THE HONG KONG POLYTECHNIC UNIVERSITY

SCHOOL OF DESIGN

SD5303 - A PROPOSITION FOR DESIGN - VISION AND OPPORTUNITY

TRANSFORMING CREDENTIAL VERIFICATION: EXPLORING THE INTEGRATION OF WEB 3.0 AND BLOCKCHAIN TECHNOLOGY FOR THE FUTURE OF THE HONG KONG COUNCIL FOR ACCREDITATION OF ACADEMIC AND VOCATIONAL QUALIFICATIONS

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Content

Abstract

Scholars and professionals have demonstrated the opportunities that digital technologies, especially Web 3.0, create in transforming education and training systems, including the potential to develop new methodologies and programs that capture, recognize, and validate a broader range of learning outcomes in an era of continuous learning and development. However, despite its potential, research shows that most organizations are yet to optimize these new capabilities to achieve the needed transformations. Over the past decade, only a few institutions, especially in the business field, have been experimenting with blockchain technology, and most individuals focus on the profit-making capabilities of technologies. The Hong Kong Council for Accreditation of Academic and Vocational Qualifications (HKCAAVQ), as an accrediting authority for academic and vocational qualifications, has the opportunity to leverage web 3.0 technology to achieve its goal of continuous quality enhancement and excellence in education and credentials verification. The integration of web 3.0 technologies has the potential to transform the operational model of HKCAAVQ, and it is important to identify the areas that require change. To address this need, this research focuses on the application of blockchain technology in the accreditation industry, within the context of Web 3.0, to develop a service framework that can enhance HKCAAVQ's quality management system and deliver value to consumers. By adopting this framework, HKCAAVQ can take advantage of the capabilities offered by blockchain technology and improve its accreditation processes and services.

Keywords: *HKCAAVQ, credential, blockchain, web 3.0, system*

Introduction

Hi! I'm Oscar Cheuk, a UX Designer in Hong Kong. Over the past few years, I have collaborated with several government departments and public organizations on system designs that involve public interests. Some examples include the newborn baby tracking system with the Hong Kong Children's Hospital, the vaccination management and administration system with the HKSAR Department of Health during COVID-19, and the intelligent robotic logistics warehouse management system with the HKSAR Government Logistics Services. In 2021, I applied for a Master's program in Design Strategies at the Hong Kong Polytechnic University. Prior to applying, I went through various processes of educational assessment and certification, experiencing firsthand the pain points of these services. As a design student and UX designer, I aspire to explore the realm of educational credentialing and identify opportunities to propose suggestions. I hope to share my thoughts from a designer's perspective on addressing the inconveniences within the system. Additionally, I would like to express my gratitude in this article to my capstone project's guidance and supervisor, Jorn Buehring. I wish you all the best in your future endeavors. I would also like to thank my family and friends for their support throughout these two years.

In recent years, the issue of educational qualifications certification has received widespread attention from various stakeholders, and the educational qualifications of many well-known figures have been questioned by society. Additionally, with the continuous migration of Hong Kong residents (Figure 1) overseas for study or employment, the net outflow of population reached a high of 96,400 in 2020 (Census and Statistics Department, 2023). However, at the same time, there has been an influx of foreign professionals and non-local students into Hong Kong. As a result, the demand to prove one's educational achievements has become more fervent, and the services of educational qualifications certification have received significant attention. Currently, the provision of academic credentialing services in Hong Kong is primarily the responsibility of various tertiary institutions, and there are also third-party organizations that offer degree verification services. However, the service processes of these organizations are complex and opaque, requiring substantial manpower and resources to support their operations, and their final recognition is also subject to questioning.

Nevertheless, with the advancement of technology, society has entered the era of Web 3.0. Web 3.0 provides significant opportunities for both public and private organizations to utilize various next-generation technologies to organize operations and process information, such as land registration, healthcare management, security management, and academic and professional qualifications certification (Terzi et al., 2019; OECD, 2016). However, in Hong Kong, few public organizations have begun to utilize these technologies to transform their operational models, failing to keep pace with the progress of the times.

According to Lemieux & Dener (2021), the main barriers to harnessing the transformative power of blockchain and Web 3.0 technologies involve issues of human and institutional capacity in unlocking these applications. The invention of blockchain is not only intended to improve information processing efficiency but also to enhance trust among institutional stakeholders (Lemieux & Dener, 2021). According to IBM (2022), blockchain establishes trust among stakeholders by providing stronger security, greater transparency, and real-time traceability of information and data. In addition to trust, blockchain offers additional business advantages, such as cost savings achieved through improved efficiency, speed, and automation (IBM, 2022). The reduction in paperwork and errors can be attributed to the reduced expenses and operating costs of blockchain, as well as the decreased need for intermediary institutions to verify transactions.

Against the background, this study aims to use The Hong Kong Council for Accreditation of Academic and Vocational Qualifications (HKCAAVQ) as a case study. The HKCAAVQ is the sole statutory organization in Hong Kong responsible for the evaluation and accreditation of educational qualifications. This paper will collect data using a combination of quantity and quality methods, and it will utilize the double-diamond design thinking approach (Figure 2): Discover, Define, Develop, and Deliver. The objective is to explore how the services of HKCAAVQ can undergo a new evolution in the era of Web 3.0, providing an all-in-one academic assessment service for its target users.

		Births	Deaths	Natural change (1)	Net movement (2)		Population growth	Population growth rate
		('000)	('000)	('000)	('000)		('000)	(%)
Type of movement		Total	Total	Total	Inflow of One-way Permit holders	Net movement of others	Total	Total	Total
Year	Reference time-point								
2019	Mid-year	**53.3**	**47.6**	**5.6**	44.4	5.2	**49.7**	**55.3**	**0.7**
	Year-end	**52.9**	**49.0**	**3.9**	39.1	-10.1	**29.0**	**32.9**	**0.4**
2020	Mid-year	**49.5**	**49.5**	**0.1**	22.1	-49.1	**-27.0**	**-26.9**	**-0.4**
	Year-end	**43.0**	**50.7**	**-7.6**	10.1	-96.4	**-86.2**	**-93.9**	**-1.2**
2021	Mid-year	**38.5**	**51.1**	**-12.6**	13.9	-69.2	**-55.3**	**-67.9**	**-0.9**
	Year-end	**37.0**	**51.2**	**-14.2**	17.9	-28.9	**-11.0**	**-25.1**	**-0.3**
2022	Mid-year	**35.1**	**61.6**	**-26.5**	18.3	-58.7	**-40.4**	**-67.0**	**-0.9**
	Year-end p	**32.5**	**62.1**	**-29.5**	21.2	-60.0	**-38.8**	**-68.3**	**-0.9**

Figure 1: Net movement of Hong Kong by Census and Statistics Department

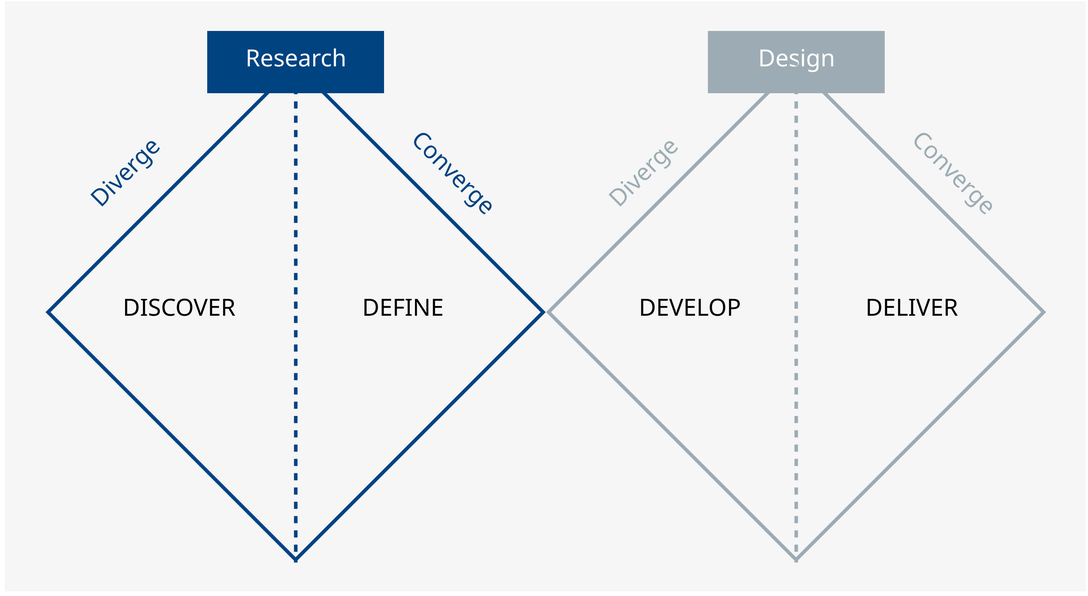


Figure 2: Double-diamond design thinking approach

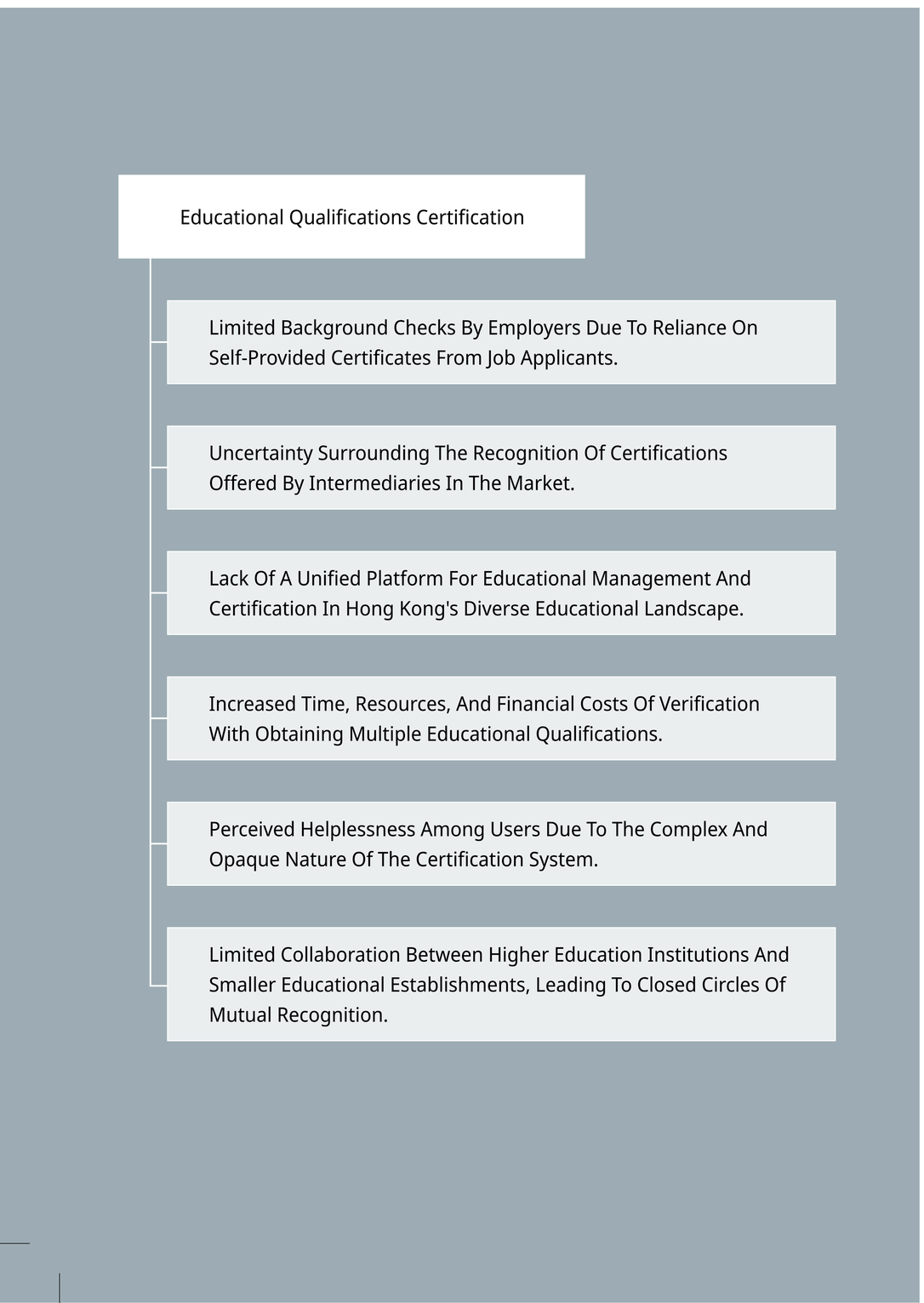
Discover

3.1 Overview of Global Credential Verification Market

The global credential verification market has grown tremendously due to rampantly shifting technologies. Today, organizations are more likely to verify the education credentials of an individual than in the past because it has become easy to forge academic documents and identities (DCC, 2020). Government authorities and organizations use verification to confirm an individual's nationality, character, and academics. Ideally, the verification industry utilizes technological innovations, including various web-based applications, to access and monitor requests for accrediting (Ryabov et al., 2020). As such, the industry is characterized by significant data volumes that have fostered the need for cloud-based applications and machine learning algorithms to sort through the vast information. Besides, the industry collaborates extensively with other sectors and applications to share information regarding individuals' educational backgrounds, finances, information technology, and medical data. Over the last ten years, the credential verification sector has faced significant challenges, including increasing cases of identity theft and fraudulent operations. Various unethical organizations and notable individuals in society have become more prevalent, contributing to the massive growth of the industry. Another reason for industry growth is the increasing technological advancements and solutions for credential and identity verification. Organizations use various risk management platforms to monitor their customers and employees and minimize financial scams and other unscrupulous behaviors.

Education credentials verification is one of the largest sectors in the verification industry. Credential verification confirms the accuracy of an educational organization and its ability to provide verified learning programs and disseminate information that adheres to the various learning standards (DCC, 2020). Education verification also confirms the accuracy of an individual's academics, learning certificates, and related documents to verify their identity. Additionally, the industry ensures that learning institutions meet quality standards and adhere to all the requirements of learning (HKCAAVQ, 2021). Employers mostly use education accreditation services to ensure their employees have the required credentials.

Figure 3: Problems in educational qualifications certification



From Figure 3, it is evident that there is a persistent demand in the Hong Kong educational qualifications certification market, which involves multiple stakeholders facing diverse challenges within this market. Consequently, we can ascertain the research questions guiding this study:

1. How can participants in the educational qualifications certification market effectively manage and scrutinize educational data?
2. How can the credibility of educational qualifications certification in Hong Kong be enhanced?
3. How can the utilization of technology augment the transparency and fluidity of the educational qualifications certification system?

3.2 About HKCAAVQ

The Hong Kong Council for Accreditation of Academic and Vocational Qualifications (HKCAAVQ) is a legislative agency established in 2007. Formerly known as the HKCAA, the organization was formed under the ordinance chapter 1150 and is the accreditation authority appointed by the secretary of education (HKCAAVQ, 2021). The statutory body has four main functions: First, the agency is responsible for accreditations regarding assessment agencies, qualifications, individuals, and learning programs. Second, the organization disseminates information about the various learning standards that must be followed by various learning institutions and promotes effective learning methods. Third, HKCAAVQ conducts extensive research and commissioned research on the maintenance and monitoring of training and education standards. Lastly, the organization forms relationships with other quality assurance and accreditation agencies outside of Hong Kong. This enables it to constantly review educational systems and compare them with standards outside of Hong Kong.

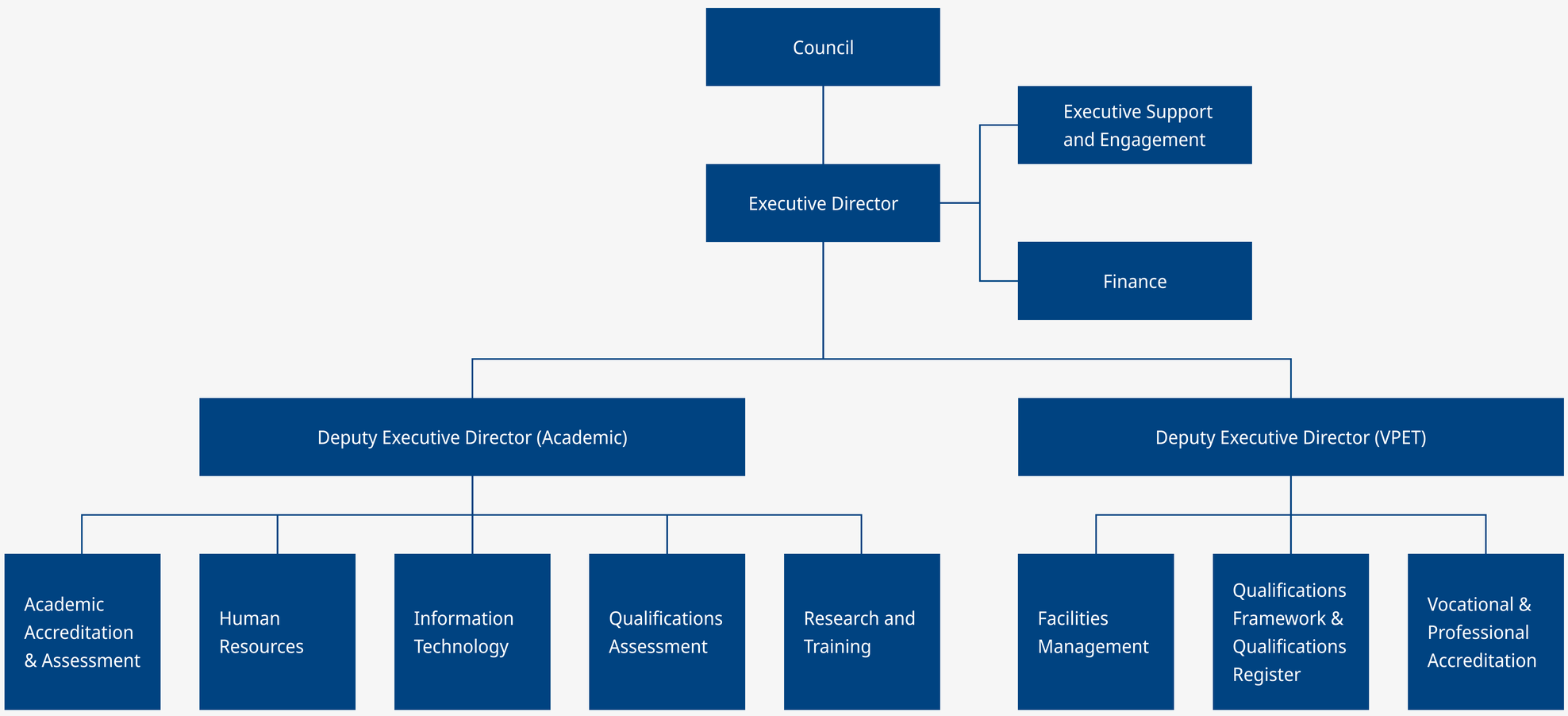


Figure 4: Organizational structure of HKCAAVQ

The organization comprises a council with between 15 and 21 members responsible for the decision-making processes. The council members are usually appointed by the Hong Kong Chief Executive. Notably, HKCAAVQ accredits and verifies organizations and programs based on requests. Organizations that want to get accredited must complete a thorough quality assurance process established by the organization, which has four stages (UNESCO). During the first stage of the accreditation process, HKCAAVQ assesses whether the organization meets the competencies required to offer and manage educational programs and services. HKCAAVQ also assesses the applicants' resource capacity and ability to deliver educational programs accordingly. In the following stages of the application, HKCAAVQ assesses the learning outcomes, assessment methods, and the planning of programs to ensure that they adhere to the standards. The process can take up to 16 weeks.

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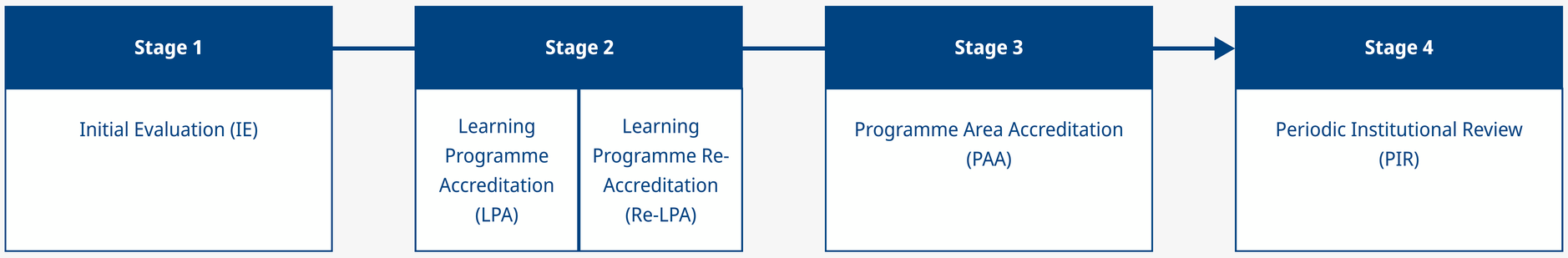
Hong Kong Council for Accreditation of
Academic & Vocational Qualifications

The Four Stages of Accreditation by HKCAAVQ

The aim of HKCAAVQ is to make sure students and vocational trainees meet a minimum threshold for programmes they are undertaking, as well as to ensure these programmes meet quality standards. To achieve this ambitious aim, HKCAAVQ uses a four-step quality verification model to address programmes delivery and guarantee internal quality. The verification model also ensures that operators are able to develop competencies for improvement and organizational productivity. This process is informed by the four-stage quality assurance process manual of the Hong Kong qualifications framework. The diagram below illustrates the four-steps undertaken before recognition and how they ate derived from each other.

Figure 5: The four-stage process of quality assurance



Stage	Purpose
Initial assessment of the four-step of the quality assurance process	To determine whether the person if fully skilled to operate the learning programmes under Hong Kong quality standards (HKQF) to a certain allowed level
Programme accreditation and re-accreditation	1. To tell whether the learning program satisfy HKGF standards for the set objectives 2. To tell whether the person is competent to undergo continuous monitoring
Accreditation of the four step process in a programme area	To tell whether the person is competent to meet quality assurances in a given programme to a given level
Periodic institutional review of the four step process	To tell whether the person is capable of effectiveness in meeting goals and vision and is open to improvement

Figure 6: Summary of the four steps of the HKCAAVQ process.

Apart from its role in quality assurance, HKCAAVQ acts as an advisory organization to government organizations and education institutions in Hong Kong and different Asia-Pacific regions (UNESCO). As such, the organization's reach is increasing internationally. For instance, HKCAAVQ has international liaisons, which have been handy in enabling the organization to meet its objectives successfully (Achim et al., 2021). One of HKCAAVQ's most important partnerships is with the International Network for Quality Assurance Agencies in Higher Education (NQAAHE), developed in 1991 (HKCAAVQ, 2021). As such, HKCAAVQ also maintains networks with many other accreditation bodies in various countries, including the UK and Ireland.

3.3 Status Quo

3.3.1 Local market competitors

HKCAAVQ currently competes with various accreditation services in Hong Kong, including the Hong Kong Accreditation Service (HKAS), MINSEN Certification, HKUST Blockcerts System, CityU e-Certification, DW Certification Limited, and JUCC. However, most current accreditation bodies offer quality assurance services in sectors other than education. HKCAAVQ has remained the main body responsible for providing accreditation services in education programs and is legislated under the Government of Hong Kong (Trifiro, 2019). Through verification, it ensures confirms the accuracy of an educational organization and its ability to provide verified learning programs and disseminate information that adheres to the various learning standards (DCC, 2020). Education verification also confirms the accuracy of an individual's academics, learning certificates, and related documents to verify their identity. Additionally, the body ensures that learning institutions meet quality standards and adhere to all the requirements of learning (HKCAAVQ, 2021). Employers mostly use these education accreditation services to ensure their employees have the required credentials. In Hong Kong, HKCAAVQ is the most prominent player in education credentials verification and is responsible for the quality assurance of learning and training organizations.

3.3.2 The adoption of new and innovative technologies

HKCAAVQ has taken advantage of new and innovative technologies and the growing global credential market to expand across the world. Education credentials verification is one of the largest sectors in the verification industry. Technological integration has been adopted to exemplify the service provision of these organizations. Over the last ten years, HKCAAVQ and other accreditation agencies have been adopting digital technologies, data analytics, and robotics to improve the efficiency of their service provision (Trifiro, 2019). In 2021, HKCAAVQ announced the development of a QR mobile application that allows users to check their verification and other credentials online (HKCAAVQ, 2021).

3.3.3 Independent operation of a public organization

HKCAAVQ is the only statutory organization under the government of the Hong Kong Special Administrative Region responsible for curriculum review, academic accreditation, and qualification assessment. However, its positioning differs from that of other public institutions. It operates as a self-funded semi-autonomous organization, generating revenue through service fees and adopting a commercial business model, while also receiving partial government funding to enhance service quality. Its personnel management is also linked to the civil service structure.

HKCAAVQ primarily collects service fees for four types of services: Accreditation, Assessment, Qualifications Framework and Qualifications Register, and Research, Training & Consultancy. According to HKCAAVQ's Annual Report (2022), their operating income for the fiscal year 2021/22 amounted to HKD$202,616,714 (Figure 7). Accreditation and Assessment are the core business of the organization. The former service is provided to course providers who need to communicate with the Accreditation Authority and submit applications directly. The Authority assesses the institutions' capacity to provide and manage educational programs and services, as well as evaluates the resources and capabilities of applicants in offering educational programs. In the subsequent stages of the application process, the Authority evaluates learning outcomes, assessment methods, and plans to ensure compliance with standards. This process can take up to 16 weeks. The latter service is more focused on the general public, students, or individuals with foreign qualifications. Users can register and apply through the Authority's website, and the entire Qualifications Assessment (QA) process is divided into five stages: Preparation, Submission, Assessment, Results, and Review (HKCAAVQ, 2023). Typically, once users provide sufficient information, the organization begins formal processing and guarantees a response within seven working days via email. The assessment fee for this service starts at HKD 2,950, depending on the purpose of the evaluation. The results received by users will indicate their academic achievements at the levels of the Hong Kong Qualifications Framework (QF).

STATEMENT OF COMPREHENSIVE INCOME
全面收益表

For the year ended 31 March 2022 截至二零二二年三月三十一日止年度

		Notes 附註	2022 HK$ 港幣	2021 HK$ 港幣
Income	**收入**			
Revenue	營業收入	5	**103,699,311**	98,917,403
Government grants	政府補助		**5,841,790**	7,243,044
Investment income	投資收入	6	**2,580,277**	2,503,225
Other income	其他收入	7	**533,447**	180,437
			112,654,825	108,844,109
Expenditures	**支出**			
Staff costs	員工成本		**(61,443,416)**	(60,553,316)
Administrative expenses	行政費用		**(11,980,266)**	(12,779,644)
Direct accreditation/consultancy costs	直接評審／顧問成本		**(9,070,352)**	(8,853,811)
Council meeting and committee expenses	本局會議及委員會支出		**(284,452)**	(264,586)
			(82,778,486)	(82,451,357)
Surplus for the year	**本年度盈餘**	8	**29,876,339**	26,392,752
Other comprehensive (expense) income	**其他全面(開支)收益**			
Item that will not be reclassified subsequently to profit or loss:	*其後不會重新分類至損益的項目：*			
Fair value (loss) gain on investments in equity instruments at fair value through other comprehensive income ("FVTOCI")	以公允價值計量且其變動計入其他全面收益的權益工具投資之公允價值(虧損)收益		**(2,775,300)**	2,092,350
Other comprehensive (expense) income for the year	**本年度其他全面(開支)收益**		**(2,775,300)**	2,092,350
Total comprehensive income for the year	**本年度全面收益合計**		**27,101,039**	28,485,102

Figure 7: HKCAAVQ's Comprehensive Income Statement

3.4 Trend

3.4.1 Global Trends

The adoption of blockchain technologies has been an increasingly emerging trend over the last five years. The Covid-19 pandemic offered adequate evidence for the need to develop the resilience of institutions, systems, and processes in the public and private sectors (UNESCO, 2022). In a context where the risk of disasters affecting data storage and use are increasing, countries are compelled to incorporate data resilience in the education sector as a fundamental aspect of disaster planning, as well as help national efforts of integrating blockchain technology as a key aspect in the implementation of sustainable development goals. Briggs (2018) defined blockchain technology as a database which permanently stores massive blocks of information, such as transaction history, to be shared within a particular community. The first blockchain was created in 2001, employing cryptocurrency, and was a distributed ledger (Jimoh et al., 2019), and the best-known blockchain technologies are those that power cryptocurrencies such as Bitcoin. Notably, bitcoins have been adopted widely over the last ten years due to their ease of transaction, transparency, and freedom of usage. A significant advantage of blockchain is that it cannot be hacked, and once information is stored, unauthorized individuals cannot access it. The application makes it possible to send and receive only the relevant bits of information to specific parties, and as each person receives a copy of the information, shared accountability keeps the information accurate and secure. As a shared ledger, blockchain facilitates the sharing, tracing, and recording of vast amounts of data across a network. Presently, certificates of attainment are increasingly being issued in the digital realm. For example, micro-credentials can be linked to a core system of identity verification, which is blockchain, and authenticated easily across institutional and national boundaries. The adoption is founded on research showing that over the past six decades, global student mobility has tripled to 6 million and is expected to double in the next decade (UNESCO, 2022). The increasing number of learners studying outside their countries, coupled with the sharp growth of online cross-border learning due to the Covid-19 crisis, and diversification of lifelong learning behaviors has fostered the requirement for portable, secure, and verifiable digital credentials. UNESCO (2022) observed that the affordance of blockchain technologies offers a unique potential to respond to this important need. The application has already proved successful at verifying digital records, simplifying organizational processes to enable mobility, and minimizing fraud through transparent and tamper-resistant records of certificates. In addition, the technology allows users to have portable, verifiable, and secure digital credentials, and to prove their personal identity to other parties, while also protecting their ownership of their assets. As the world shifts to Web 3.0, blockchain technology is considered a profound addition to institutional processes.

Information disclosure is increasingly becoming a challenge because of data breaches. As Briggs (2018) observed, it is becoming more difficult to keep information private, and the process is more complex in large organizations. A report by the Privacy Commissioner for Personal Data of Hong Kong stated that cyber-attack incidents, including ransomware, comprised 30% of the reported data breaches and one out of four incidences was due to a lack of appropriate governance and applications systems to protect the institutions from hackers. The influx of digital technologies and models of credentialing means that the organization holds massive of data, including personal details that increase its vulnerability to security risks and reputational damage. The blockchain technology model creates the ability to verify if certain attributes are true or false, potentially using a decentralized infrastructure. The advantage of the model is that each party maintains their copy of the information, and all members must validate updates collectively (UNESCO, 2022). The information could entail transactions, contracts, assets, and anything that can be used in digital form. In addition, the entries are permanent, transparent, and traceable, which makes it possible for community members to view transactions, increasing the trust and efficiency of the organization.

Another important reason for adopting blockchain technologies is their focus on information sharing and access (UNESCO, 2022). They provide primary data from and binding ledgers that allow users to view all the information ever received. Organizations using blockchain technologies do not have to worry about hacking or fraudulent information (Cheng et al., 2020). For this reason, these technologies present significant opportunities for HKCAAVQ and other organizations dealing in quality assurance to enhance quality credential verifications, particularly given that all transactions in the blockchain are placed together in a chain or network that cannot be reversed.

3.4.2 Local Trends

On average, each person in Hong Kong owns two mobile phones (HK01, 2020), and nowadays, individuals have become accustomed to a paperless lifestyle, using their mobile phones to handle daily affairs. Mobile phones also store a large amount of important personal information, including credit cards, passports, identity cards, membership cards, and more. People have also become accustomed to the data control and transparency brought by technology, including delivery tracking, restaurant ratings, various electronic services, and so on. The business market in Hong Kong is thriving, and institutions often keep up with global trends by developing various types of electronic services. The characteristics of Hong Kong people are also aligned with following technological trends. Whether it's the introduction of Clubhouse, Metaverse, and NFT during the COVID-19 period or the recent launch of Threads, they have attracted a large number of downloads from Hong Kong people within a few days (Figure 8). This demonstrates the high level of acceptance of new technologies in the Hong Kong market.

Blockchain technology, despite being in development for several years, still remains an emerging trend in the technology market with great potential. While its widespread adoption in the field of education quality assurance and verification has not yet been achieved (Jimoh et al., 2019), most educational and credentialing institutions that have adopted blockchain have begun using it as the primary technology for storing and sharing academic records and certificates. For example, the Hong Kong University of Science and Technology launched the HKUST platform, a block-chain enabled verification system for documents such as graduation diplomas and academic transcripts (HKUST, 2022). The model was created in a move to promote a paperless sustainable institution as well as countering the issue of fake credentials. Graduates can receive cryptographically signed and tamper-proof e-versions for their graduation certificates. Other institutions, including HKCAAQ are yet to integrate the technology within their system in relation to accreditation of academic and vocational qualifications.

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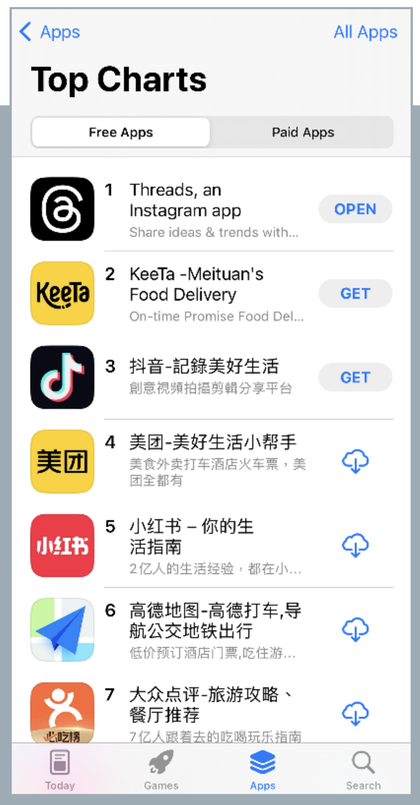


Figure 8: Top Charts in Hong Kong App Store at Jul 2023

Define

4

4.1 Stakeholder

To gain a thorough understanding of stakeholder interaction, it is crucial to take all stakeholders into account. The following stakeholder map (Figure 9) shows various stakeholders classified by their level of engagement and commitment to HKCAAVQ. The map offers diverse approaches for effectively engaging with each stakeholder.

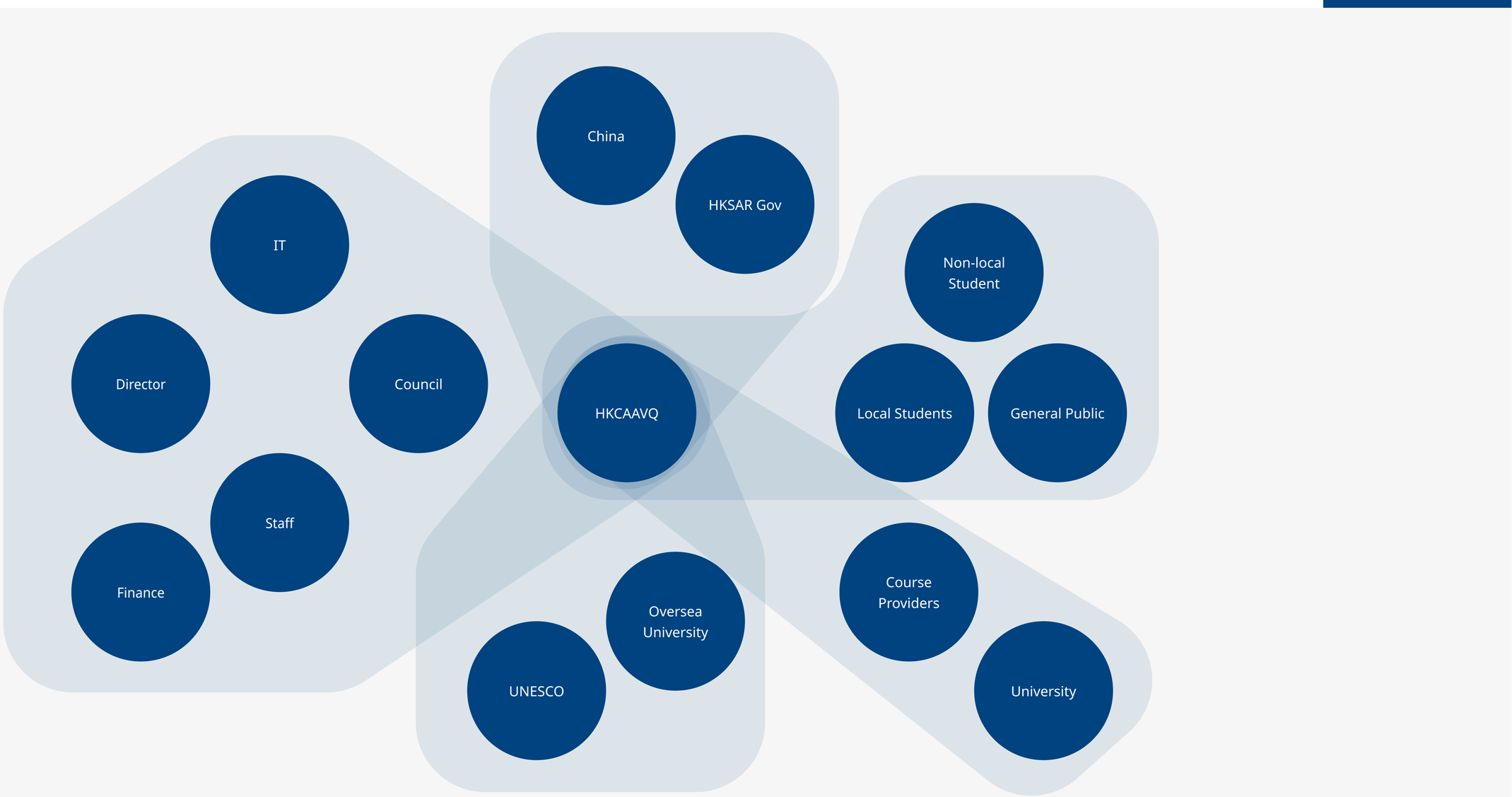


Figure 9: Stakeholder Map of HKCAAVQ

From the figure, we can observe that there are five major types of stakeholders associated with HKCAAVQ. The first type is the government, influenced by both the Chinese government and the government of the Hong Kong Special Administrative Region. As a public institution, HKCAAVQ conducts curriculum reviews based on the professional content of the courses and investigates the institutions' loyalty to the government. Additionally, the government provides various funding schemes to HKCAAVQ. The second type is the employees of HKCAAVQ, who directly influence the organization's operational efficiency and interactions with other stakeholders. The third type is collaborators, as HKCAAVQ needs to communicate and collaborate with non-local educational institutions to conduct comprehensive evaluations of foreign qualifications. Therefore, establishing good relationships with collaborators is crucial for enhancing services. The fourth type is the local course providers, who need to provide sufficient evidence to demonstrate the professional standards of their courses. The fifth type is the graduates of various post-secondary programs, as their qualifications will impact their future career development. Thus, the process of qualification recognition is an essential aspect of their lives.

The educational institutions and students are stakeholders directly associated with HKCAAVQ's operations, making them the core customers of the organization. However, according to the survey results (Figure 10), 92% of students are unaware of the existence of HKCAAVQ. Among individuals with a bachelor's degree, 39% (Figure 11),reported having used qualification verification services. All respondents with a master's degree indicated that they have used qualification assessment or verification services. Among the local respondents who have used qualification verification services, all of them did so through their original institutions. From the data, it is evident that there is a high demand for qualification verification services in the Hong Kong education market. However, HKCAAVQ has a relatively low level of awareness among local students, and some of its business has been taken over by university institutions. Nevertheless, the services provided by the original tertiary institutions are not perfect. By examining the student user journey map (Figure 12) below, we can gain a comprehensive understanding of the pain points that students currently encounter when using qualification

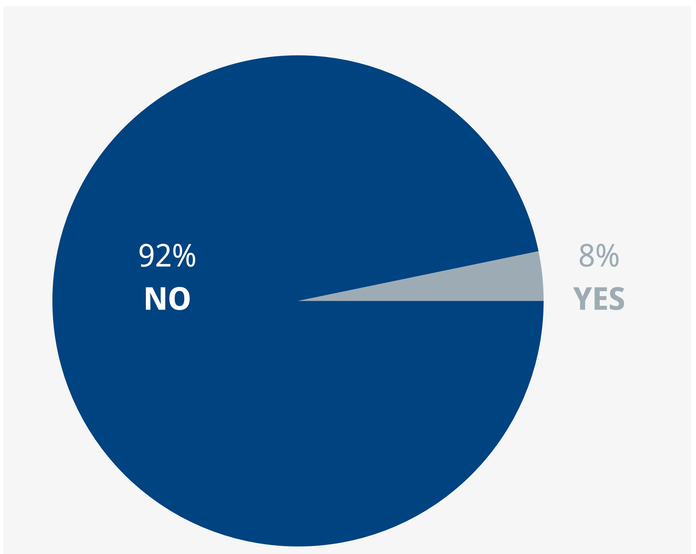


Figure 10: Do you know HKCAAVQ ?

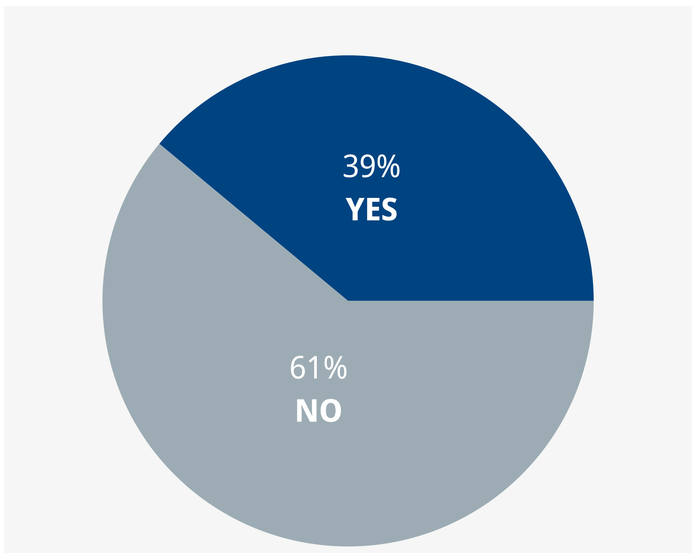


Figure 11: Did you use qualification verification services before?

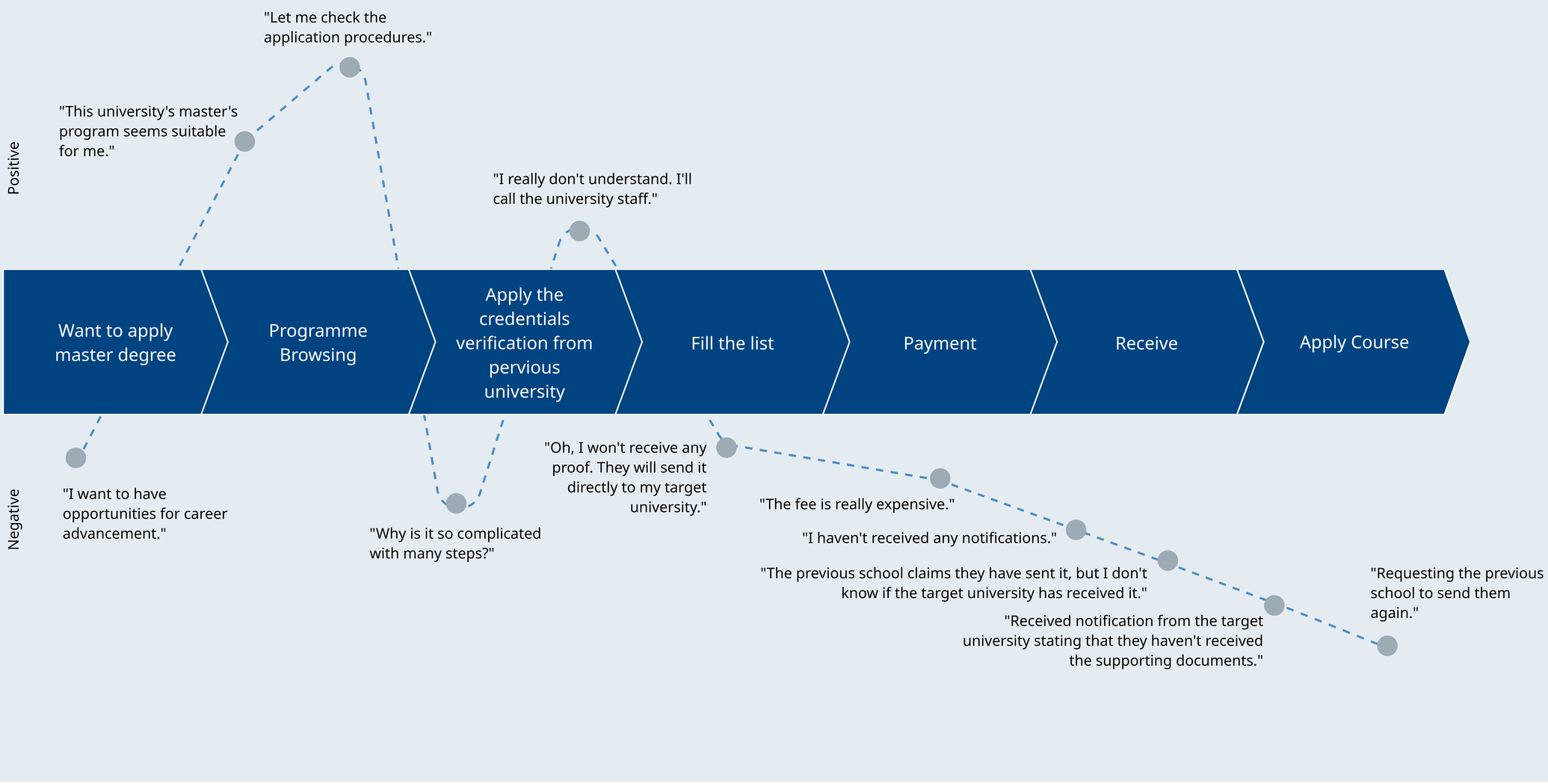


Figure 12: User Journey Map

4.2 Product opportunity gap

4.2.1 SWOT Analysis

The SWOT analysis framework assesses an organization’s key strengths, weaknesses, opportunities, and threats. The model is critical in identifying areas for improvement and using the available resources to take advantage of existing opportunities in the industry.

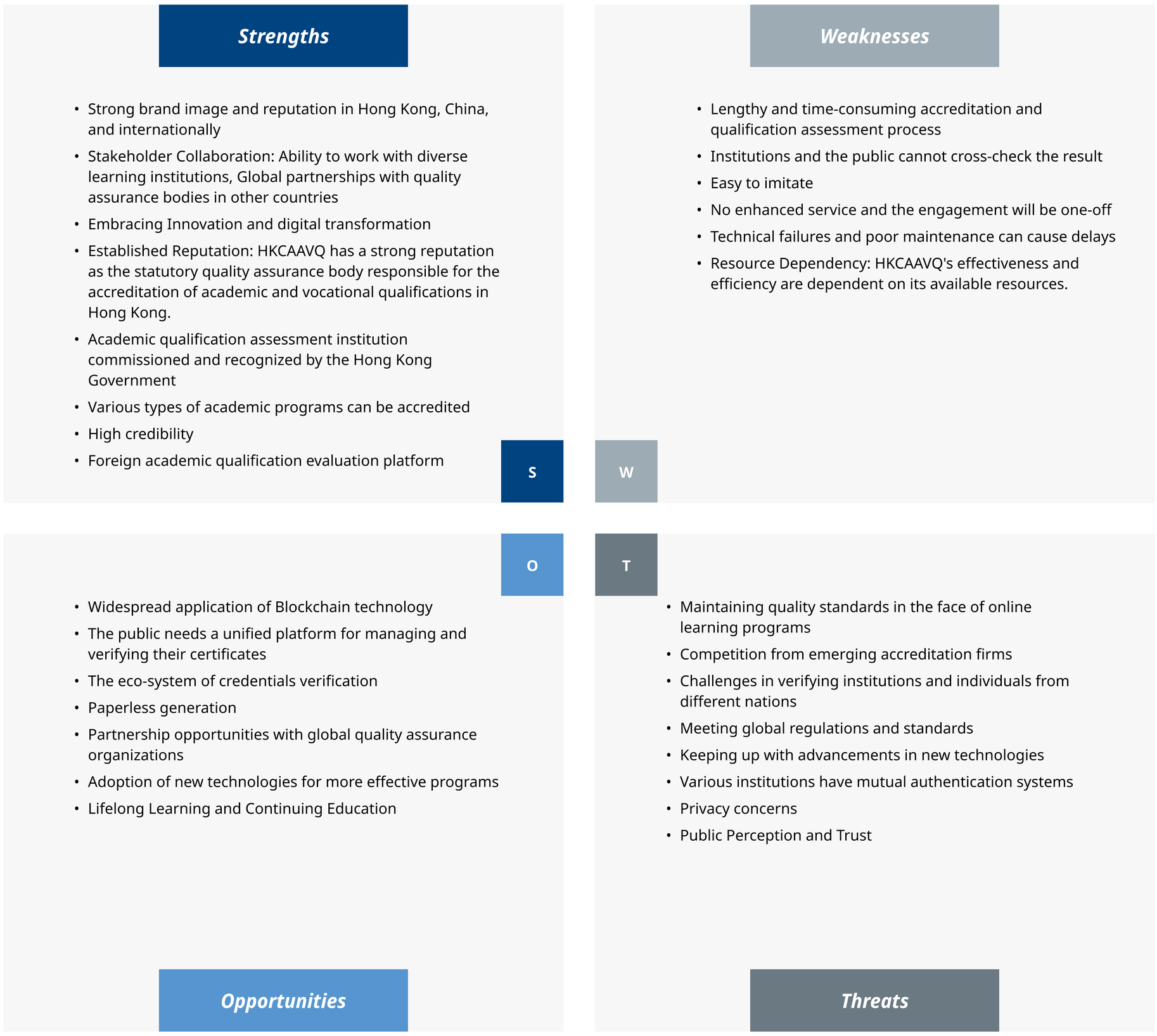


Figure 13: SWOT Analysis Of HKCAAVQ

4.2.2 SET Factors

The HKCAAVQ presently functions in the realm of Web 2.0, enabling many of its services to be accessed online. However, to advance from Web 2.0 to Web 3.0, additional research is required to examine the societal, economic, and technological aspects associated with the HKCAAVQ and to discover its potential for growth.

Social Factors	*Economic Factors*	*Technological Factors*

• Constantly changing labor force demand
  • Employment market demands are constantly changing
  • Emerging occupations and courses are increasing
• Globalization and mobility:
  • Students and professionals have an increasing desire for international mobility
  • Global online courses have become mainstream
• Low trust in government technology
• Hong Kong government gradually disconnecting from foreign institutions
• HKCAAVQ stakeholders are relevant but lack connectivity
• The public attaches greater importance to personal data and privacy
	• Intense competition in the Hong Kong market
	  • Trend towards specialization in skills
	  • Employers and universities prefer candidates with certifications
	• Expensive service fees of HKCAAVQ
	• HKCAAVQ users have one-time needs only
	• High cost of HKCAAVQ qualification accreditation
	  • Relies mainly on manual review
	  • Institutions cannot maintain 24/7 service
	  • Back-end server service requires funding to sustain
	• Market demand for centralized management of the same qualifications
	• Intense market competition
	  • Large academic institutions seek to generate revenue through qualification accreditation
	  • Universities collaborate to reduce accreditation costs
		• QA i-Portal service, accessible through online application
		• Technological ecosystem becomes mainstream
		• Development trend towards Web3.0 decentralization
		  • Digital currency
		  • Blockchain
		  • NFTs
		• Development of artificial intelligence
		  • ChatGPT
		  • Bard
		• Service quality is traceable and monitorable

Figure 14: SET Factors Of HKCAAVQ

Product Opportunity Gap

Based on the stakeholder analysis, examination of customer pain points, SWOT analysis, and SET factors, we can identify a product opportunity gap for The Hong Kong Council for Accreditation of Academic and Vocational Qualifications (HKCAAVQ)：

HKCAAVQ has traditionally been the institution with the highest recognition for qualification accreditation in the Hong Kong market. However, it is currently facing challenges in terms of market fragmentation by other intermediaries and alliances with major tertiary institutions, as well as low awareness among students. Nevertheless, the demand for qualification assessment and verification from students remains high, indicating that there is still potential for market development. Additionally, investing in future technologies presents a potential opportunity for HKCAAVQ.

Therefore, the product opportunity gap lies in leveraging HKCAAVQ's existing status as the leading accreditation institution in the Hong Kong market, addressing the challenges posed by market fragmentation and low awareness, and capitalizing on the continued demand for qualification assessment services. Furthermore, seizing the potential offered by technological advancements can contribute to the organization's growth and success.

4.3 Look into Future

By understanding the product opportunity gap, we can now hypothesize future scenarios and analyze the past, present, and future of HKCAAVQ. This analysis will provide a strategic foundation to guide our future design direction.

McKinsey developed the three horizons model in the twentieth century and has played a significant role over the years in helping organizations grow and expand on their innovation (Sharpe, 2020). The model reinforces strategic planning in companies and is centered on helping firms transform based on three approaches: horizons 1, 2, and 3. In each horizon, organizations focus on a different kind of transformation. The model is represented in an S-Curve graph with time and value axes (Blank, 2019). Therefore, each innovation is represented in three horizons that are measured according to their value. Horizon 1 innovations, typically, are short-term innovation projects that are meant to generate the required results in a short time, usually between one and three years. Tangible results of this horizon are visible because they will be witnessed within a short duration. The main goal of projects on this horizon is to maintain the core business activities as they generate revenues quickly. In Horizon 2, the innovations take longer to on for and complete. These projects can take between 2 and five years and invest significant resources. Horizon 2 projects aim to take advantage of emerging products and markets and focus on the growth of an organization. Lastly, horizon three innovations are long-term projects that can take between 5 and 12 years. Projects on this horizon create entirely new businesses or operations.

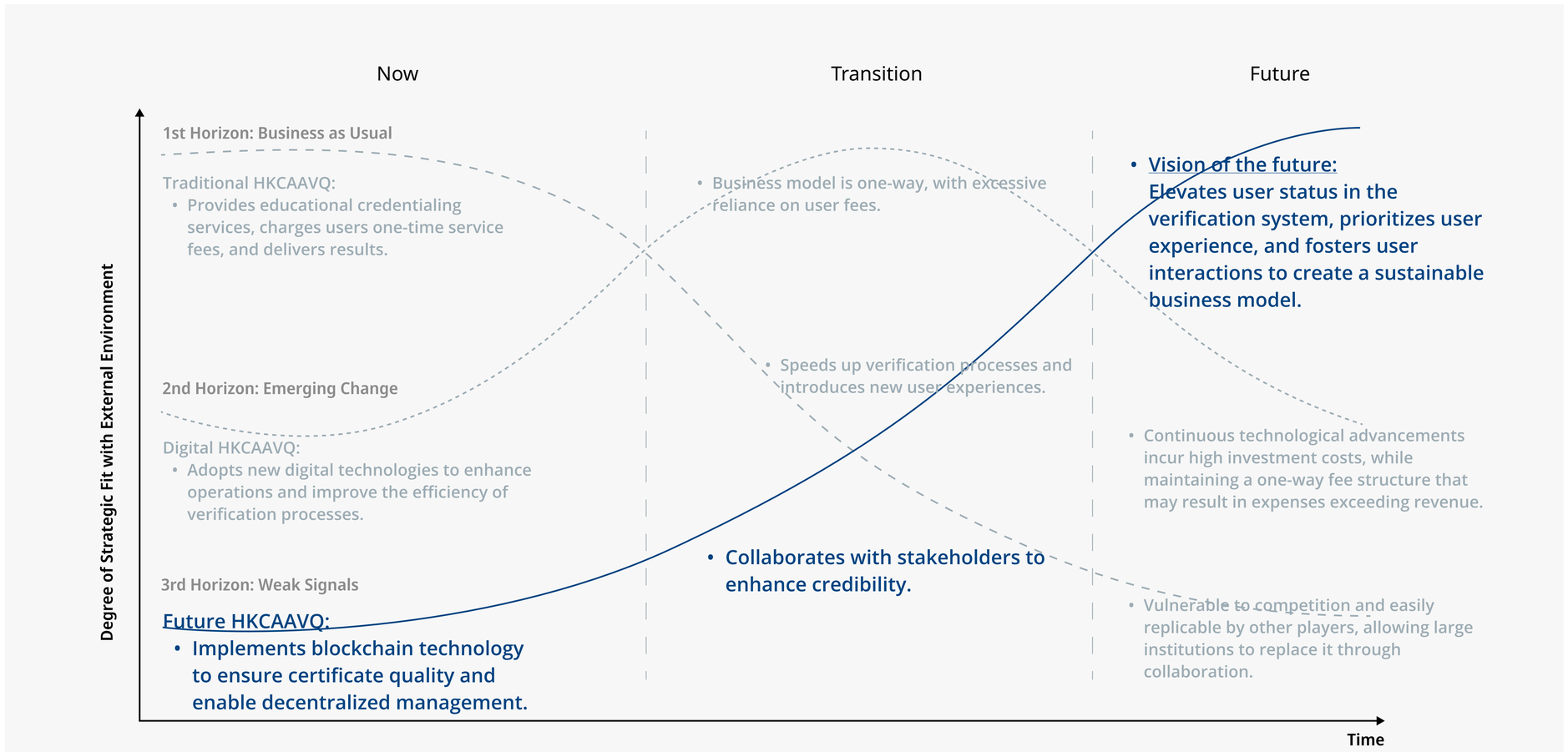


Figure 15: Three-horizon model Of HKCAAVQ

The three-horizon model can be used to evaluate HKCAAVQ's current state and prospects in various ways. Ideally, the model was developed to help organizations evaluate their existing business models while looking into opportunities for the future (Sharpe, 2020). The model has a significant focus on innovation, as it drives the growth of an organization. Based on the three-horizon model, HKCAAVQ is currently at horizon 2 of innovation. Over the last few years, the organization has adopted new digital technologies to enhance its operations and verify organizations more effectively and efficiently. The onset of the Covid-19 pandemic in 2020 became a notable catalyst for the considerable shift by the organization toward adopting more digital solutions in its operations. Traditionally, HKCAAVQ evaluated learning organizations based on traditional methods. However, changing technologies have fostered HKCAAVQ to adopt digital innovations to evaluate the digital learning models used by organizations.

Since then, the organization has advocated for digital learning in classrooms and encouraged more learning institutions in Hong Kong to follow suit. The organization is now using online data analytics to conduct investigations and give accreditations to organizations (Trifiro, 2019). Online assessments are increasingly being used, which have become crucial in transforming the core business operations of HKCAAVQ. Notably, horizon two innovations focus on core and emerging businesses. In light of this, HKCAAVQ is now using changing technologies to transform its model. The use of blockchain to drive credential verification will also play a significant role in influencing the organization's core operations. Besides, the organization is looking into Horizon 3 innovations that are blotching technologies and how they can transform the learning nod verification process.

The future cone (figure) below illustrates the predictions and how HKCAAVQ can cater to the user's requirements.

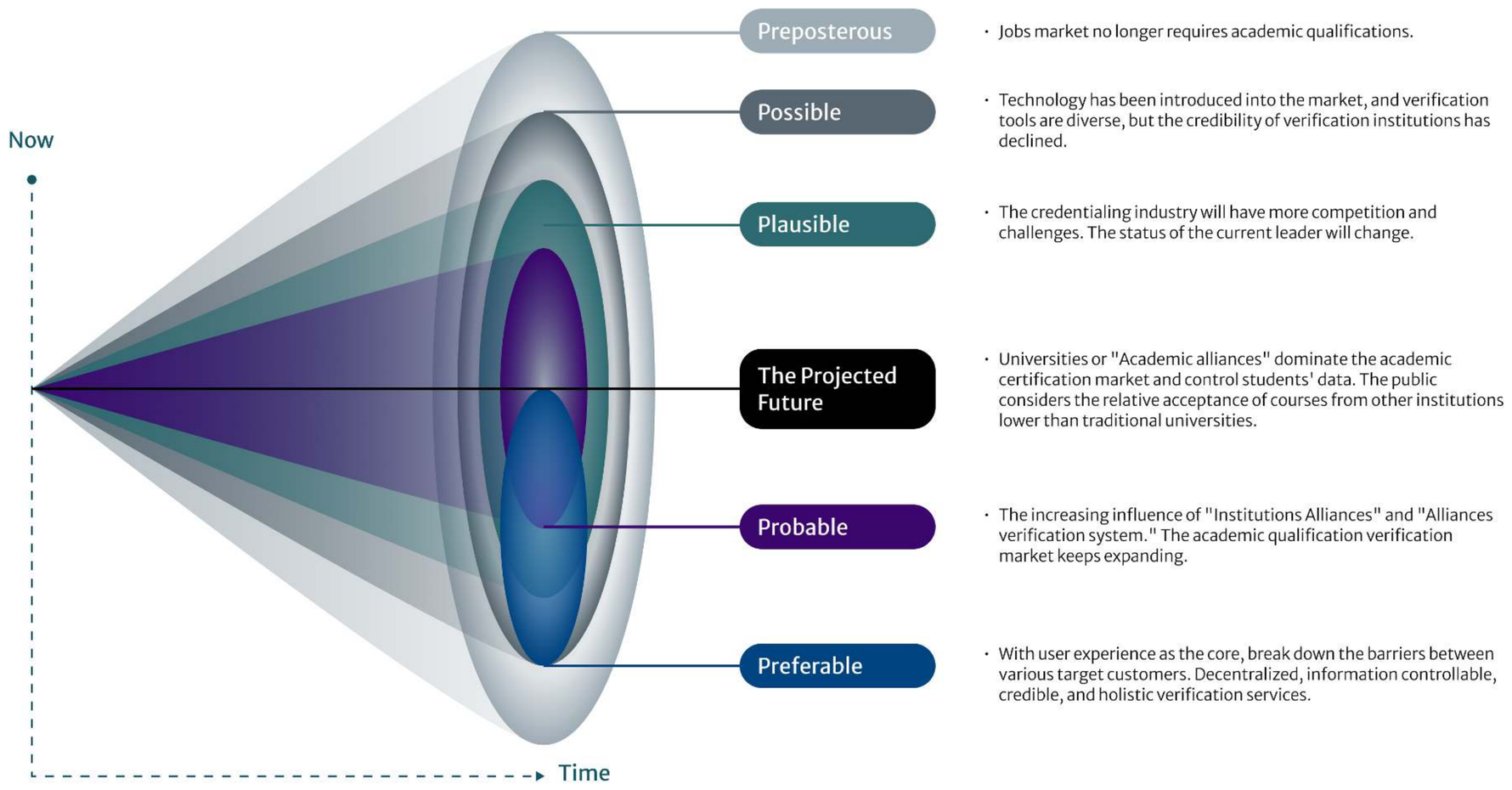


Figure 16: Future Cone Of HKCAAVQ

Based on the analysis above, it is evident that HKCAAVQ has a promising future. Now, we can define the opportunities statement for the organization's future development.

Opportunities Statement for HKCAAVQ:

By leveraging blockchain technology to rebuild the digital system and collaborating with tertiary course providers, redesigning the qualification assessment services by the HKCAAVQ would offer consumers a new credential management and verification ecosystem.

Develop

5

5.1 Brand Posting

To regain the fragmented market of qualification accreditation, keep up with technological advancements, and increase public awareness of HKCAAVQ, the organization must reposition its services by leveraging its statutory status and access to comprehensive course data from all tertiary institutions in Hong Kong. Furthermore, effective collaborations can be established to differentiate HKCAAVQ from other competitors. At present, HKCAAVQ faces competition from three formidable competitors in the Hong Kong qualification accreditation market:

- Joint Universities Computer Centre (JUCC): JUCC is a collaborative organization among the eight government-funded higher education institutions in Hong Kong, serving as a central computing and information technology service center. It aims to facilitate coordination, development, provision, and consultation services in the field of computing and IT, encompassing teaching, learning, research, and administration. JUCC includes mutual recognition services for qualifications among the eight member institutions.

- HKUST Blockcerts Verifier: The HKUST Blockcerts Verifier is an internal Electronic Documents Verification Program at The Hong Kong University of Science and Technology (HKUST). It is the first educational institution in Hong Kong to utilize blockchain technology for student registration and verification of released electronic documents. Once registered, the academic credentials of HKUST students and alumni possess features such as encrypted signatures, tamper resistance, and shareability, enabling individuals to possess and share their official records.

- e-Certification for Graduates: Offered by City University of Hong Kong (CityU), e-Certification for Graduates is an electronic certification service provided to CityU graduates. It allows graduates to issue independent links to employers, employment agencies, and educational institutions. These third-party entities can access and verify the academic and other achievements of the student during their time at CityU through the provided links.

The following figure illustrates the strengths and weaknesses of four institutions in the market, including HKCAAVQ:

	HKCAAVQ	***JUCC***	***HKUST Blockcerts Verifier***	***CityU e-Certification***
strengths	• Government statutory organization • Diversified range of services • Negotiating power with collaborators • High international reputation	• University alliance • Fast processing of academic credentialing • Responsive to university needs with quick system updates	• Adoption of blockchain technology • High transparency in services • User-friendly interface	• High transparency in services • User-friendly interface
weaknesses	• High fees • Lack of transparency in service progress • Difficult-to-use user interface	• Does not accept participation from other educational institutions • Lack of transparency in service progress	• Limited audience, only available to HKUST students	• Low technological sophistication, susceptible to hacking • Limited accessibility, only available to CityU students

Figure 17: Competitor Analysis

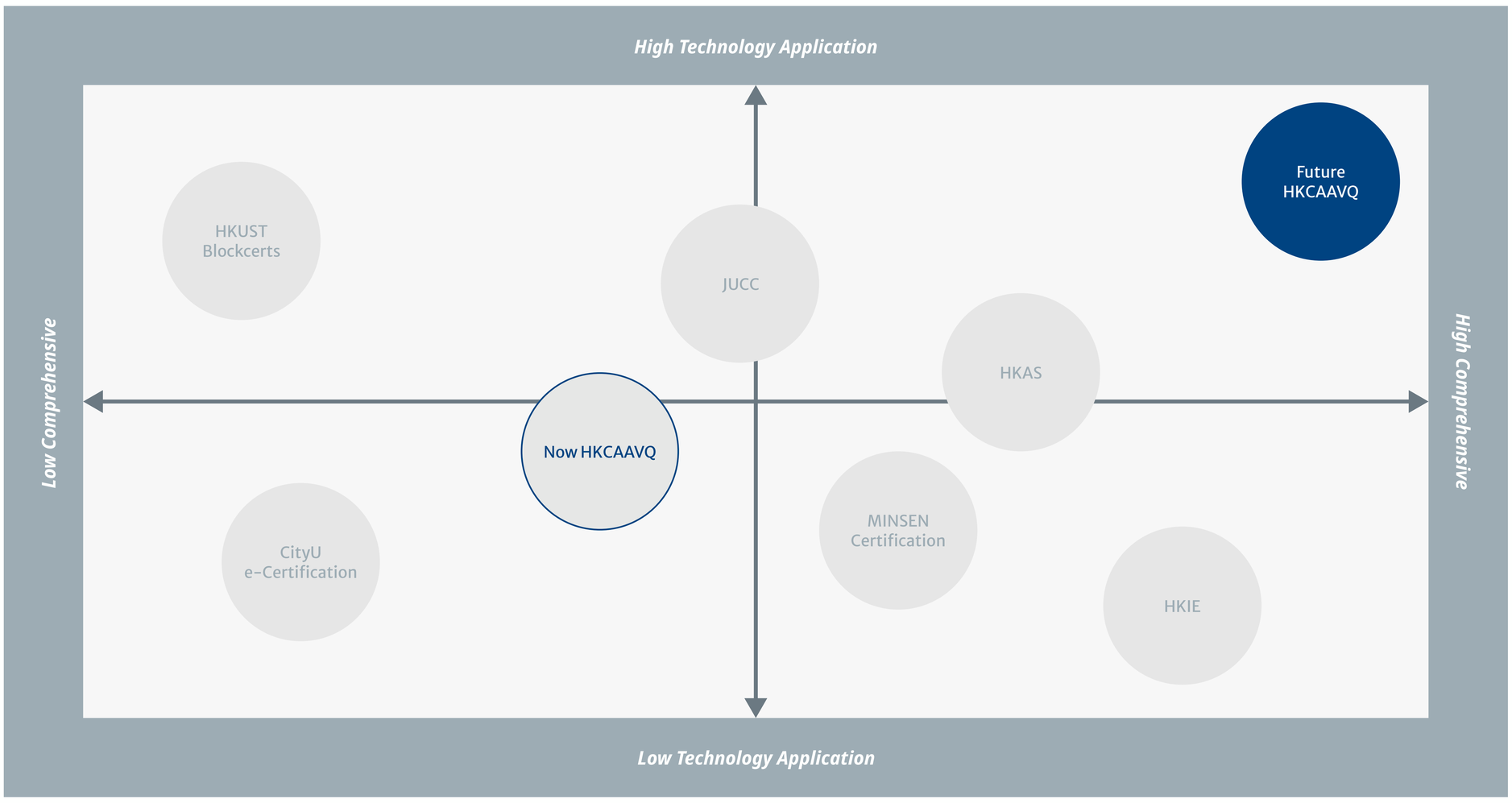


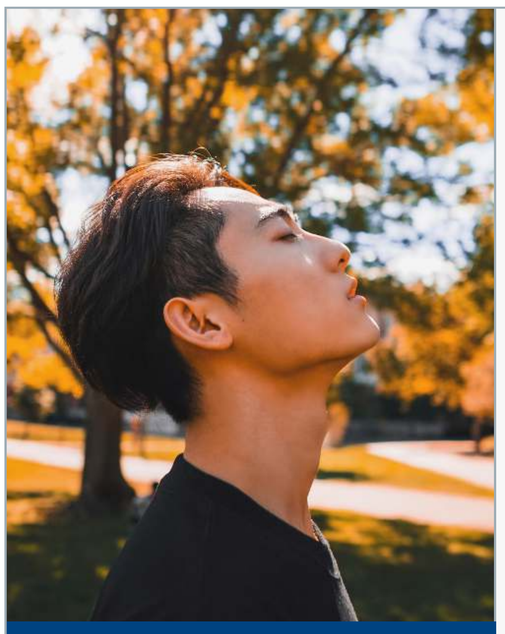
Figure 18: Position map of HKCAAVQ and Competitors

The above figure illustrates that the future development of HKCAAVQ will involve leveraging high-tech solutions and comprehensive integration to establish a more robust ecosystem for qualification accreditation, thereby differentiating itself from competitors. This approach aligns with the technological habits of Hong Kong individuals, making academic credential data more easily accessible, controllable, and portable. As a result, it fosters brand loyalty among the public towards HKCAAVQ.

5.2 Target Customer

Although the service of qualification accreditation primarily targets the mass market, where everyone needs to manage their academic data, establishing a new ecosystem involves engaging various stakeholders. It is essential to align with target customer groups and adopt precise strategies to target them effectively.

The primary users in need of qualification accreditation are students. Therefore, we will utilize two personas to aid future scenario planning and demand forecasting: Local University Student (Figure 19) and Non-local University Student (Figure 20). Both personas require the use of qualification accreditation services to enhance their job prospects or academic advancement opportunities. They serve as the primary proactive users within the system, engaging in interactions that build user reliance on HKCAAVQ.



Alex Yeung

Local University Student

Demographics

Age	20
Gender	Male
Education	High Diploma
Status	Single

Personality

Introvert	Extrovert
Creative	Analytical
Organised	Fateful
Independ	Team Player

Goal

- Considering studying at a local or foreign university
- Being able to provide proof of my academic qualifications and equivalency of foreign qualifications
- To gain the necessary credentials for the industry I aspire to work in.

Challenges

- The process of applying for verification services for my previous educational institution was complicated
- I had no way of knowing the progress of my application
- I continued to incur fees after submitting the application.

Figure 19: Persona of Local University Student

Joyce He

Non-local Student

Demographics

Age	27
Gender	Female
Education	Bachelor
Status	Single

Personality

Introvert	Extrovert
Creative	Analytical
Organised	Fateful
Independ	Team Player

Goal

- Considering studying for a master's degree in Hong Kong.
- Hoping to find opportunities to work with foreign companies in Hong Kong.
- Wanting to improve English language proficiency.

Challenges

- The process of academic credential verification in Hong Kong is complex.
- The intermediary fees, academic verification, and cost of living in Hong Kong are high.
- Needing to take the IELTS English language test.

Figure 20: Persona of Non-local Student

In our previous analysis, we defined two primary customer groups generating revenue for HKCAAVQ: educational institutions and students. However, within the new HKCAAVQ ecosystem, the target customer groups will expand to include business entities, totaling three groups. Both educational institutions and business entities are participants in the future system, albeit in a more passive role. However, their actions contribute to enriching the system's data and acceptance. Collaboration with educational institutions (Figure 21) can reduce their expenses related to academic data management while gaining technical support. As for business entities (Figure 22), they can easily access and verify applicants' academic achievements through the system, simplifying the background screening process. In the new ecosystem, HKCAAVQ, students, educational institutions, and business entities can create a win-win situation for all parties involved.

Samantha Lee

Course Provider

Demographics

Age	42
Gender	Female
Occupation	Marketing Course Subject Leader
Status	Single

Personality

Introvert	Extrovert
Creative	Analytical
Organised	Fateful
Independ	Team Player

Goal

- Provide high-quality and relevant courses.
- Enhance students' learning experience.
- Stay updated with industry changes.

Challenges

- Competition in the course market.
- Technology integration.
- Building credibility and reputation.
- Marketing and attracting students.
- Pass the accreditation from HKCAAVQ.

Figure 19: Persona of Course Providers

Tony Cheung

Business Entities

Demographics

Age	35
Gender	Female
Occupation	Human Resource
Status	Married

Personality

Introvert	Extrovert
Creative	Analytical
Organised	Fateful
Independ	Team Player

Goal

- Efficiently manage employee data and records.
- Streamline and automate HR processes.
- Ensure compliance with legal and regulatory requirements.
- Support employee engagement and satisfaction.
- Collaborate with other departments for effective workforce

Challenges

- Dealing with a large volume of employee information and paperwork.
- Adapting to evolving HR technologies and software systems.
- Ensuring data security and privacy.
- Navigating complex employment laws and regulations.

Figure 20: Persona of Business Entities

5.3 Value Proposition

To address the public dissatisfaction with the existing accreditation system and the growing demand for academic credentials, HKCAAVQ should proactively engage with educational institutions as a public organization and provide them with a graduate credential storage system. The new system will primarily cater to students, minimizing the institutional presence and enhancing user value. In below figure 23, we will utilize Peter Thomson's value proposition canvas (Thomson, 2015) to assess the situation. The value proposition canvas is a tool used to analyze various elements within a company and create a compelling value proposition. This process aims to achieve "minimum viable clarity," resulting in a concise value proposition statement. Thomson considers the value proposition as a crucial link between business strategy and brand strategy, and his model integrates both strategies. The canvas consists of six areas, each dedicated to exploring specific aspects that contribute to the overall value proposition.

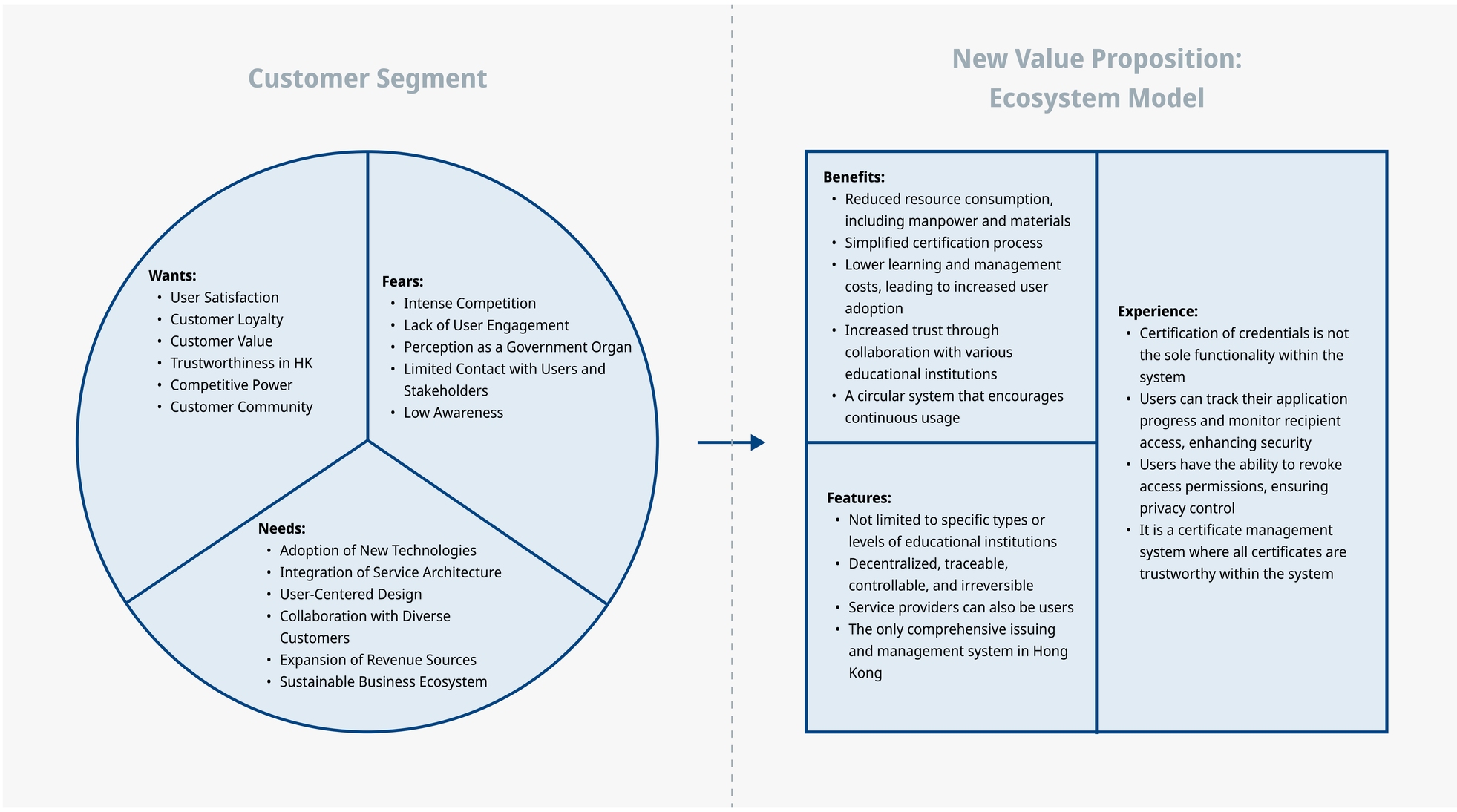


Figure 23: Value Proposition canvas

5.4 Brand strategies

Brand Statement: The goal of The Hong Kong Council for Accreditation of Academic and Vocational Qualifications (HKCAAVQ) is to provide educational institutions, business entities, and students with an all-in-one platform for efficient management, storage, portability, transmission, authentication, and tracking of academic credentials. By leveraging the advantages of blockchain technology, such as immutability, decentralization, long-term record-keeping, and high transparency, the future platform for qualification accreditation services will be more trustworthy and capable of sustainable operation.

The new brand identity of HKCAAVQ is characterized by high technology, trustworthiness, and inclusivity. Through the operation of the ecosystem, we aim to ensure that users understand that their academic credentials cannot be tampered with and that all actions on the platform are automatically recorded. The platform is designed to accommodate individuals with qualifications from all tertiary institutions, regardless of their size or reputation.

Deliver

6

6.1 Business Ecosystem

When establishing a new brand positioning and objectives, it is essential to re-evaluate the existing business model of The Hong Kong Council for Accreditation of Academic and Vocational Qualifications (HKCAAVQ) before introducing a new business model. Currently, HKCAAVQ operates under a traditional one-way business model, where the organization serves as a service provider, and users select their services based on their needs, establishing contracts. Once the one-time payment is made and the results are received, the contract is completed, and the relationship between HKCAAVQ and the user ends. In this operational model, it is evident that the role of the organization is more passive, with interactions with stakeholders limited to the moments of placing an order and delivering the results. In the current business environment, which emphasizes user experience and building relationships to generate more value, HKCAAVQ's model lags behind and fails to keep up with the development of the times and market competition. The diagram below provides a detailed illustration of the current business interaction between HKCAAVQ and its customers.

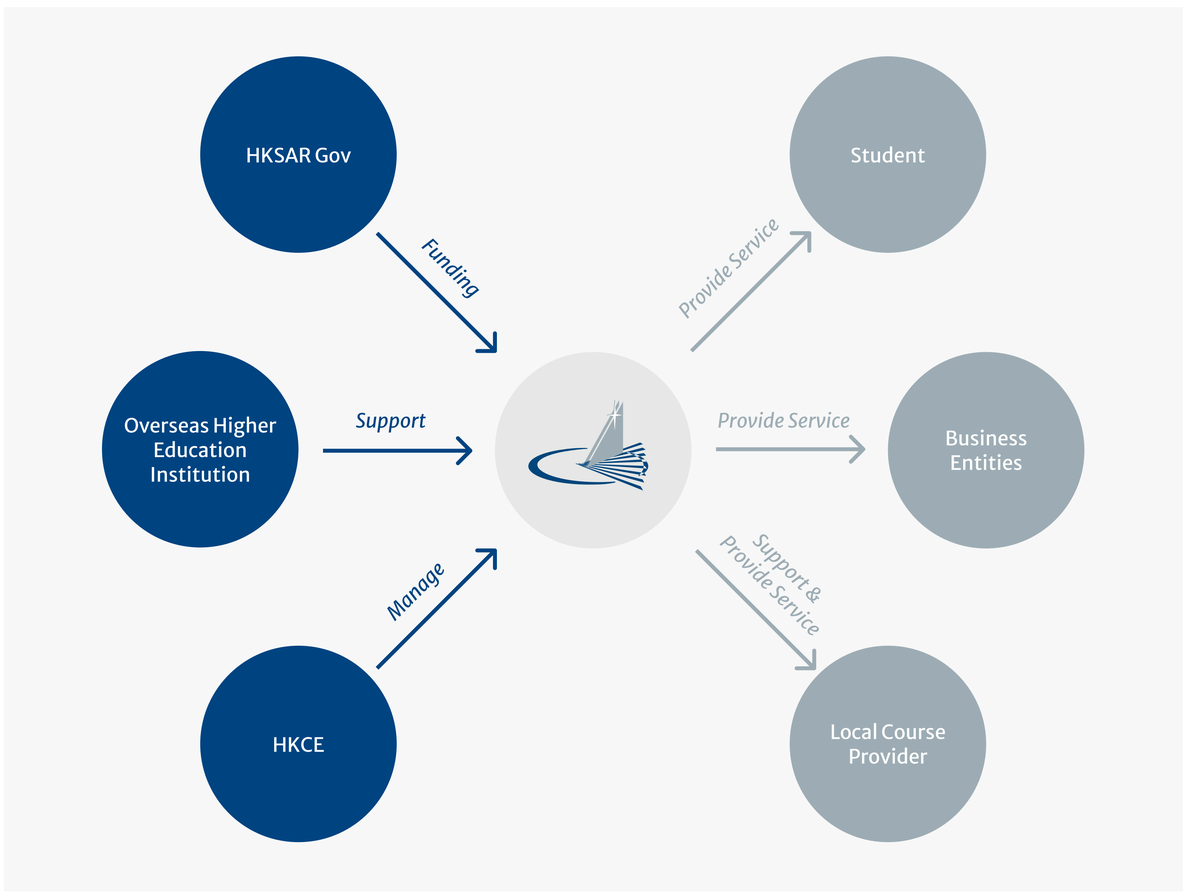


Figure 24: Current business model

Now, we aim to establish a new iterative business model for the HKCAAVQ's new ecosystem. The diagram in Figure 24 reveals the connections between the organization and multiple stakeholders. HKCAAVQ will address the disparities in accreditation services for educational institutions of different sizes by standardizing the presentation of academic achievements across various schools. Departing from the past, the new positioning of HKCAAVQ will transform it from a service provider to a service custodian, allowing more stakeholders to interact through the platform. For instance, institutions can upload graduates' academic achievements and grades, which can be accessed by students through the system instead of being sent directly to their accounts. Students can obtain their graduation certificates and academic records by logging into the system. When students have job or further education opportunities, they can simply send their academic records to the target companies through the platform. The companies can track the number of views and can revoke access at any time. Furthermore, businesses no longer need to apply for certification through phone calls or written applications to educational institutions. Once an email is generated by the system, they can clearly understand the applicant's academic background. As depicted in this interaction diagram, the presence of HKCAAVQ will be diminished within the system, and the new operational model mitigates the drawbacks of the previous one-way interaction. In this circular economy model, the service provider will become the system itself rather than the HKCAAVQ organization, reducing the need for human and material resources. However, the organization can sustain its operations by charging accreditation fees, ensuring that all stakeholders benefit from the new system.

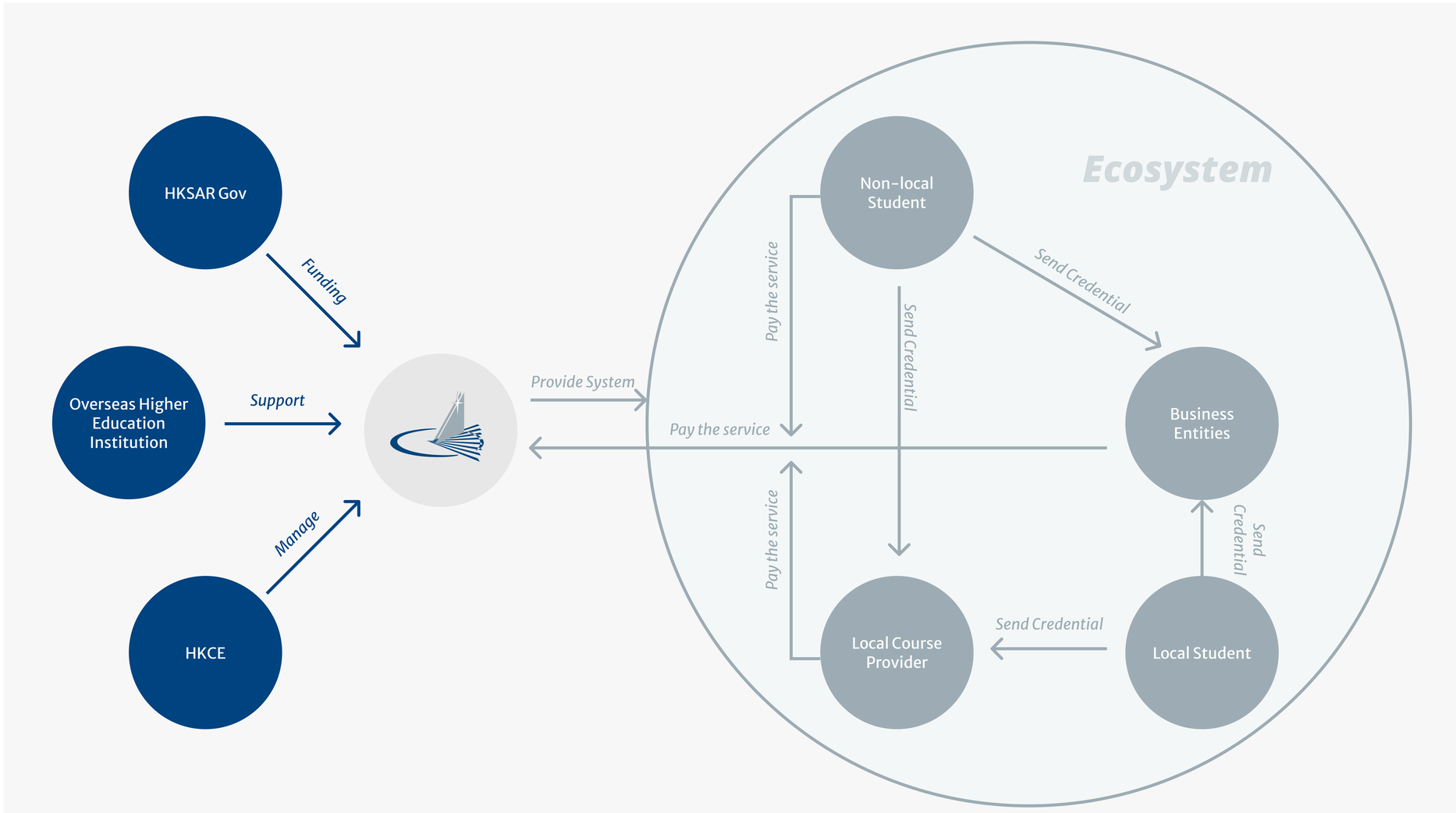


Figure 25: New business ecosystem

The presented model provides a robust ecosystem for establishing connections among different stakeholders, meeting the growing demand for academic certification services in Hong Kong society. In this model, individuals can conveniently manage their data anytime and anywhere. Academic institutions reduce the need for human and material resources to manage graduate records and data. Businesses gain confidence through receiving academic certification reports issued by government agencies. The primary operational costs for HKCAAVQ itself are server maintenance and network supply.

6.2 Value Transformation

The current development of HKCAAVQ has been relatively slow, and despite the desire of the institution to keep up with social and technological trends, it has not been able to leverage its influence effectively (Figure 26). As a result, it faces pressure in four areas: economy, psychology, sociology, and ecology. To analyze this situation, we can apply Elke Den Ouden's (2012) value framework, which enables the creation of shared value for individuals, organizations, and society. This framework emphasizes the understanding of challenges at the user, organizational, and societal levels through collaboration among diverse stakeholders. By incorporating perspectives from economy, psychology, sociology, and ecology, the Value Framework identifies opportunities for value creation. This approach can help define new value propositions or evaluate and enhance existing ones.

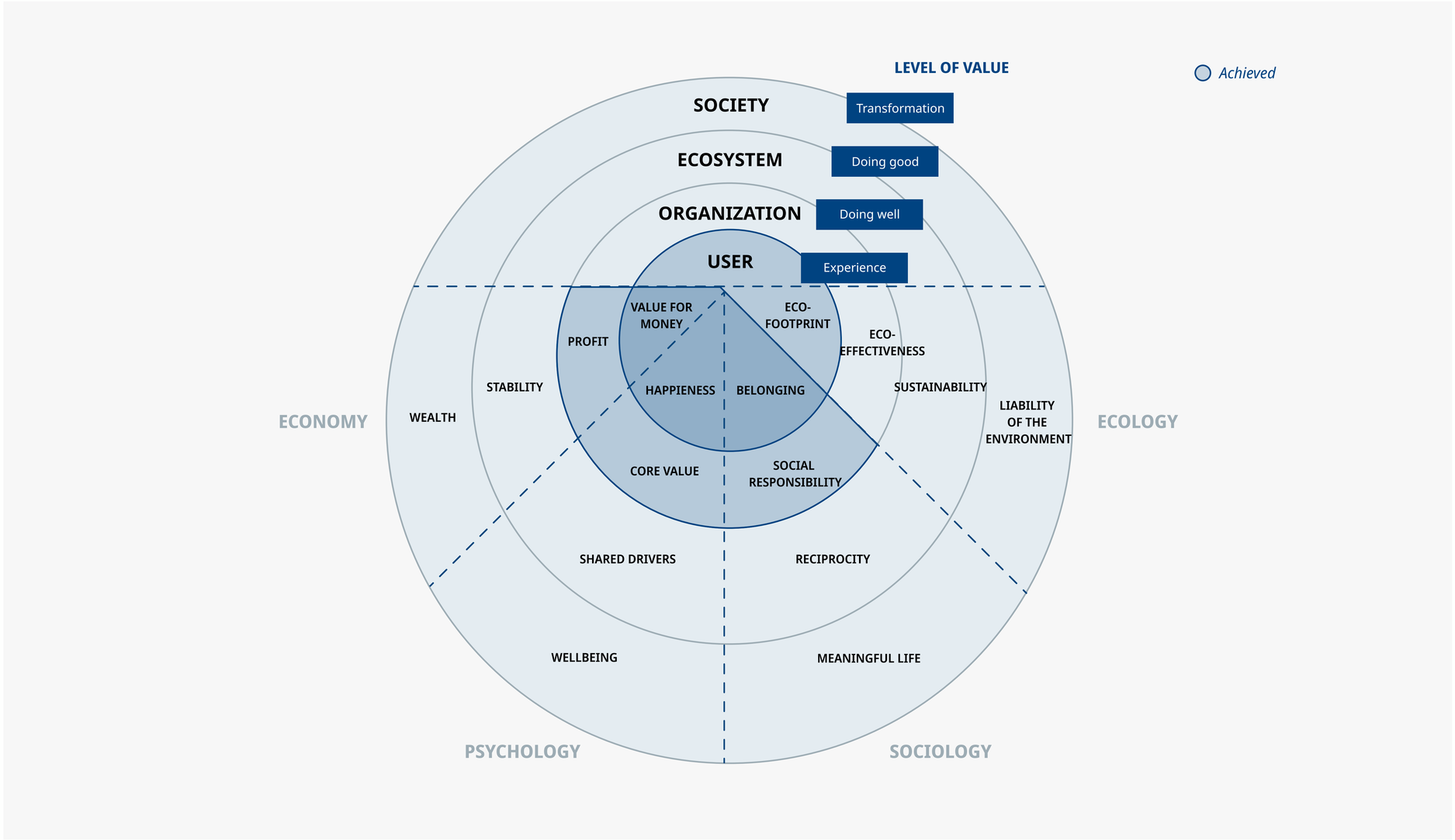


Figure 26: Current Value Framework

<u>Economy - Ensuring sustainable operations:</u>
Based on HKCAAVQ's financial statements (2023), although the institution generates sufficient funds from its services to sustain its operations, the net income after deducting costs is only 20%. HKCAAVQ should integrate its services, collaborate with multiple parties, and reduce costs.

<u>Psychology - Low public awareness:</u>
As a government organization responsible for quality assurance in the Hong Kong education system, HKCAAVQ's visibility is currently limited to its collaborations with institutions. According to surveys, HKCAAVQ has low visibility among students and the general public, and even though it provides qualification assessment services, it fails to establish a connection with individuals.

Sociology - Political scrutiny and credibility:

As a public institution under the control of the Chinese and Hong Kong governments, there is a general sense of skepticism in society. Recent demands from the HKSAR Education Bureau for HKCAAVQ to align with Mainland China have raised concerns about the mutual recognition of qualifications between China and Hong Kong (Singdao, 2023), making it easier for Mainland Chinese to pursue education or work in Hong Kong. In the eyes of the public, HKCAAVQ is seen as merely a part of the government and lacks autonomy in qualification assessment.

Ecology - Era of paper certificates:

While HKCAAVQ's services are digitized for application processes, it still contributes to paper waste as applicants receive both electronic and paper copies of certificates. In an era shifting towards paperless operations, many institutions have transitioned to electronic certificates. However, in Hong Kong, the widespread adoption of electronic certificates has not been achieved.

In the previous operating model, it can be observed that HKCAAVQ was unable to effectively deliver value to consumers, organizations, the ecosystem, and society. However, with the introduction of the new HKCAAVQ qualification assessment service, it has the potential to create value for stakeholders in four key areas: Economy, Psychology, Sociology, and Ecology.

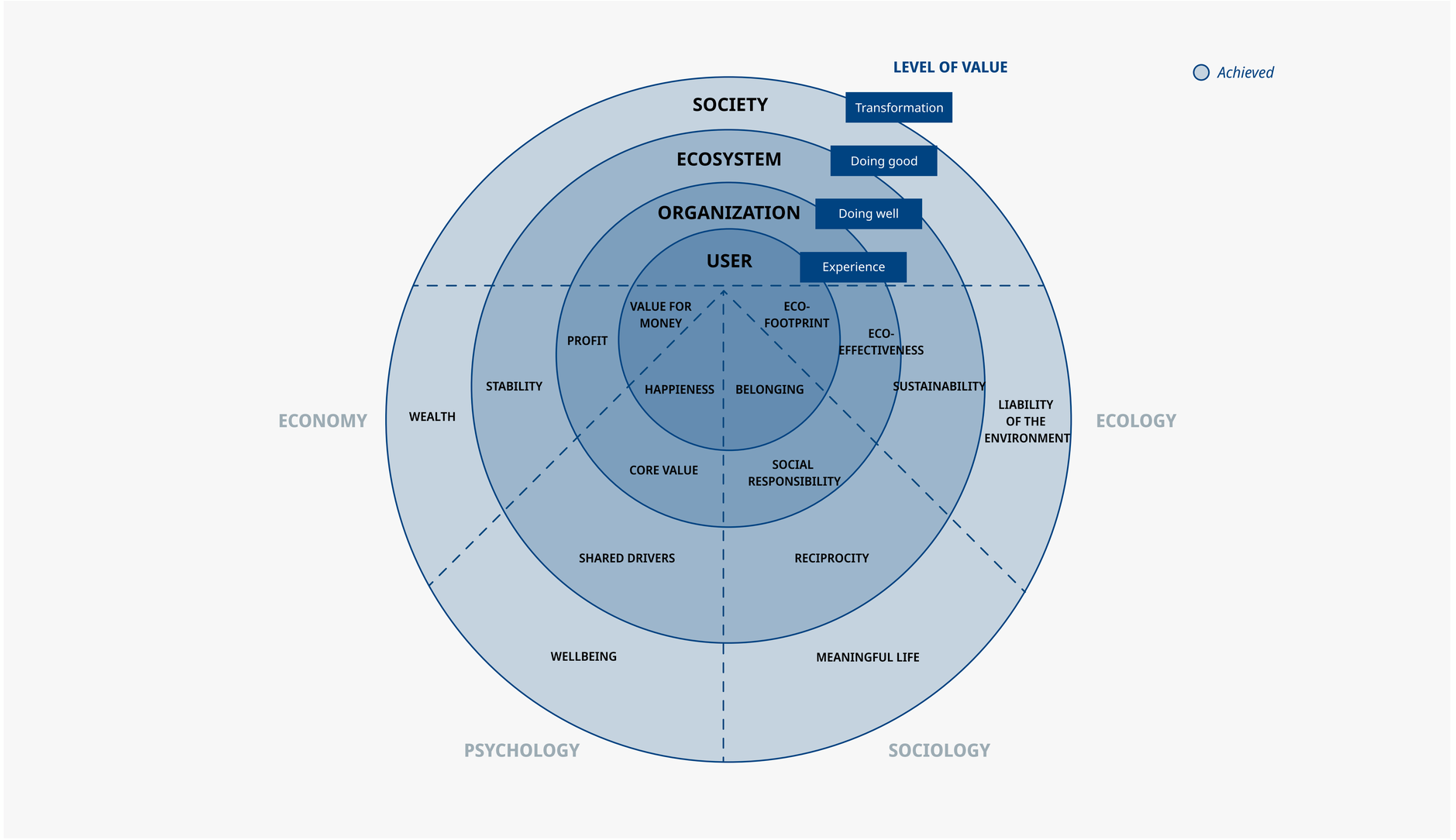


Figure 27: New Value Framework

Economy - Circular Economy:
The new HKCAAVQ qualification assessment service will amplify the presence of users and leverage user interactions to create value. By collaborating with multiple stakeholders, all users on the platform, whether they are users or service providers, contribute to the value creation, while HKCAAVQ can still generate revenue by minimizing its human resource costs.

Psychology - Increased Public Engagement:
Through collaborations with educational institutions, the new service design not only helps reduce the administrative burden and costs for these institutions but also encourages active participation from students. Compared to the previous service model, the current approach has lowered the entry barrier, making it easier for students and the general public to access HKCAAVQ's services.

Sociology - Integration of Blockchain Technology:
Certificates issued by educational institutions and HKCAAVQ enjoy high social acceptance. Additionally, the use of blockchain technology ensures the immutability of certificates, significantly reducing the risk of academic fraud. The decentralized and irreversible nature of the platform, which relies on blockchain, enhances public trust and instills confidence among business and educational communities, prompting them to conduct verifications.

Ecology - Environmental Friendliness:
By leveraging blockchain technology for storage and transmission, users can manage and share their academic credentials anytime, anywhere through electronic devices, eliminating the need for paper wastage. The platform also eliminates the need for traditional methods such as phone calls or paper applications, reducing resource consumption and promoting environmental sustainability.

Conclusion

In the era of Web 3.0, where work and learning have become increasingly flexible and accessible anytime, anywhere, individuals now have the freedom to choose their preferred location for living. In response to this fast-paced population mobility and the growing demand for credentialing, the adoption of blockchain credentialing frameworks is an inevitable and significant step forward. As a key accreditor in the academic sector, HKCAAVQ plays a crucial role in providing a vital credentialing service that aligns its core principles with the needs of its stakeholders.

By leveraging this framework, HKCAAVQ aims to enhance the quality assurance process and establish itself as a global leader in the field of academic and vocational qualifications. The institution can develop a trusted, decentralized, and shared infrastructure that sets the standard for issuing, storing, displaying, and verifying credentials.

The brand positioning of HKCAAVQ is built upon its commitment to continuous development and its aspiration to be recognized globally as a leader in quality assurance and accreditation. As the most reputable accreditation brand in Hong Kong and the Asian region, HKCAAVQ sets the benchmark for other established and emerging quality assurance programs in the design and implementation of new processes and services.

Operating in a diverse and complex market, HKCAAVQ caters to the diverse needs of various stakeholders, including different roles, training programs, course providers, and the general public. Given the dynamic nature of the industry, strategic positioning of the institution is crucial to adapt to the ever-changing landscape. This understanding of institutional positioning provides a sense of control and continuity in an increasingly technology-driven industry, benefiting all stakeholders involved.

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