 Surgeon Digestive).

Minimal Effort stakeholders (patients) also benefit from robotic surgery's reduced postoperative pain and faster recovery. Interviewee #16 highlighted:

> With quicker recovery, we can leave the hospital just one day after surgery (#16 Patient).

Sina robots also feature telesurgery, enabling remote procedures and overcoming geographical barriers (Mirbagheri *et al*., 2020). This function was a key factor for adoption. Interviewee #3 noted:

> Once the pilot project succeeds, remote systems will be installed in regional hospitals for complex operations without travel (#3 Surgeon Digestive).

The Key Players, Keep Informed, and Minimal Effort stakeholders recognize *Sina*'s convenience through technical efficiency, user-friendliness, and telesurgery functions. Thus, prioritizing this technology positions Indonesia well for the Robotic Telesurgery Project.

b. Technology affordance

Technology affordance refers to the action possibilities a technology offers (Yang *et al*., 2024). The Key Players (MOH) and Keep Informed stakeholders (surgeons, hospitals) facilitated *Sina*'s adoption due to its affordability. It is 66 percent cheaper than *Da Vinci* (USD2.7 million) (Mirbagheri *et al*., 2020), and its experimental status allows for lower government purchase prices. Interviewee #1 noted:

> The price is 20 billion IDR, subsidized by the government by 50 percent. For a pilot project, it costs 10 billion IDR, or the same as the price of a Cath lab [A Cath Lab, or Catheterization Laboratory, is a specialized medical facility where doctors perform cardiac catheterization procedures, which are used to diagnose and treat various heart conditions] (#1 Hospital HRD Management).

Sina also enables technology transfer, reducing costs of consumables like robotic hands. Interviewee #6 stated:

> We are ready to transfer technology to manufacture components locally, aligning with ASEAN market expansion (#6 *Sina* Expert).

Patent protection further encourages collaboration. Interviewee #9 emphasized:

> The government is working on patenting robotic telesurgery in Indonesia, securing its future in healthcare (#9 MOH Health Services Directorate).

The Key Players and Keep Informed stakeholders recognize *Sina*'s affordability and potential for technology transfer, supporting its suitability for widespread adoption.

Organizational mechanism

According to the TOE framework, some critical factors in analyzing stakeholder mechanisms in an organizational context include employee connectivity, internal communication process, organizational size, and available additional resources. This section will delve into the communication process, training, and curriculum.

a. Communication process

Effective communication ensures timely and impactful information delivery, fostering clarity and alignment among stakeholders (Koschmann and Kopczynski, 2017). Collaboration among surgeons, nurses, technical staff, and engineers is essential for success (Malik and Brinjikji, 2022). Trust is crucial, as interviewee #11 noted:

> Trust from all stakeholders is vital for progress and commitment to project goals (#11 MOH International Cooperation).

The success of promoting the adoption of robotic telesurgery technology relies heavily on how the MOH (Key Players) negotiates with other stakeholders. In the case of the Robotic Telesurgery Project in Indonesia, MOH strategically chose to have all stakeholders involved sign a Memorandum of Understanding (MOU) to ensure everyone's commitment to the project's completion. Interviewee #9 stated:

> We strive to adhere to the timeline, despite some delays in ethics committee approval (#9 MOH Health Services Directorate).

Close communication with the MOF allows the MOH to expedite the arrival of *Sina* robots. Interviewee #12 emphasized:

> The MOH coordination ensures our cargo personnel are informed of the robot's arrival (#12 MOF Custom Officer).

Through strategic communication, the MOH manages stakeholders, aligns objectives, and facilitates project adoption.

b. Training and curriculum

Although human trials have not begun, the Keep Informed stakeholders (surgeons) have adopted the technology through internal training. This enhances doctors' expertise in preparation for clinical evaluations. Interviewee #3 noted:

> Telesurgery is still experimental, with no global training programs. The Indonesian government brought in the robot as a training platform (#3 Surgeon Digestive).

The MOH collaborated with hospitals (RSHS and RSS) to develop a national curriculum covering six stages, from virtual reality to live patient procedures. Interviewee #7 stated:

> We created a standardized robotics curriculum for surgeons, nurses, and engineers (#7 MOH Health Talent Directorate).

Despite being experimental, the national curriculum and training programs ensure the readiness for widespread adoption of robotic telesurgery.

Environmental mechanism

Meanwhile, in the context of environmental stakeholder mechanisms, as outlined by the TOE framework, several important factors that need to be considered are the health system environment, infrastructure for technological support, and government regulations.

a. Health system environment

A sustainable health system enhances health while minimizing environmental impact (WHO, 2017). A health system comprises multiple interacting elements, including organizations, people, and activities, that work together to provide healthcare services and promote overall health (McCoy and Allotey, 2021).

Effective healthcare relies on an adequate workforce size, distribution, and composition (WHO, 2016). However, Indonesia faces a persistent shortage of medical professionals. Interviewee #3 noted:

> Indonesia has fewer than 3,000 surgeons for a population of 250 million, with most senior doctors in big cities (#3 Surgeon Digestive).

Additionally, returning doctors struggle with unrecognized foreign qualifications. Interviewee #7 highlighted:

> Many pursue specialized training abroad but face challenges with credential recognition upon return (#7 MOH Health Talent Directorate).

To address this, the government is promoting robotic telesurgery training to expand medical expertise and technology adoption.

b. Infrastructure for technology support

Surgeons have worked on remote robotic surgery for decades, with 5G significantly improving its feasibility (Moustris *et al.*, 2023). In this case, Key Player stakeholder (MOH)

partnered with Keep Satisfied stakeholder (telecommunication service provider/company: PT. Telkomsel) to integrate 5G and fiber optic networks for *Sina* robotic telesurgery. Interviewee #15 noted:

> We provide 5G at 60 Mbps and fiber optics at 100 Mbps, ensuring stable connections for telesurgery (#15 Telecommunication Company).

Stakeholders agree that a robust network infrastructure is critical for successful implementation, making robotic telesurgery ready for wider adoption.

c. Government regulations

Regulation harmonizes healthcare objectives (Groenewegen *et al.*, 2002). The MOH supports *Sina* robotic telesurgery, aligning with the 2023 Health Law amendments, which incorporate telemedicine practice and telesurgery. Interviewee #9 stated:

> The amended Health Law includes telemedicine policies that facilitate robotic telesurgery adoption (#9 MOH Health Services Directorate).

The adoption of a new technology or system is also influenced by government support (Neumann *et al.*, 2022). For example, government support also includes tax exemptions for importing robots. The MOF plays a role in easing financial burdens. Interviewee #12 noted:

> Collaboration with MOH ensures smooth customs clearance for incoming robots (#12 MOF Custom Officer).

Ethical concerns remain due to the technology's experimental nature. Interviewee #13 emphasized:

> Legal aspects, especially patient safety, must be carefully considered (#13 Researcher).

Strong regulations focusing on patient safety and inter-ministerial support are crucial for the program's success.

The changing dynamics of stakeholders

Stakeholder roles are inherently dynamic, evolving with each stage of collaboration. For example, the Ministry of Finance was initially only a tax regulator, but later became actively involved in logistics and permit expediting, so it can move from "Keep Satisfied" to "Key Players". Similarly, referral hospitals, after undergoing training and clinical trials, can transform into key players in the national implementation phase.

Discussion

This study aims to explore how stakeholders influence the adoption of robotic telesurgery technology in Indonesia by combining stakeholder theory (Mendelow's interest-power matrix) with the Technology-Organization-Environment (TOE) framework. This study provides an empirical and conceptual contribution to the literature on the role of stakeholders in health technology adoption in developing countries.

Using the Robotic Telesurgery Project in Indonesia as a case study, this paper addresses the research questions by analyzing the policy process of the project's successful implementation.

Who are the stakeholders involved in the adoption of robotic telesurgery?

Our stakeholders mapping identified four categories of stakeholders based on their power and interest in the project: (1) Key Players (MOH and healthcare industry/companies) had high power and interest, significantly impacting policy and project success. They played central roles in setting policy direction, coordinating inter-institutional collaboration, and driving technology adoption; (2) Keep Informed (hospitals, universities, MOH health polytechnics)

showed high interest but had limited decision-making power. These stakeholders contributed primarily through technical input, training, and advocacy for adoption; (3) Keep Satisfied (MOF and telecommunication provider) hold high power but low interest, with concerns addressed to ensure smooth project execution. Their role was instrumental in enabling infrastructure and logistics; and (4) Minimal Effort (patients and general public) have low power and interest, though they ultimately experience the outcomes of the project.

This classification clarifies the ecosystem of stakeholders that must be engaged to support successful adoption, particularly in the Indonesian public health and governance landscape.

How do these stakeholders influence the adoption process?

The findings reveal that each stakeholder group influenced the adoption process through different mechanisms aligned with the TOE framework. Table 1 summarizes the key findings.

Technological mechanisms include convenience and affordance as important aspects. Key Players (MOH and healthcare industry/companies) facilitate adoption by choosing more affordable and locally adaptable robotic systems (*Sina*), supporting technology and intellectual property transfer efforts. The Keep Informed stakeholders (hospitals and surgeons) influence adoption through their evaluation of functionality, usability, and clinical applicability.

In terms of organizational mechanisms, communication process, training and curriculum play an important role. The Key Players (MOH) play a major role in building trust, managing communication, and standardizing training programs through collaboration with hospitals and polytechnics. Hospitals and surgeons adopted the robot as part of a pilot training program, which strengthened internal organizational readiness. The Ministry of Finance contributed to coordinating the customs clearance process for robot shipments, demonstrating the role of administrative coordination in organizational adoption.

Table 1. Summary of Findings – Four types of stakeholders

Factors	Key Players	Keep Informed	Keep Satisfied	Minimal Effort
Technology convenience	• Highly efficient	• Small instrument size • Telesurgery function		• Quicker recovery
Technology affordance	• Affordable price • Technology transfer • Patents	• Affordable price • Technology transfer		
Communication process	• Trust and commitment		• A close monitoring process • The arrival of the robotic devices	
Training and curriculum	• Standardization of training curriculum	• Training platform for surgeons		
Health system environment	• Shortage of surgeons	• Shortage of surgeons		
Infrastructure for technology support	• Telecommunication providers' engagement		• Combination of 5G and fiber optic connections	
Government regulations	• Health Law incorporates telemedicine practices and robotic telesurgery	• Ethical concern for patient safety	• Tax exemption for importing robots	

Source: By authors

Environmental mechanisms include the health system environment, technology support infrastructure, and government regulations. The broader policy and regulatory environment, including amendments to the Health Act of 2023, enables a legal framework that supports telemedicine and telesurgery. Infrastructure collaboration with telecom service providers (5G and fiber optics) ensures technical feasibility. Stakeholders also discussed ethical considerations related to patient safety and experimental use.

This study contributes to the literature by highlighting the importance of stakeholder configurations in shaping the adoption of complex technologies in developing countries. While most existing research focuses on technical or organizational readiness, the findings emphasize how strategic collaboration and dynamic stakeholder engagement enable institutional change and technology diffusion. These insights are not only applicable to the Indonesian context but can also inform digital health transformation in other developing countries facing similar challenges in health system reform, human resource gaps, and infrastructure limitations.

Conclusion

In conclusion, the adoption of robotic telesurgery in Indonesia was driven by the alignment of technological, organizational, and environmental factors enabled by strategic, collaborative, and adaptive stakeholder engagement. The solutions identified through stakeholder mapping in this study directly address the main challenges in adopting robotic telesurgery technology in Indonesia. First, budget constraints and access to advanced technology were addressed by selecting the *Sina* telesurgery system, which offers a more affordable alternative compared to other systems in the same category. This selection was led by key stakeholders, particularly the Ministry of Health and the medical device industry, which also promoted technology transfer and local production efforts. Second, challenges related to technological infrastructure readiness, particularly in supporting remote surgical procedures, were addressed through strategic collaboration with telecommunications service providers. This collaboration enabled the integration of 5G networks and fiber optic connections to ensure the stability and security of telesurgery operations. Third, the issue of surgeon shortages was proactively addressed by involving hospitals, health polytechnics, and educational institutions from the early stages of development. This involvement took the form of internal training and the development of a national curriculum focused on medical professionals' readiness to deal with new technologies.

The successful adoption of robotic telesurgery in Indonesia depends not only on technical readiness but also on multi-stakeholder coordination, institutional support, and regulatory facilitation. This experience provides important lessons for other developing countries looking to implement high-tech solutions in the public health system. Future studies can be extended by comparing stakeholder dynamics in other national contexts or exploring the role of new stakeholders such as local governments, civil society, or international donors.

The limitation of this study is that, as it is a qualitative study on a specific case in Indonesia, the findings may not be applicable to other countries. There are differences in the use of robotic telesurgery between developing and developed countries, with developing countries like Indonesia focusing more on adoption studies and developed countries on advancing robotic applications. More research is needed to understand the implications under different contexts.

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Ethical Statement:
This research did not require ethical clearance as it did not involve medical interventions, personal health data, or sensitive personal information. The research focused on stakeholder perspectives through interviews conducted with professionals and policymakers, following standard ethical guidelines for social science research. All participants provided informed consent before participation.

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