Quality Startup Management System Model

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Abstract

For developing of advanced technology, the innovation and technology industries have become key areas to which the HKSAR Government is committed. Hong Kong Science and Technology Parks Corporation (HKSTP) has continuously provided technical, operational, promotional and financial support to start-ups (incubatees) through incubation programmes so as to nurture and support local technology start-ups grow and flourish successfully. Moreover, Hong Kong Quality Assurance Agency (HKQAA) is a non-profit-distributing, credible conformity assessment organization established by the Hong Kong Government in 1989. HKSTP had signed a Memorandum of Understanding (MOU) with HKQAA in March 2015 with the aims of supporting incubation programmes through business matching and quality assurance mechanisms for start-up companies. We affirm the third party assessment will set a benchmark for the start-ups, so that they would build their professionalism. Therefore, we proposed a Quality Startup Recognition Scheme for all incubatees under the incubation programmes in HKSTP. Moreover, Hong Kong Society for Quality (HKSQ) was invited by HKQAA to be one of members in the advisory committee for this recognition scheme.

The focus group will be formed and consisted of different parties, including but not limited to Incubatees, Incubators, Investors, HKSTP, HKQAA, HKSQ and other stakeholders. HKQAA focuses mainly on Quality Control, Financial Control and Information Security Control. And HKSTP monitors their incubatee's Product Development, Business Development and Competitive Advantage through milestone checking mechanism. HKSQ supports in theoretical research to establish the Quality Startup Management System (QStarMS) Model in quality perspective.

The purpose of this paper is to study a systematic approach model named "Quality Startup Management System (QStarMS) Model" through literature review and analysis, focus group and case study. It aims to integrate Business Side of start-up using Business Model Canvas (BMC) and Management Side under ISO 9001:2015 Quality Management System. In addition, the model will be simplified to achieve the management system by considering the limitation of start-ups on resources and manpower. Certainty, HKQAA and HKSTP requirpments will be also considered.

Keywords: Quality Startup, ISO 9001:2015, Business Model Generation, Incubation Program, QStarMS

1.0 Introduction

Hong Kong Science and Technology Parks Corporation (HKSTP) is a statutory body inaugurated on 7th May 2001 by the HKSAR Government to building a vibrant innovation and technology ecosystem to connect stakeholders, nurture technology talents, facilitate collaboration, and catalyze innovations to deliver social and economic benefits to Hong Kong and the region. HKSTP mission is to strengthen Hong Kong's position as a regional technology hub by promoting innovation, technology development and commercialization of five technology clusters: Biomedical Technology, Electronics, Green Technology, Information & Communications Technology, Materials and Precision Engineering. Throughout the past decade, HKSTP has nurtured hundreds of startups, attracted topnotch international companies to anchor them regard R&D operation in Hong Kong, and built a critical mass of innovative companies that deliver inventions which address societal needs.

HKSTP incubation programmes provide incubation services to assist technology startups in their vulnerable inception stages, enabling them to grow and flourish. There are three different incubation programmes included Incu-App, Incu-Bio and Incu-Tech, where incubation period are 18-month, 3-year and 4-year, respectively. They are custom-made for startups involved in web and mobile technology, technology and biotechnology. Incubation Programme services include Financial Aid, Office/Wet Lab, State-of-the-Art Lab Equipment, Technical & Management Assistance, Business Plan Consultation, Strategic Partnership, Promotion & Development Assistance, Legal Consultation, Business Matching and Investment Sourcing. The main objective is to encourage and promote innovation-based entrepreneurship by providing relevant assistance and support.

Hong Kong Quality Assurance Agency (HKQAA), a non-profit-distributing organization, was established by the Hong Kong Government in 1989 to help industry and commerce in the development of quality environmental, safety, hygiene, social and other management systems. Their missions are to promote management concepts in accordance with the applicable management system standards, to assist industry and commerce to implement relevant systems, and to deliver world-class conformity services. HKQAA has three primary functions which are "Transfer Technology", "Share Knowledge" and "Provide Assurance". They provide different services including Certification, Registration, Assessment and Verification, as well as Survey & Research. Most of services are self-developed and focusing on the industrial and community needs in Hong Kong such as "Wine Storage Management System & Registration Scheme", "Hong Kong Cooking Oil Registration Scheme" and "Barrier Free Accessibility", etc.

Hong Kong Society for Quality (HKSQ) as professional body has formed since 1986. Its members includes executives, managers, engineers, industry practitioners, academics, students and those who are interested in quality engineering, management and associated disciplines and practices in organizations of respective industries in Hong Kong and abroad. Being one of the leading quality societies in Hong Kong, HKSQ is a non-profit making organization with the objectives to promote greater awareness of quality evolution in Hong Kong and the Region for ensuring product and service excellence through continuous improvement of quality and customer satisfaction, and to provide continuing education to professionals involved in quality, reliability and innovation disciplines. HKSQ has since 2002 been recognized as WorldPartner of the American Society for Quality (ASQ), and is one of the founding members of Asian Network for Quality (ANQ) and one of founding members of Chinese Quality Forum (CQF).

HKSTP and HKQAA had signed a Memorandum of Understanding (MOU) in March 2015. It aims to support incubation programmes with a mutual understanding for the following 4 core aspects:

1. Business Matching,
2. Recognition for Innovation and Technology Startup Company,
3. Community for Innovation and Technology Professional, and
4. Promoting Management Concepts and Knowledge Transfer.

HKSQ is one of advisory bodies to share knowledge and expertise for developing the Quality Startup Management System so as to fulfill the 2nd core aspect "Recognition for Innovation and Technology Startup Company" through the Quality Startup Recognition Scheme for all incubatees

under the incubation programmes in HKSTP. Quality Startup will be considered in Product & Business Development, Technology and Quality Management, as well as, Financial Management.

2.0 Theoretical Background

2.1 Business Model Canvas

A business model is a holistic concept embraced elements of pricing, mechanisms, customer relationships, partnering and revenue sharing, etc. Business Model Canvas (BMC) developed by Osterwalder & Pigneur (2010) included four areas of company, namely Customer Interface, Value proposition, Infrastructure Management and Financial Aspects. These areas are further divided into a set of nine interlinked building blocks which are the core of the business model namely Customer Segments (CS), Value Proposition (VP), Channels (CH), Customer Relationships (CR), Revenue Streams (RS), Key Resources (KR), Key Activities (KA), Key Partnerships (KP) and Cost Structure (CT). The framework of BMC using incubation program in HKSTP as sample demonstrated in Figure 1.

Osterwalder & Pigneur (2010) and Miki Imazu (2013) described the model starting from Customer Segments (CS). CS identifies the different groups of people/ organizations which an enterprise aims to reach and serve. From CS moving to Value Proposition (VP), VP defines a bundle of products and services which would create value for a specific CS. It needs a Channel (CH) to provide means for company to communicate with and reach its CS to deliver VP. Further, different types of relationships of Customer (CR) a company shall be built with specific CS. Consequently, Revenue Streams (RS) indicates the value a company generating from each CS, i.e. cost subtracted from revenues. This route is called "Customer Value Infrastructure".

Another route named "Business Value Infrastructure" starts from Key Resource (KR) that illustrates the most critical assets required to support Key Activities (KA) which is the most important operations a company must do to make its business model work (value-added process). KA can be enhanced by Key Partnerships (KP) which provides a network of suppliers and partners. Finally, Cost Structure (CT) is all costs incurred to operate a business model that should be considered.

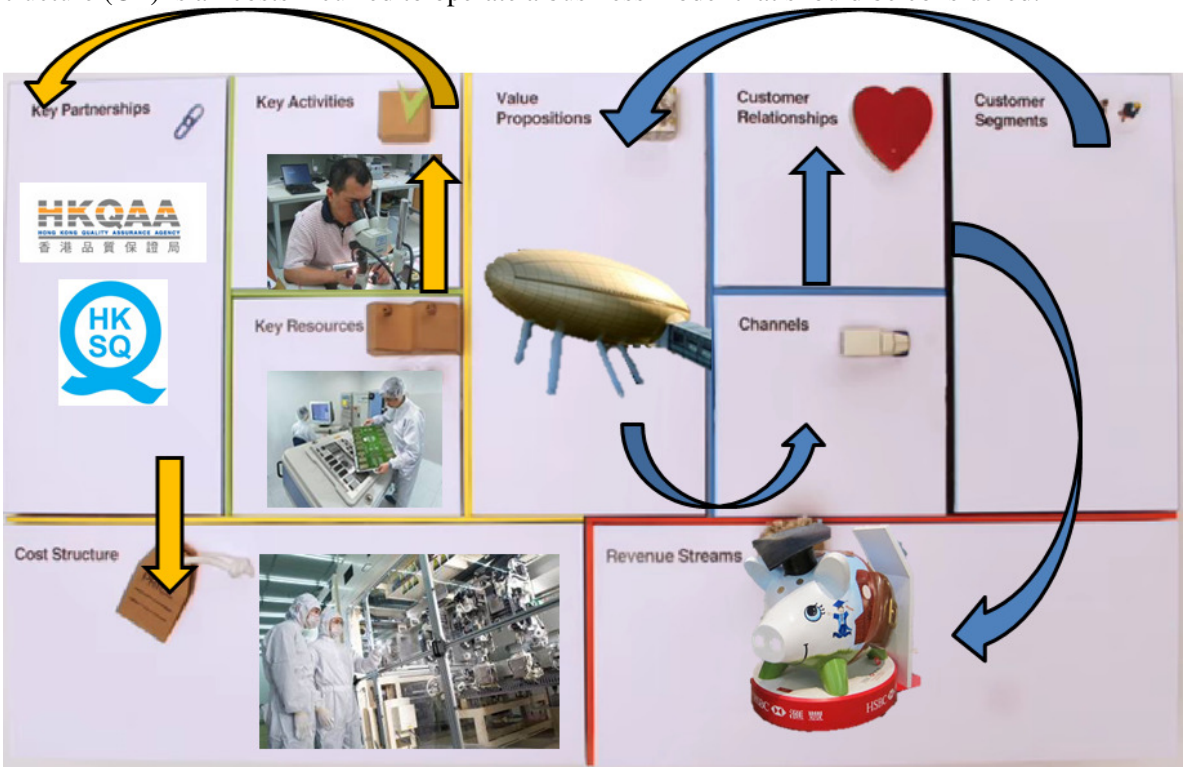

Figure 1. The Business Model Canvas with the Nine Building Blocks (e.g. Incubation Programme)

2.2 ISO 9001:2015

Quality management has a long history. Its evolution took place during the Industrial Revolution when traditional inspection role was the starting point, and continued through quality control, quality assurance, to Total Quality Management (TQM) and so on. The ISO 9001 Quality Management System (QMS) standard is widely accepted around the world. ISO 9001 QMS model uses a process approach and its advantages are:

a) understanding and meeting customer requirements,
b) considering processes in terms of added value,
c) assessing results of process performance and effectiveness
d) continually improving processes based on objective measurement.

The new version of ISO9001:2015 is established based on PDCA cycle (Figure 2) and Annex SL – High Level Structure (HLS) that is the common framework for all ISO management systems. There are ten clauses of standard (Table 1). The implementation of QMS begins from clause 4 (Context of Organization) that organization requires to determine external and internal issues that are relevant to its purpose (or intended outcome).

1. Planning phase: Clause 5 – Leadership and Clause 6 – Planning stress on involvement of top management and understanding of the major risks associated with each process through the planning on addressing risks & opportunities.
2. Do phase: Clause 7 – Support and Clause 9 – Operation determine and provide the necessary resources to execute the plan and to meet customer requirements.
3. Check phase: Clause 9 – Performance Evaluation defines requirements for monitoring, measurement, analysis and evaluation, as well as, Internal Audit and Management Review.
4. Act phase: Clause 10 – Improvement gives a new manner to put preventive actions into practice (this clause removed in the new version of ISO 9001:2015), i.e. incorporated preventive actions in QMS through risk assessment.

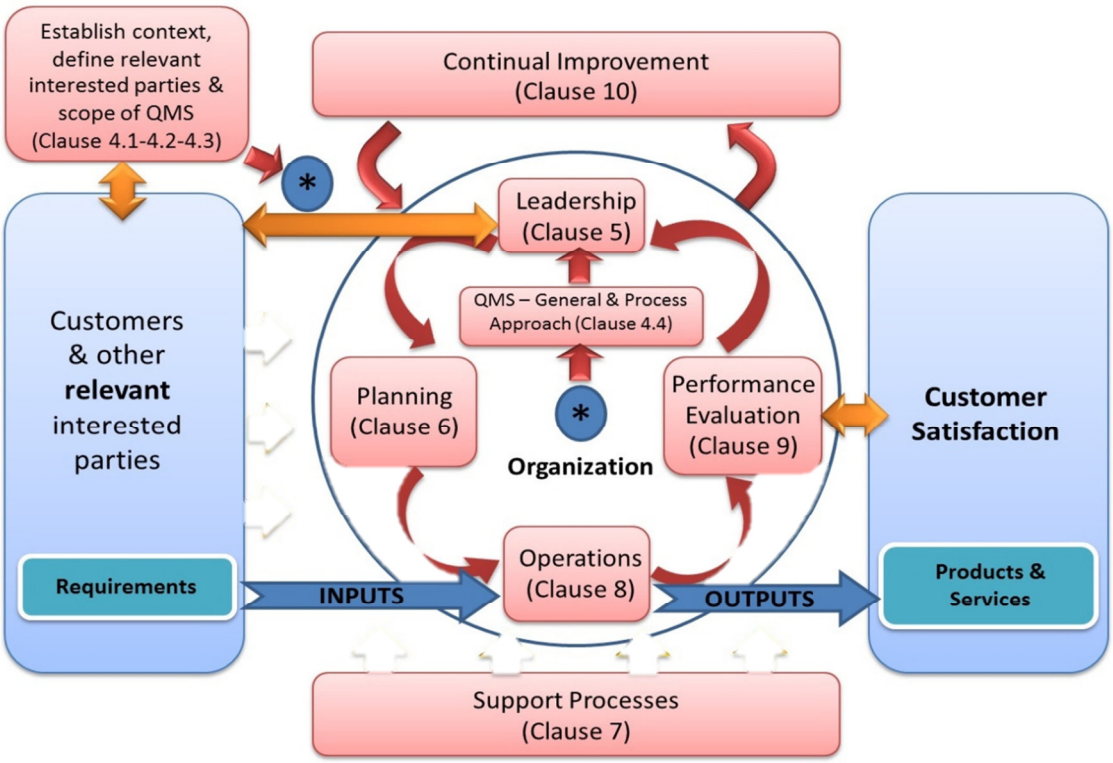

Figure 2. The Quality Management System Model (ISO 9001:2015 DIS)

Table 1. Key Clauses of ISO 9001:2015 (DIS)

Clauses of ISO 9001:2015 (DIS)	
1. Scope	
2. Normative References	
3. Terms and Definition	
4. Context of Organization	- Understanding the organization and its context - Needs and expectations of interested parties - Determining the scope - Management System
5. Leadership	- Leadership and commitment - Policy - Roles, responsibility and authority
6. Planning	- Actions to address risks & opportunities - Objectives and plans to achieve them
7. Support	- Resources - Competence - Awareness - Communication - Documented information
8. Operations	- Operation planning and control
9. Performance Evaluation	- Monitoring, measurement, analysis & evaluation - Internal audit - Management review
10. Improvement	- Non-conformity and corrective action - Continual improvement

2.3 HKSTP Incubation Milestone Assessment

HKSTP Incubation Programmes have quality assurance mechanism to guide and assist start-ups through regularly milestone assessments. When start-ups apply for the incubation programmes, they are required to submit business plan with key milestones, follow their plan and carry out their product and business development. HKSTP incubation team will check their performance according to the submitted plan through milestone assessments. HKSTP has three incubation programmes with different incubation period, i.e. Incu-App (18 months), Incu-Bio (4 years) and Incu-Tech (3 years). The assessment criteria among Incu-App, Incu-Bio and Incu-Tech are shown as Table 2.

Incu-App is focused on Apps, web and mobile technology. The product life cycle is short and highly requested on time to market. Therefore, the milestone assessment will be performed in the 3rd month after admission of the programme. Then the sequence of assessment will be 6th month and 12th month. If start-ups performances are below the standards, they need to join a Performance Improvement Plan (PIP). For Incu-App, it will be added one more assessment in the 9th month if they under PIP in previous milestone assessment.

Incu-Tech is focused on different technology such as electronic or internet based platform development (except Apps programing and Biotechnology). The requirement level is higher than Incu-App. Within 3 years incubation period, there are five milestone assessments and each assessment per six months as the 6th, 12th, 18th, 24th and 30th month.

Incu-Bio is focused on biotechnology such as pharmaceutical, health care, elder/ ageing service, etc. It is the longest programme upto 4 years among HKSTP incubation programmes. Within 3 years incubation period, there are seven milestone assessments and each assessment per six months as the 6th, 12th, 18th, 24th, 30th, 36th and 42nd month.

Table 2. Comparison of Milestone Assessment Criteria among Incu-App, Incu-Bio & Incu-Tech

Incu-Tech and Incu-Bio	Incu-App
Product Development Progress	
• Design Work • Design for Manufacturing • Testing • Prototype/ Sample • Product Demonstration • Trial Client/ Pilot Site	• Design Work • Technical Testing • Usability Testing • Product Launch
HKSTP Service Utilization	
• Laboratory Service • Assistant Funding • Industry & University Collaboration, etc.	
Business Development Progress	
• Business Partnership • Sales & Marketing Activities • Award Application • Number of Client • Patent/ Trademark Application • Funding Activities • Headcount • Sales Revenue	• Strategic Partners/ Business Collaboration • Promotion & Traffic Driving • Award Application • Download Rate • Patent/ Trademark/ Design Registration • Capital/ Government Funding • Headcount • Sales Revenue

2.4 HKQAA Assessment Checklist for Startup Company

HKQAA had proposed a preliminary assessment checklist for start-ups established for not more than 5 years. The checklist focuses mainly on Quality Control, Financial Control and Information Security Control (See Table 3). Auditor will register the operations of participated start-ups' current management system through inspection with Yes, No or Not Applicable.

Table 3. HKQAA Quality Startup Recognition Scheme – Checklist (Preliminary)

Three Focus Area	Checklist Topic
Quality Control	1. Customer/ Project Development Requirements
	2. Legal & Regulatory Requirements
	3. Internal Requirements
	4. Design Planning (if applicable)
	5. Design Outputs (if applicable)
	6. Production and Service Provision – Method
	7. Production and Service Provision – HR
	8. Production and Service Provision – Infrastructure & Environment
	9. Production and Service Provision – Materials
Financial Control	10. Authorization Level
	11. Budget
	12. Cash Flow Monitoring
	13. Asset Management
Information Security Control	14. Information Classification
	15. Information Storage
	16. Mobile Device
	17. Information Disposal

3.0 Development of Quality Startup Management System (QStarMS) Model

3.1 Limitation of Business Model Canvas

Why BMC as the way has start-up employed all over the world? It is because three features included "Simplicity", "Practice-orientation" and "Plug-and-Play principle" (Ching HY & Fauvel C. (2013)). Even though BMC is a very useful conceptual tool for start-ups to present the value creation, systematic description of the mechanism of interaction with partner business, as well as, converting technological developments into economic benefits; it was criticized by Kraaijenbrink (2012) as below:

i) It excludes organization's strategic purpose (Only financial success drive start-up)
ii) It excludes a notion of competition
iii) It mixes levels of abstraction

Another limitation observed was lack of systematic requirement for implementing such BMC after startup adopted. Based on ISO 9001:2015 (DIS), documented information is one of the key evidences to demonstrate the necessary data/ information with its traceability and security. Moreover, nine boxes could be consolidated into four large groups (meta-concept) as a mind map of BMC (Gavrilova *et al.*, 2014) which could be modified for Quality Startup Management System Model development. Therefore, Gavrilove suggested Mind Map BMC's consolidated into four groups below:

i) Products (contain – KA & VP)
ii) Customers (contain – CR, CH & CS)
iii) Environment (contain – KP & KR)
iv) Finance (contain – CT & RS)

3.2 Barriers for Start-up Company to achieve ISO 9001 QMS

Reference to the difficulties on implementation of ISO 9001 by Zeng *et al.*, (2007) and Gotzamani (2005), some critical barriers for start-ups to have an effective implementation of ISO 9001 standard were identified as follows:

i) Limitation on Human Resource (Few key members in start-up only)
ii) Limitation on Knowledge of QMS (No training in the beginning of start-up business)
iii) Inadequate Management Commitment (Product & Business Development (or Survive) is the first priority.)

iv) Inadequate Attitude Towards Quality (Delivery first)
v) Heavy Documentation Requirement (No practice on traceability)
vi) Over-expectation on ISO 9001 Standard (What its value on start-up in terms of business?)
vii) Short-sighted Goal for "Getting Certified" (Access government or big company's tender list)
viii) Unrealistic Requirements and Ritualistic Implementation

Therefore, seldom start-ups implement ISO 9001 successfully and get their value after heavier resources input (including HR, Knowledge, Time & Money) to establish and implement the QMS.

3.3 Observations on HKSTP Incubation Milestone Assessment

There are about 90 start-up companies joined and completed under HKSTP Incu-Tech schemes. Some observations were summarized below.

For Product Development, it observed:

i) Most of start-ups had planned and met their product development under their milestone.
ii) About 50% of start-ups did not consider "Design for Manufacturing". It is probably the IT dominant start-ups in the scheme.
iii) More than 80% of start-ups planned to employ "HKSTP Service Utilization" so as to enhance their product development.

For Business Development, it observed:

i) Difficulty to achieve the "Headcount" and "Sales Revenue" they planned in the last three milestones (on 18^{th}, 24^{th} and 30^{th} month).
ii) More than 60% of start-ups without planning for Award Application
iii) About 50% start-ups did not consider "Patent / Trademark Application" and "Funding Activities".

3.4 Difficulties on HKQAA Assessment Checklist for Start-up Company

HKQAA start-up assessment checklist is employed for registration scheme inspection. For Product and Business Development, it depends on HKSTP regular incubation milestone assessment. Employing this Startup assessment checklist, start-ups are required to demonstrate they had implemented the requirements with records or relevant documentation. Most start-up had not experience on implementation of the management system (e.g. ISO 9001, ISO 27001, etc.) so that it foresees some difficulties for employing this checklist and summarized as follows:

i) Without systematic model for start-up to implement to achieve these requirements.
ii) Without a stepwise framework for QStarMS to follow.
iii) Without guideline for implementation, especially on three key areas control (Product, Finance & InfoSec).

3.5 Quality Startup Management System (QStarMS) Model combined BMC, ISO 9001 QMS, HKSTP and HKQAA Assessment Requirements

After reviewed BMC, ISO 9001:2015 (DIS), HKSTP Incubation Milestone Assessment and HKQAA Preliminary Assessment Checklist, the proposed QStarMS Model is created as Figure 3 by taking into account all features of BMC, PDCA, HKSTP Milestone Assessment and HKQAA Checklist (similar approach with Lai *et al.*, 2009 & 2011).

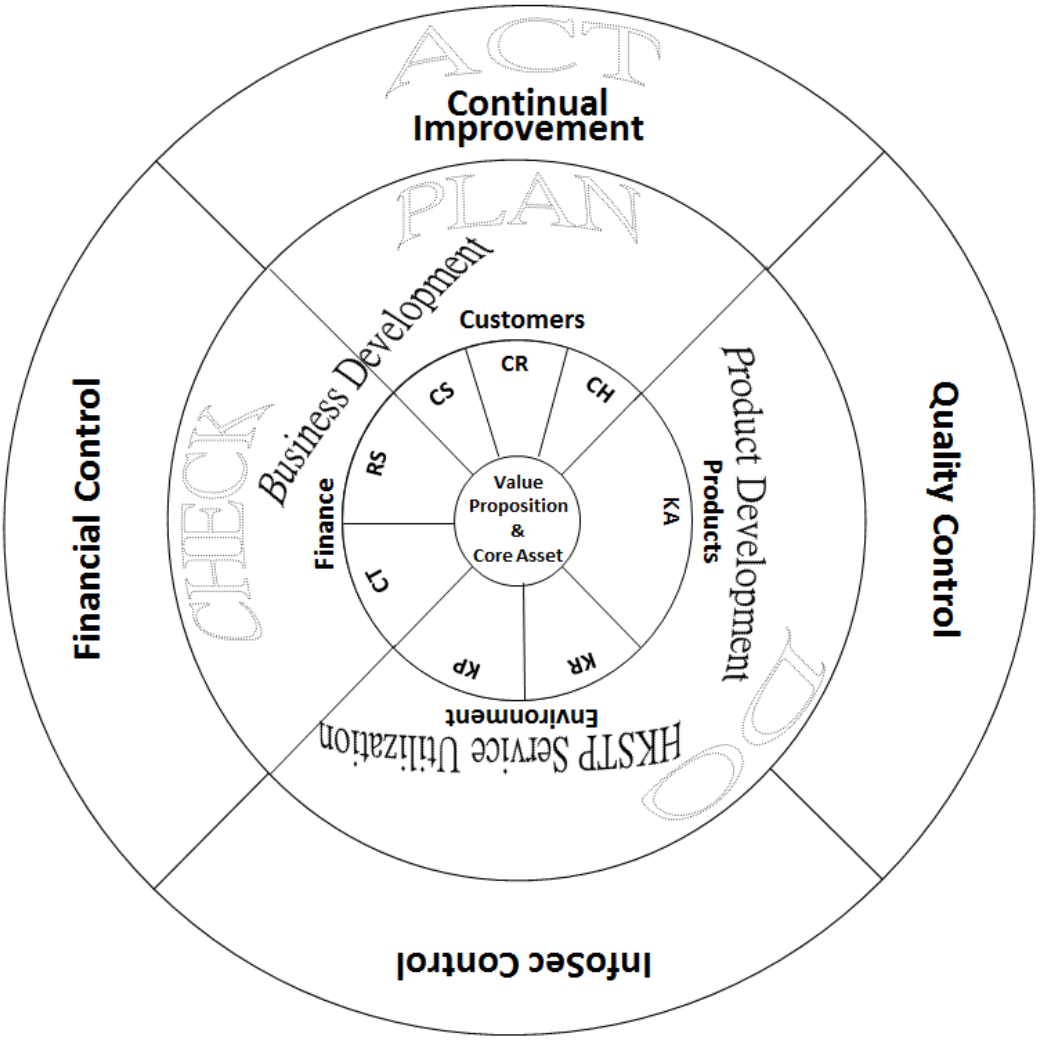

Figure 3. The Quality Startup Management System Model (QStarMS Model)

4.0 Conclusion

It believes the business opportunity and management skill level, as well as, survival rate will increase if start-ups employ Quality Startup Management System (QStarMS) Model and have registration under HKQAA-HKSTP Startup Recognition Scheme. QStarMS model consists of BMC startup basic business function, key elements of ISO 9001, concerns of Information Security (InfoSec) control and the core value of all management system, i.e. continual improvement. The model will help to overcome the difficulties and limitation for start-ups' business and product development, and to enhance their management skill level. For a long run, the model with the implementation framework and guideline for start-ups will be further evolved in the future.

Reference:

Ching H.Y. and Fauvel C. (2013) "Criticisms, variations and experiences with business model canvas" International Journal of Small Business and Entrepreneurship Research, Vol.1, No.4, pp.18-29, Dec 2013.

Gotzamani K.D. (2005) "The implications of the new ISO 9001:2000 standards for certified organizations" International Journal of Productivity and Performance Management, Vol.54, No.8, pp.645-657.

Kraaijenbrink (2012) Three shortcomings of the Business Model Canvas. Kraaijenbrink Training & Advies. Retreved October 18, 2013, from http://kraaijenbrink.com/2012/07/shortcomings-of-the-business-model-canvas/

Lai, Lotto K.H., Chin, K.S. & Tsang, A.H.C. (2009) "Integration of Quality Management System and Information Security Management System – HKSTP implementation case" Proceedings CD-ROM of The seventh ANQ Congress, paper HK02.

Lai, Lotto K.H., Chin, K.S. & Tsang, A.H.C. (2011) "Integrated Laboratory Management System (ILMS) Model - HKSTP implementation case" The ninth ANQ Congress, paper 28-A-01.

Mäkelä, Otto & Pirhonen, Veikka (2011) The Business Model as a Tool of Improving Value Creation in Complex Private. Service System - Case: Value Network of Electric Mobility. 21st International RESER Conference, 7-10 Sep 2011, Hamburg, Germany.

Miki Imazu (2013) *ZUKAI Business Model Generation Workbook*, Shoeisha Co., Ltd.

Osterwalder, A., and Pigneur, Y. (2010) "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers" Hoboken NJ: John Wiley & Sons.

Zeng S.X. and Tian P. (2007) "Overcoming barriers to sustainable implementation of the ISO 9001 system", Managerial Auditing Journal, Vol.22, pp.244-254.