BIG DATA FRAMEWORK FOR QUANTITY SURVEYING FIRMS IN MALAYSIA

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DEDICATION

This thesis is dedicated to my late grandmother,

who always thought me to dream big

and never be afraid of making it happen.

Al-Fatihah

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ABSTRACT

Big data emerges as a technology that improves decision making capability, optimizing productivity, and capable of generating a financial return in organizations across industries. Like many others, the benefit of big data is imminent, prompting construction organizations to redesign the conventional construction processes, thus stimulating change to the construction practices. While big data does improve productivity, any construction organizations which aspire to leverage its benefit will require a refreshed mindset and a new set of capabilities. Recognizing the importance of big data to the future of construction in Malaysia, there has been a strong push by the construction authorities for big data initiatives across organizations given the Construction Industry Transformation Programme (CITP) 2016-2020. Though the initiatives from CITP 2016-2020 managed to introduce big data to the construction organizations, there appear to be a fraction of construction organizations in Malaysia that are lagging behind the others to embrace big data. A clear case is Malaysian quantity surveying (QS) firms, where a limited big data adoption strategy was observed, creating a knowledge gap that hinders the Malaysian QS firm's capability to move forward with big data. Against this background, this research aims to develop a big data conceptual framework as a basis to support Malaysian QS firm's strategic big data adoption. The research outlines four objectives which include identifying big data potentials for QS, identifying attributes supporting QS firm's big data success, developing a conceptual big data framework for QS firms in Malaysia, and validating the big data framework for QS firms to support their strategic big data adoption. Adopting the TOE framework and the 5G innovation model as theoretical underpinnings, the research adopted Charmaz's grounded theory approach where sixteen QS with known experience in handling big data were contacted and interviewed. Data analysis revealed nine big data potentials for QS which are optimized data access, national cost data establishment, cost control data-driven decision making, project management data-driven decision making, development management data-driven decision making, work synchronization, data commercialization, diversifying professional services and strategic policy establishment. Likewise, seven big data attributes supporting the QS firm's big data success were identified which are data, people, technology, financial investment, strategic alignment, power, and collaboration. The conceptual framework demonstrates QS strategic big data adoption sequentially follows 'creating big data', 'big data buy-in', and 'revolutionizing through big data' phases. Each phase detailed specific big data potentials that the Malaysian QS firms can achieve, subject to the firm's resources and facilities availability. Framework validation was administered with the research participants and big data experts using a questionnaire survey to establish conformity. It was concluded that big data is a universal technology for the QS firms but, requires a unique set of big data attributes appraised from the peculiarities of its context of adoption. This research contributes by identifying big data potentials and attributes supporting big data success for QS firms. Further, it provides insights for policymakers, regulators, and authority bodies to strategically maximize their capabilities in advancing Malaysia's big data agenda.

ABSTRAK

Data raya muncul sebagai teknologi yang meningkatkan kemampuan membuat keputusan, mengoptimumkan produktiviti dan mampu menghasilkan pulangan kewangan dalam organisasi di pelbagai industri. Walaubagaimanapun, manfaat daripada teknologi data raya memaksa organisasi dalam bidang pembinaan untuk merancang semula proses pembinaan yang konvensional. Sekali gus, merangsang perubahan amalan pembinaan sedia ada. Walaupun data raya mampu menambah baik produktiviti, mana-mana organisasi pembinaan yang berhasrat memanfaatkan faedahnya akan memerlukan corak pemikiran yang segar dan set kemampuan yang baharu. Melalui Program Transformasi Industri Pembinaan (CITP) 2016-2020, terdapat desakan kuat untuk inisiatif data raya di seluruh organisasi pembinaan daripada badan berkuasa yang menyedari kepentingan data raya. Walaupun inisiatif daripada CITP 2016-2020 berjaya memperkenalkan data raya, terdapat sebahagian kecil organisasi pembinaan di Malaysia yang ketinggalan dalam menerimanya berbanding yang lain. Kes yang jelas ialah firma ukur bahan (QS), dimana wujudnya jurang pengetahuan yang menghalang kemampuan firma QS untuk menggunakan data raya. Penyelidikan ini bertujuan untuk membangunkan kerangka konseptual data raya sebagai asas untuk menyokong penggunaan data raya yang strategik oleh firma QS di Malaysia. Kajian ini menggariskan empat objektif yang merangkumi mengenal pasti potensi data raya untuk QS, mengenal pasti atribut yang menyokong kejayaan penggunaan data raya dalam kalangan firma QS, membangunkan kerangka konseptual data raya untuk firma QS di Malaysia dan mengesahkan kerangka data raya bagi firma QS untuk menyokong penggunaan data raya yang strategik. Mengambil kerangka TOE dan model inovasi 5G sebagai teori asasnya, penyelidikan ini menggunakan pendekatan teori Charmaz. Enam belas orang Juruukur Bahan yang berpengalaman dalam mengendalikan data raya telah dihubungi untuk ditemu ramah. Analisis data menunjukkan sembilan potensi data raya untuk QS, iaitu pengaksesan data yang optimum, penetapan kos data nasional, pengambilan keputusan kawalan kos berdasarkan data, pengambilan keputusan pengurusan projek berdasarkan data, pengambilan keputusan pengurusan pembangunan berdasarkan data, penyegerakkan kerja, pengkomersialan data, mempelbagaikan perkhidmatan profesional dan pertubuhan polisi strategik. Tujuh atribut yang menyokong kejayaan data raya di firma QS turut dikenal pasti iaitu data, sumber manusia, teknologi, pelaburan kewangan, penjajaran strategik, kuasa dan kerjasama. Kerangka konseptual menunjukkan penggunaan data raya strategik QS secara berurutan seperti fasa-fasa berikut iaitu 'mencipta data raya', ‘pembelian masuk data raya’ dan ‘revolusi melalui data raya’. Setiap fasa memperincikan potensi data raya tertentu yang boleh dicapai oleh firma QS Malaysia, tertakluk kepada sumber dan fasiliti sedia ada. Pengesahan kerangka tersebut telah dijalankan dalam kalangan peserta kajian dan pakar data raya menggunakan kaedah soal selidik dengan tujuan mewujudkan kesesuaian. Kesimpulan yang dicapai, data raya ialah teknologi universal untuk firma QS tetapi ia memerlukan satu set atribut data raya yang unik yang dinilai daripada keunikan konteks penggunaannya. Penyelidikan ini menyumbang dengan mengenal pasti potensi dan atribut yang menyokong kejayaan data raya bagi firma QS. Ia turut memberikan pandangan untuk pembuat polisi dan badan yang berwibawa untuk memaksimumkan keupayaan mereka secara strategik dalam memajukan agenda data raya Malaysia.

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LIST OF ABBREVIATIONS

AI	-	Artificial Intelligence
BQ	-	Bill of Quantities
ACDA	-	As Completed Detailed Abstract
ATDA	-	As Tendered Detailed Abstract
BQSM	-	Board of Quantity Surveyors Malaysia
CCM	-	Construction Cost Modelling
CIDB	-	Construction Industry Development Board
CITP	-	Construction Industry Transformation Programme
DOI	-	Diffusion of Innovation
ECA	-	Elemental Cost Analysis
IBS	-	Integrated Building System
IT	-	Information Technology
IS	-	Information System
JIT	-	Just in Time concept
KKR	-	Ministry of Works Malaysia
LCC	-	Life cycle costing
MDEC	-	Malaysia Digital Economy Corporation
MIGHT	-	Malaysia Industry-Government Group for High Technology
ML	-	Machine Learning
PWD	-	Public Works Department
QS	-	Quantity Surveyor, Quantity Surveying
RICS	-	Royal Institution of Chartered Surveyors
RISM	-	Royal Institution of Surveyors Malaysia
SICA	-	Statistics, Indices in Construction and Automation
SMM	-	Standard Method of Measurement
TAM	-	Technology Acceptance Model
TOE framework	-	Technology, Organization, Environment framework
TPB	-	Theory of Planned Behavior

TPI	-	Tender Price Index
UTAUT	-	Unified Theory of Acceptance and Use of Technology
5G innovation model	-	Fifth Generation Innovation model

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter details the research background, problem statement, research questions, research aim and research objectives. The chapter also includes the research significance, the research methodology in brief, the scope governing the research area as well as brief summary of chapters in this thesis.

1.2 Background of Study

Big data is the new generation technology designed for organizations and professionals to economically extract value from large, variety and velocity data characteristics (Manyika *et al.*, 2011; Villars *et al.*, 2011; Sagiroglu and Sinanc, 2013; Chen *et al.*, 2014). In generic context, big data emerge in 1997 to portray the problem of large data volume (Cox and Ellsworth, 1997; Ularu *et al.*, 2012; Addo-Tenkorang and Helo, 2016). While business organizations struggle with data storage investment, some begin to embrace big data and took advantage on data availability due to its promising investment impact on a global scale. Big data empowers organization to enhance business value.

The adoption of big data introduces data driven decision making arena which allow organizations to make informed decisions and reduce 'time-to-answer' (Villars *et al.*, 2011; Economist Intelligence Unit, 2012; Das and Kumar, 2013; Davenport, 2014; Halaweh, 2015). Uniquely, big data technology increases organization competitive advantage by optimizing business operations and transcending customer value (Brown *et al.*, 2011; Barton and Court, 2012b; McAfee and Brynjolfsson, 2012; Groves *et al.*, 2013; Ohlhorst, 2013; Chang *et al.*, 2014; Forbes Insights, 2015).

Together, these potentials create eminent impact on productivity improvement (Manyika *et al.*, 2011). From the financial stance, study shows big data delight stakeholders with 5% to 6% increase in profit (McAfee and Brynjolfsson, 2012).

McKinsey & Company leading big data report 'Big data : The next frontier for Innovation, Competition, and Productivity' in 2011 disclose big data universality in delivering value across different industries (Manyika et al., 2011). Consistently, Chawla and Davis (2013), Goss and Veeramuthu (2013), Groves *et al.* (2013), Kurtz and Shockley (2013), Srinivasan and Arunasalam (2013), Chen and Zhang (2014), Yin and Kaynak (2015), Addo-Tenkorang and Helo (2016) and Bradlow *et al.* (2017) academic research recognized big data significance in synchronizing, improving or creating new alternative in governing organization's operation efficiency as well as enhancing business value in three domain industries of manufacturing, retail and supply chain.

In the construction industry context, technology investment in this industry viewed as a catalyst to productivity, economic growth and bolster contribution to GDP (Ahmad *et al.*, 2004; Roztocki and Weistroffer, 2009; Shahiduzzaman and Alam, 2014). Ergo, the construction industry increasingly explores information technology (IT) since the early 2000. Though considered as slow technology adopters (Stewart *et al.*, 2002; Love and Irani, 2004; Irizarry *et al.*, 2012), in contrary, Figure 1.1 from the Global Construction Survey Report 2016 shows the increase of modern technology adoption in the construction industry. The recent technology evolution evokes the construction industry to cope with digitalization and agile development trends.

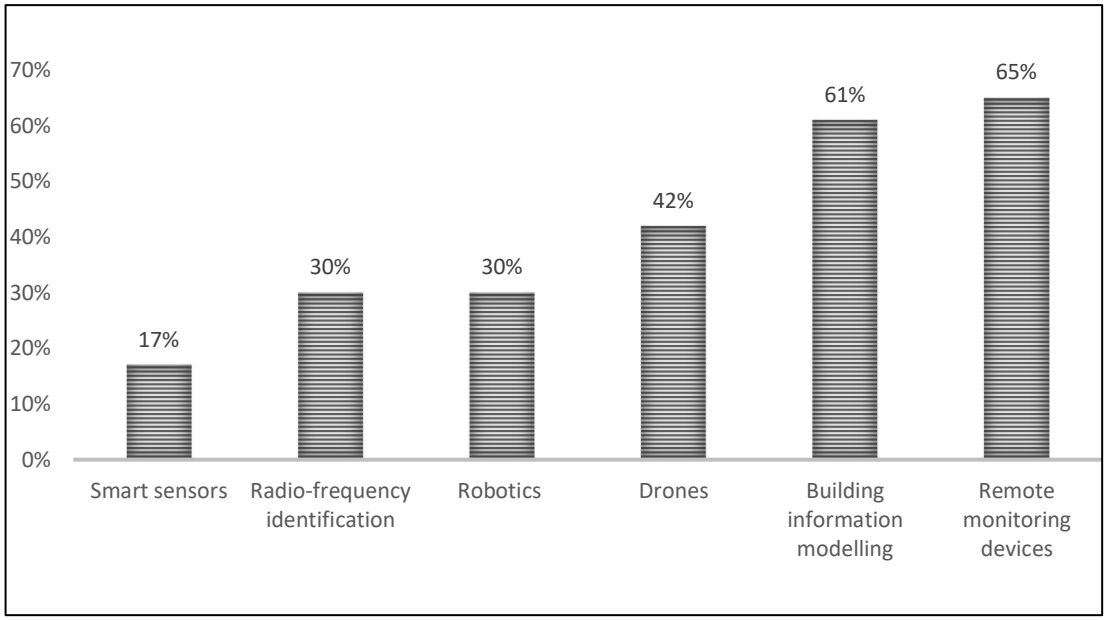

Figure 1.1 Modern technology usage in the construction industry

Source: Adopted from KPMG (2016, p. 16)

Moreover, recent technology research in the construction industry such as radio-frequency identification (RFID), drone, sensors, virtual reality (VR) and building information modelling (BIM) (Williams, 2007; Matipa *et al.*, 2010; Maalek and Sadeghpour, 2013; Wong and Fan, 2013; Zahrizan *et al.*, 2013; Dimitrov and Golparvar-Fard, 2014; Akhavian and Behzadan, 2015; Martínez-Rojas *et al.*, 2015; Wang and Hu, 2017) consistently shows positive avenue for modern technology in improving project planning efficiency, enhance construction site safety, automate site inspection, improve construction stakeholder's communication, reduce operations error, removes design uncertainties and minimize resource waste. The modern technology uptake viewed to improve time, cost and resource optimization in construction projects. Therefore, this strengthens the importance of modern technology in the construction industry.

Big data as the 21st century prominent technology due to its universality (Susanto *et al.*, 2019). Aligning to big data universality, Figure 1.2 from McKinsey Global Institute report in 2011 reckon big data to improve serious productivity issue in the construction industry (Manyika *et al.*, 2011). The report further accentuates the

relevance of big data as the construction industry was positioned among sectors with moderate ease of big data capture index. This implies presumptive moderate difficulty level for the construction industry to advance big data and more importantly, present a case for big data opportunity to revolutionize the construction industry.

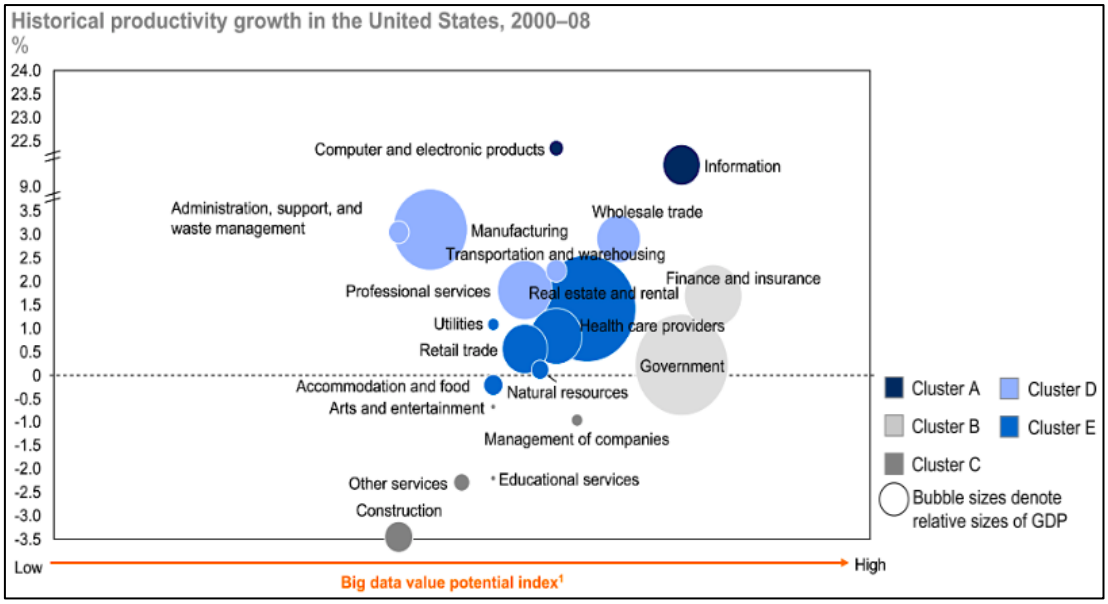

Figure 1.2 Big data relevance in the construction industry

Source: Adopted from Manyika *et al.* (2011, p.16)

Correspondingly, the Construction Industry Transformation Programme (CITP 2016-2020) strongly support modern technology uptake in transforming four main areas of quality, safety and professionalism, environmental sustainability, productivity and internationalization. Hence, the Construction Industry Development Board (CIDB) and the Ministry of Works Malaysia (KKR) que the opportunity for construction stakeholders to embark on big data (CIDB Malaysia, 2016; SICA, 2017c). Big data is significant to overture data driven decision making value aimed to improve productivity, soothe disruptive challengers and enhance industry's excellence (CIDB Malaysia, 2016; SICA, 2017c). Particularly, this signify the big data relevance and significance in the local construction industry context. Hence, this present clear proposition and positive avenue for construction stakeholders and construction professionals to uphold CITP vision, embark and reap the big data potentials.

1.3 Problem Statement

In the context of specialized profession adopting big data, research post 2010 in medical, accounting and legal context shown these professions have started to understand and appreciate data value (Chan, 2003; Mittermayer, 2004; Manyika *et al.*, 2011; Savage, 2012; Zenger, 2012; Dynamic Markets, 2012; IBM, 2012, 2013b; Association of Chartered Certified Accountants, 2013; Murdoch and Detsky, 2013; Chawla and Davis, 2013; Digital News Asia, 2013; Groves *et al.*, 2013; Knowledgent, 2014; Siegel, 2017; Roberts, 2019). These professions embrace big data to turn value upon data and transform from delivering passive and reactive services towards strategic decision making and proactive services.

Within the surveying profession, big data hailed attention across the Royal Institution Chartered Surveyors (RICS) headlines. RICS COBRA 2016 alerted the possibility of big data in changing the building industry (RICS, 2016). The Global Trends in Data Capture and Management in Real Estate and Construction Report 2017 highlighted the importance of systematic data capture and management within the surveying profession (RICS, 2017). This was followed by RICS Annual Review 2016-2017: Shaping Our World Report connoting big data significance for the surveying profession to stay relevant (RICS, 2018a).

In 2018, RICS reviewed the assessment of professional competence (APC), stating big data as optional competency for the chartered surveyor award evaluation (RICS, 2018d) and the Big Data, Smart Cities, Intelligent Buildings – Surveying in a Digital World Report 2018 further recognized big data as key competition for the surveying profession growth and begin to define big data for the surveying profession (RICS, 2018b). Big data was also frequently discussed in RICS News & Opinion 2019 publications concerning data ownership, big data skills and collaboration culture (RICS, 2019b, 2019c). In this sense, RICS advocate immense effort to introduce and create awareness on the significance of big data for the surveying profession.

Today, big data is avidly explored in the construction industry, particularly, project management, building design, waste-water management, construction safety,

facilities management and energy management (Barista, 2014; Olsson and Bull-Berg, 2015; Yang *et al.*, 2015; Zhang *et al.*, 2015; Guo *et al.*, 2015, 2016; Lu *et al.*, 2015, 2016; Mathew *et al.*, 2015; Bilal, Oyedele, Akinade, *et al.*, 2016; Ahmed *et al.*, 2017; Taylan *et al.*, 2017; Chen *et al.*, 2017; Koseleva and Ropaite, 2017). The positive big data adoption in construction projects not only enhance human capability by simplifying or shortening construction professional's decision making process but, shifting the construction industry digitalization context to cater and advance maximization of new data forms such as sensor data and video surveillance data. As a result, current positive big data adoption is swiftly changing the conventional construction process. Hence, this suggest critical demand for QS as construction professionals with capability to manage new data structure and respond to the construction process changes.

In contrary, Quantity Surveying (QS) profession limitedly discuss big data. Nevertheless, research shows progressive IT uptake within the QS profession as QS professionals dominantly use MS Word and MS Excel to carry out tendering, valuation of variation, interim payment and final account services; BIM technology, CostX and Glodon to automate taking-off process; and Atlespro and Masterbill to manage Bill of Quantities (BQ) preparation (Shen and Chung, 2007; Olatunji *et al.*, 2010; Ibironke *et al.*, 2011; Wijayakumar and Jayasena, 2013; Ann and Ahamad, 2016). The progressive technology uptake and the British Standard Institute observation on the information generated within the last two years superseded data generation of the mankind history suggests the rise of digitalized environment within this profession (RICS, 2018b). Succinctly, this highlights QS yet to turn their biggest asset, which is data, into value albeit positive big data avenue.

Within this rein, big data is not the future technology for QS, instead, the present. Two indicators recognized are the big data advancement in construction industry is changing the construction processes and demand capabilities to manage new forms of data. Secondly, QS yet to realize the value of data and recognize the big data potential to turn data into value. Together, this shows big data is both an advantage and disadvantage to QS profession. Big data is an advantage to QS shall this profession embrace big data within its operation, improve decision making capability and

transcending QS value (Aibinu, 2017a; Claudia Conway, 2017). In contrary, shall QS stand dormant and incapable of addressing the impact of big data adoption, the presence of big data is viewed to create marginalization of the QS profession.

Aligning to the call for modern technology through CITP 2016-2020, CIDB Malaysia and Ministry of Works Malaysia (KKR) que construction professionals such as QS profession to embark big data in the light of pursuing the local construction industry excellence (SICA, 2017b). With earlier recognition of big data as threat and advantage to QS, this suggests a valid need for QS firms to harness value from data by moving forward with big data, especially the local QS firms. With the positive big data adoption in construction projects including RICS and the Malaysian government proactive big data direction for QS firms, the limited discussion on strategic big data adoption for QS firms indicates a clear knowledge gap. Limited knowledge on this area incapacitate QS to move forward with big data.

Further to this, McKinsey Global Institute reported 10-20%, 20-30% and 30-40% gearing return in European Union public industry, manufacturing industry and United States retail industry respectively (Henke *et al.*, 2016). These show positive yet inconsistent big data gearing value in different industries across the globe. This highlight that big data value depends on organization's capability to steer strategic big data adoption. This highlights criticality for the QS firms to be strategically guided when moving forward with big data.

Table 1.1 Current big data research context

Big data research context		Authors
Framework	Generic	Mikalef *et al.* (2016); Popovic *et al.* (2016); Raja Mohd Ali *et al.* (2016); Segarra *et al.* (2016); Klievink *et al.* (2017); Mazzei and Noble (2017); Olszak and Mach-Krol (2018); Orenga-Rogla and Chalmeta (2019)
	Retail industry	Mneney and Van Belle (2016)
	Construction industry	Lu *et al.* (2015); Bilal *et al.* (2016); Chen *et al.* (2017)
	Healthcare industry	Chawla and Davis (2013); Kim *et al.* (2014)

Big data research context		Authors
Critical success factors	Generic	Wielki (2013); Rajpurohit (2013); Cato *et al.* (2015); Dutta and Bose (2015); Fosso Wamba *et al.* (2015); Halaweh (2015); Koronios *et al.* (2015); Saltz and Shamshurin (2016); Adrian *et al.* (2017); Al-qirim *et al.* (2017); Eybers and Hattingh (2017)

Resource: As shown

To date, big data potential exploration research commonly addressed in generic context as well as in specific industries such as manufacturing and retail industry context (Bughin *et al.*, 2011; Manyika *et al.*, 2011). Similarly, Table 1.1 shows current big data research dominantly address big data framework in generic or in specific industries such as retail, construction and healthcare industry as well as generic exploration of big data critical success factors to support organization's strategic big data embarkment. This evidenced the lack of big data research addressing QS specific niche which undermines QS firm's capability to leverage resources and exploit the big data potentials strategically. This strengthens the criticality to address the knowledge gap through establishment of big data framework for QS firms. The presence of big data framework for QS firms in Malaysia is essential to deliver descriptive knowledge and strategic intel to guide the Malaysian QS firm's big data embarkment.

1.4 Research Questions

This research attempt to address the following questions:

1. What are the big data potentials for the quantity surveyors?

2. What are the attributes supporting quantity surveying firm's big data success?

3. How can the Malaysian quantity surveying firms move forward with big data?

1.5 Research Aim and Objectives

This research aims to develop a big data framework for QS firms in Malaysia. The proposed conceptual framework aspires to provide understanding on QS big data phenomenon through identification of big data phases from infancy to maturity. The big data phases set to outline big data potentials corresponding to specific big data attributes, hoped to guide the Malaysian QS firm's big data adoption.

Accordingly, the following objectives were set to achieve the aim:

1. To explore big data potentials for quantity surveyors

2. To identify attributes supporting quantity surveying firm's big data success.

3. To develop a conceptual big data framework for quantity surveying firms in Malaysia

4. To validate the big data framework for quantity surveying firms in Malaysia

1.6 Significance of Research

This research contributes to the following:

1. It extends the findings on big data knowledge, especially on big data potentials for QS. This provides QS profession an understanding and awareness on distinctive big data potential while delivering a purpose for QS firms to pursue big data.

2. It extends the findings on big data knowledge, especially on attributes for QS firm's big data success. This provides QS profession understanding and awareness on distinctive attributes supporting the Malaysian QS firm's big data success.

3. It develops a big data framework depicting QS big data phenomenon. This creates an all-embracing big data understanding and basis for the Malaysian QS firms to strategically embark on big data.

   The research contribution is not limited to;

4. The conceptual framework developed in this research serve as basis for governing bodies such as Board of Quantity Surveyors Malaysia (BQSM) and CIDB to align the big data directions while supplementing operational constructs to improve QS big data development, adaptation and advancement.

1.7 Research Methodology

This research is strategically designed to explore big data in specific setting of the Malaysian QS. To establish rich findings and deep understanding on big data for the QS firms, this research adopts qualitative research, manoeuvred through grounded theory methodology. Figure 1.3 summarizes the process undertaken in this research. This research begins with conducting extensive literature on big data context, particularly on big data potentials and big data success attributes across different industries. This process stimulates researcher's inquiry while providing vast research background to the researcher. This greatly raised the researcher's capability to ascertain a grounding view on big data context.

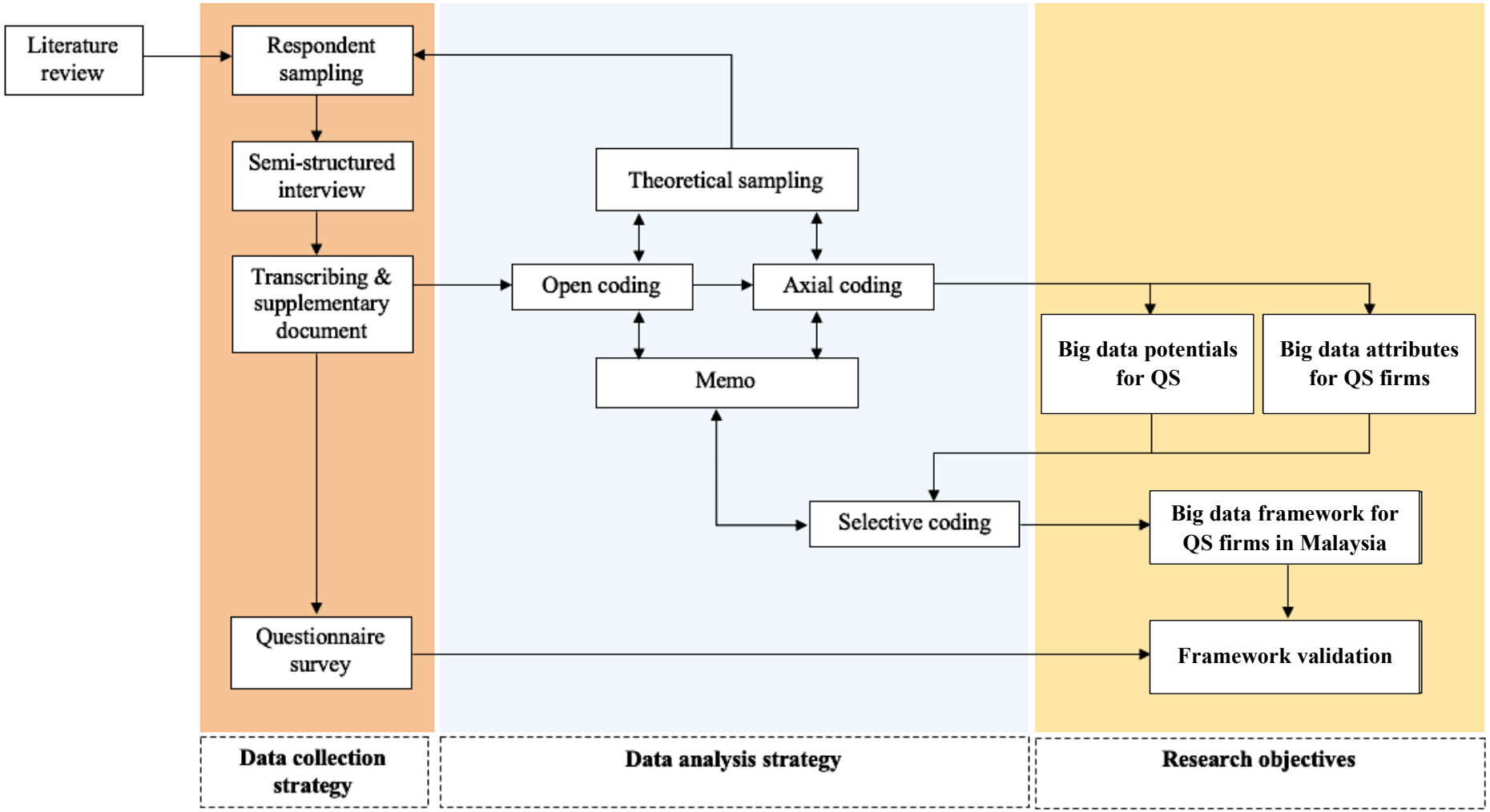

Figure 1.3 Research process

Data in this research were collected using semi-structured interview process. Snowball sampling technique guided by theoretical sampling were used to identify the research participants. The interview data was instantly transcribed upon interview session. Transcribes were analysed using three stages coding process of open coding, axial coding and selective coding. As suggested in grounded theory, data collection and data analysis were conducted concurrently. The researcher further use memo as a medium to record analytic thinking during data analysis process.

Open coding and axial coding process were repeatedly pursued to establish findings on big data potentials and big data attributes. The selective coding process further identified the relationship between the findings to outline the QS big data phenomenon. The QS big data phenomenon outline is further refined and detailed as effort to develop a comprehensive and coherent QS big data phenomenon. This understanding further as basis to establish the big data conceptual framework, depicting knowledge on QS firm's progression across QS big data phenomenon from infancy to maturity. Finally, research validation process was carried out to validate the conceptual framework through participant validation and subject expert validation. No adjustment was carried out on the conceptual framework established.

1.8 Scope of Research

This research focuses on big data in the local context. Data supporting this research were based on big data knowledge, perspectives and experiences from QS professionals, especially those pioneering the local big data initiatives. Despite limited number of QS professionals with big data knowledge, combination of QS professionals from various QS organization background such as local authorities, private consultants, academicians and government bodies allow the construction of multi-perspective, deep and un-biased understanding on big data.

This research only include data on Construction Cost Modelling (CCM), Tender Price Index (TPI), Life Cycle Costing (LCC) and PCE-PREMO big data initiatives discussed during research interview. Besides being the recent and formalized big data initiatives at national level, the selection of big data initiatives allows consistent basis to support the analysis in this research. Depth and breadth of the big data knowledge is expanding yet limited to origin constructs of Technology, Organization and Environment (TOE) framework with Lacovou's perceived benefit tenet as well as Fifth Generation (5G) innovation model.

The development of the big data framework for QS firms was based on co-construction of findings on big data context from local QS professionals, 5G innovation model theoretical basis and established big data maturity models. To govern credibility of data supporting this research, only big data maturity model established by prominent big data organizations and academic research with data analysis were selected. In respond to big data phenomenon solicited from the Malaysian QS perspective, this framework shall best address big data adoption for the Malaysian QS firms as it embodies and appraise local issues, uniqueness and characteristics.

1.9 Organization of Chapters

This thesis comprises of eight chapters including this introductory chapter. Organizations of the chapters are as follows:

Chapter 1: This chapter details the research background, problem statement, research questions, research aim and research objectives. The chapter also includes the research significance, the research methodology in brief as well as the scope governing the research area.

Chapter 2: This chapter provides detail examination on relevant literature epitomizing progression of topics on big data research area from multiple perspectives. The context of big data definition, potential and attributes across industries and professions were

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