

**STAKEHOLDER COLLABORATION IN UNITED KINGDOM (UK) PUBLIC-PRIVATE
PARTNERSHIPS (PPP) SOCIAL INFRASTRUCTURE PROVISION**

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“Strength and growth come only through continuous effort and struggle” - Napoleon Hill.

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List of Abbreviations

3PD	Third-Party Development
A&E	Accident and Emergency
ADB	Asian Development Bank
AUDE	Association of University Estate Directors
BIM	Building Information Modelling
BN	Billion
BSF	Building Schools for the Future
BuildCo	Construction Contractor
CBA	Cost Benefit Analysis
CHP	Community Health Partnerships
CPPIB	Canadian Pension Plan Investment Board
CSF	Critical Success Factor
CSP	Corporate Social Performance
DCSF	Department for Children, Schools and Families
EBRD	European Bank of Reconstruction and Development
EFA	Education Funding Agency
eLIFT	Express Local Improvement Finance Trust
FA	Factor Analysis
FMCo	Service Provider
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GWI	Global Water Intelligence
HBOS	Halifax Bank of Scotland
HS2	High Speed 2
HubCo	Hub Company
IADB through its MIF Investment	Inter-American Development Bank through its Multilateral Fund
ICT	Information Computer Technology
IEA	International Energy Agency
IFU	Infrastructure Finance Unit
IJ	Infrastructure Journal Online Database
IMF	International Monetary Fund

IMR	Infant Mortality Rate
IPA	Infrastructure and Projects Authority
IPD	Integrated Project Delivery
IRR	Internal Rate of Return
IsDB	Islamic Development Bank
IT	Information Technology
ITF	International Transport Forum
JV	Joint Venture
KMO	Kaiser-Meyer-Olkin
LEP	Local Education Partnerships
LIFT	Local Improvement Finance Trust
LLTI	Limiting Long-Term Illness
M	Million
MGI	McKinsey Global Institute
MIM	Mutual Investment Model
MLA	Mandated Loan Arranger
NAO	National Audit Office
NHS	National Health Service
NI	Northern Ireland
NIPD	National Infrastructure Delivery Plan
NIPSA	Northern Ireland Public Service Alliance
NPD	Non-Profit Distribution
OBC	Outline Business Case
OECD	Organisation for Economic Co-operation and Development
OGC	Office of Government Commerce
ONS	Office for National Statistics
PA	Project Agreement
PAIDF	Pan African Infrastructure Development Fund
PCA	Principal Components Analysis
PF2	Private Finance 2
PFI	Private Finance Initiative
PFP	Private Finance Panel

PfS	Partnerships for Schools
PIP	Pension Investment Platform
PPIAF	Public-Private Infrastructure Advisory Facility
PPP	Public-Private Partnerships
ProjCo	Project Company
PSBP	Priority School Building Programme
PSC	Public-Sector Comparator
PUK	Partnerships UK
RBS	Royal Bank of Scotland
REIT	Real Estate Investment Trust
RFP	Request for Proposal
RFQ	Request for Quotation
RICS	Royal Institute of Chartered Surveyors
RII	Relative Importance Index
RM	Relationship Management
SDS	Sustainable Development Strategy
SFT	Scottish Futures Trust
SIS	Social Infrastructure Stakeholders
SPSS	Statistical Package for Social Sciences
SPV	Special Purpose Vehicle
S&P	Standard and Poor's
TN	Trillion
UK	United Kingdom
UNESCAP	United Nations Economics and Social Commission for Asia and the Pacific
US	United States
VfM	Value for Money
WA	Weighted Average
WBG	World Bank
WWII	World War II

Abstract

This research investigates stakeholder collaboration in Public-Private Partnerships (PPP) for the provision of 'more and better' social infrastructure in the United Kingdom (UK). Infrastructure development has been targeted by governments internationally as a vehicle for national growth. However, as economic infrastructure provision continues to dominate investment discord, there are 'signposts' pointing towards the need for social infrastructure provision particularly in Western Nations. The UK has suffered from a legacy of underinvestment. Moreover, as the UK continues to undertake protracted austerity policies to address the implications of the Global Financial Crisis and growing national debt, there is appetite for greater private-sector participation in the provision of social infrastructure. This is to serve the bilateral purpose of leveraging alternative sources of capital into infrastructure as well as to enhance investment impact through greater efficiencies in provision frameworks. This has re-stimulated debate over the viability of cross-sectoral initiatives such as PPP.

PPP has already been pivotal in UK social infrastructure provision. However, the previous framework; the Private Finance Initiative, has been discredited and lambasted for delivering poor Value for Money (VfM), with the partnership being identified as a primary source of poor project performance. This research addresses this knowledge gap. Using a bi-quantitative research methodology comprising a quantitative assessment of datasets sourced from *Infrastructure Journal (IJ)* Online Database as well as survey questionnaires, this investigation contributes: a contemporary analysis of the UK PPP social infrastructure market; defines the PPP social infrastructure partnership boundary specification; determines the ranked salience of PPP stakeholder collaboration attributes identified from literature; empirically extracts six PPP stakeholder collaboration components premised on best-practice exemplars; and applies these findings to the PPP project lifecycle to produce a PPP stakeholder collaboration framework which can be used to provide meaningful inputs to inform policy, industry practitioners and future academic investigation.

CHAPTER ONE

INTRODUCTION

1. Introduction

1.1. Background to Research

The salience of the infrastructure concept as a premise for socio-economic development has been well documented and in the wake of the Global Financial Crisis (GFC), its pertinence appears to be more profound now, perhaps than ever before. As governments continue to position infrastructure investment central to their mandates, Inderst and Stewart (2014) estimate that baseline future infrastructure outlay equates to \$80trillion (tn) over the next two decades. Economic infrastructure development has been identified as a catalyst for economic prosperity and in this regard its provision has dominated infrastructure investment discussion boards. Notwithstanding the salience of economic infrastructure, as the nature of the infrastructure investment paradigm continues to evolve commensurate with societal needs, social infrastructure investment has grown in prominence particularly in Western nations.

Set against a legacy of underinvestment, in the United Kingdom (UK), there are now pronounced 'signposts' indicating the need to upgrade and replace social infrastructure facilities. Yet, as the UK government continues to implement its protracted austerity policies to reduce public-sector debt, a gap has manifested between infrastructure investment demands and capital supply.

To bridge this gap, there is greater appetite for private finance to fund infrastructure provision. Furthermore, in the current economic context, the UK government now requires better impact from their investments. Therefore, the UK government is now confronted with a bi-lateral infrastructure provision challenge comprising the need to identify and lever alternative sources of capital to provide 'more' social infrastructure, as well the task of improving efficiencies within infrastructure procurement frameworks and strategies for 'better' infrastructure provision to enhance investment impact

A procurement framework which has been extolled as a vehicle for 'more and better' social infrastructure provision is Public-Private Partnerships (PPP). PPP utilises private financing and expertise. Moreover, many have argued that the private-sector is characteristically more proficient than the public-sector in the provision and delivery of infrastructure services premised on superior management skills and resources (IMF, 2015; PwC, 2017). Considered one of the pioneers of partnering initiatives through the Private Finance Initiative (PFI), already PPP has been instrumental in social infrastructure provision in the UK and indeed

where offering best Value for Money (VfM), PPP will continue to be a viable mechanism for social infrastructure development.

Notwithstanding this commitment to partnership-based procurement, the PPP provision mechanism has lost traction. The previous framework; the Private Finance Initiative (PFI) has been discredited and lambasted for delivering poor VfM for the taxpayer. Consequentially, there has been low confidence in PPP which has culminated in the UK government undertaking a policy reformation to address inherent inefficiencies of these frameworks as well as to stimulate wider alternative sources of capital beyond government funding capacity (HM Treasury, 2012). Despite these reformations, the UK PPP market has failed to return to activity levels exhibited prior to the GFC. Curtailed levels of market activity have resultantly engendered uncertainty around to the future of PPP. Furthermore, this has prompted some to query whether the changes implemented through these nuanced modalities have legitimately addressed the inherent inefficiencies of PFI.

Grounded in a cross-sectoral partnership, for some time, collaboration has been acknowledged as a cornerstone of the long-term sustainability of these frameworks (Latham, 1994; Duffield, 2006; Smyth and Edkins, 2007; Zheng et al., 2008; Constructing Excellence, 2011; HM Treasury 2012; Waring et al., 2013; Burke and Demirag, 2017). Furthermore, as nascent alternative sources of capital continue to enter the PPP space, there is a need for greater collaboration to unlock these additional sources of finance. Nevertheless, despite the importance of collaboration, literature identifies that the ethos of these arrangements has been a contractual outsourcing arrangement as opposed to a collaborative partnership. Consequentially, many in PPP literature point toward the partnership as a primary source of poor performance (Zou et al., 2013; Jefferies et al., 2014; Jefferies and Rowlinson, 2016; Burke and Demirag, 2017; O’Nolan and Reeves, 2017). Against this backdrop, it is argued that there is a forthcoming knowledge gap pertaining to stakeholder collaboration in ‘more and better’ UK PPP social infrastructure provision.

1.2. Aim and Objectives

The aim of this thesis is to critically investigate stakeholder collaboration in PPP, for the provision and delivery of ‘more and better’ social infrastructure in the UK. To achieve this aim, this thesis has strategically determined the following research objectives:

1. To critically appraise the infrastructure concept as a premise for socio-economic development;

2. To critically evaluate the role of PPP as a vehicle for 'more and better' social infrastructure provision in the UK;
3. To critically examine collaboration between stakeholders within UK PPP social infrastructure projects;
4. To identify the salient attributes of stakeholder collaboration in PPP in the provision, delivery and management of UK social infrastructure; and
5. To develop a stakeholder collaboration framework for application in UK PPP frameworks.

1.3. Research Methodology

This investigation undertook a bi-quantitative research methodology. This was comprised of a contemporary analysis of the UK PPP social infrastructure market as well as electronic survey questionnaires.

Premised on datasets sourced from *Infrastructure Journal (IJ)* Online Database, this research undertook a quantitative assessment of the UK PPP social infrastructure market. This was to offer contemporary insights into the current marketplace in the absence of publicly available centralised or standardised datasets. *IJ* depicts global PPP activity from 2005 to present day, therein supplying details on capital value, financial structures, Special Purpose Vehicle (SPV) details and key actors. Data was downloaded and interrogated using Microsoft Excel and was profiled in terms of deal number, transaction capital value, sector activity, regional market activity and financial structure. Access to these datasets required an annual subscription and was obtained for this research in the period spanning 31/05/2017 to 31/05/2018. Data, for this market investigation, was downloaded on 31/06/2017.

Holding a positivist epistemological and objectivist ontological stance; in addition to the market investigation, the research also undertook a quantitative survey with electronic questionnaires as the research instrument. The survey was hosted by SurveyMonkey and was issued to key social infrastructure stakeholders (SIS). A population of 522 SIS organisations was determined from two sources, namely, *IJ* and *HM Treasury PPP summary data*. From this population, a sample was selected using a purposive random sampling technique. In total, 220 organisations were invited to partake in the survey; 109 responded and 36 were incomplete culminating in 73 completed and useable responses. From a sample of 220, 73 completed surveys equated to a 33% response rate. Participants were asked to provide information on their background to offer opinions on UK PPP social infrastructure provision as well as perceptions of stakeholder collaboration inherent to these frameworks. Questions were asked by means of closed-questions, using a five-point Likert scale to allow

for consistency and generalisability. The principal purpose of the survey was to have respondents evaluate a list of 27 PPP stakeholder collaborative attributes which were identified as part of the literature review.

With the collated responses, the research conducted a Relative Importance Index (RII) to rank the attributes in terms of their importance. This was complimented with the Kruskal-Wallis H test which was conducted to determine differences between groups. Following this, Kendall's Coefficient of Concordance was carried out to establish statistical significance and levels of agreement among respondents. Having satisfied these tests, a Principal Components Analysis (PCA) was undertaken to reduce the larger number of 27 PPP stakeholder collaboration attributes into smaller, more meaningful constructs which are more easily understood. The research tested the accuracy and reliability of the PCA sample through the application of the Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and Bartlett's test of sphericity. The PCA employed an eigenvalue of one, stipulated a component variance benchmark of 70%, adopted an orthogonal varimax rotation and any component scores below 0.45 were suppressed. Ultimately, the PCA identified six principal components; dynamic partnering, partnership core values, formal governance structures, risk management, Authority leadership and mission statement. To validate the components, Cronbach's alpha was applied. The purpose of this was to examine the levels of variance within components and covariance between components. A value of 0.78 was determined which satisfied this test. Components were then contextualised to the PPP lifecycle to develop the PPP stakeholder collaboration framework and components were named in accordance with their loading variables which was informed by literature.

Chapter six provides further discussion on the research methodology.

1.4. Research Contributions

This section presents a summary of the key contributions to knowledge derived from the research. More on these contributions is further detailed in chapter ten.

The research made six fundamental contributions to knowledge. Firstly, the research has added to the infrastructure stock of knowledge. While many continue to consider infrastructure investment through the lens of economic infrastructure provision, this research has alternatively identified, considered and promotes the need for 'more and better' social infrastructure investment in the UK. As the demographic of the UK population

changes, significantly, this research highlights the importance of providing social infrastructure commensurate with these socio-economic demands.

Utilising *IJ* datasets, the research has contributed a contemporary analysis of the UK PPP social infrastructure market. By doing so, this added timely credibility to the investigation. The research profiles the UK PPP social infrastructure market. This provides value insights into transactional trends in terms of deal number, capital value, sectoral spend, regional markets and financial structure. This fills a knowledge gap which is not available in public forums which is important set against the backdrop of market uncertainty and the future use of PPP.

In literature there remains discourse as to who should be considered a PPP social infrastructure stakeholder (SIS). This is also coupled with an absence of defined systems to understand how PPP SIS are involved in these partnering frameworks. This research addresses this knowledge gap. Grounded in *stakeholder theory*, the research has contributed a PPP SIS boundary specification framework. Premised on the attributes of *legitimacy* to identify PPP SIS as well as *power* and *urgency* to understand how they are involved, this research has contributed a PPP SIS framework that advantageously accounts for changes over time as opposed to a definitive list which runs the risk of excluding future unknown SIS. Furthermore, by grounding the framework in theory, this framework can be imported into economic PPP as well as into other international jurisdictions. Therefore, this framework is applicable both in the UK as well as internationally.

Premised on the findings of an assessment of this PPP SIS boundary specification, the research has also undertaken a critical examination of literature to identify 23 inherent PPP stakeholder collaboration gaps. Combined with this list of collaboration gaps, the research undertook an analysis of additional PPP research and collaboration literature to ultimately identify 27 PPP stakeholder collaborative attributes. This list of PPP stakeholder collaborative attributes was subsequently evaluated by SIS organisations as part of the survey questionnaires. Empirically, through the application of the RII and the Kruskal-Wallis test, the research has presented a salience list which ranks these attributes in terms of their importance for PPP stakeholder collaboration. Equally, it was identified there were disparate opinions between SIS groups in regard to four of the collaborative attributes. This has made an original contribution to knowledge.

While the list of 27 attributes in and of itself is valuable, it can be difficult to interpret these findings, therefore this research additionally undertook a PCA to refine this list into smaller,

more meaningful constructs for easier interpretation. Through the application of PCA, this thesis has determined six principal components of PPP stakeholder collaboration and therein made an empirical contribution. These components were: dynamic partnering, partnership core values, formal governance structures, risk management, Authority leadership and mission statement. By simplifying this framework, beneficially the findings of this investigation can be used to inform policy-makers as well as industry practitioner business models to enhance collaboration among SIS for improved project delivery.

Finally, the research has made an important contribution to knowledge by contextualising the PCA extracted components to the PPP project lifecycle to produce a PPP stakeholder collaboration framework. In doing so, the research has delineated best-practice recommendations premised on the research findings. Originally, this offering accounts for the dynamic nature of collaboration as well as the transformational boundary specification across the duration of the project.

1.5. Thesis Structure

This thesis comprises ten chapters. The order and layout of these chapters is delineated in figure 1.1 together with how they correspond to the research methodology and the objectives of the research.

Chapter one introduces the research. It offers insight into the background and pertinence of this investigation. As well as this, chapter one identifies the aim and objectives of the study, the adopted research methodology, the thesis structure and the ultimate contribution to knowledge.

Chapter two considers the infrastructure concept to fulfil objective one of the research. In the context of this research, the infrastructure concept encompasses defining infrastructure, an analysis of the socio-economic implications of infrastructure provision and consideration of the infrastructure investment paradigm. Thus, chapter two considers the role of infrastructure investment in a functioning and vibrant society. Moreover, it considers the scale of the infrastructure provision challenge ahead and therein identifies how social infrastructure investment has been eclipsed by economic infrastructure development in the UK. Chapter two then reviews social infrastructure investment in the UK before critically examining the potential of private-sector participation in providing 'more and better' social infrastructure. Finally, this chapter recognises the increased appetite for PPP thereby providing the link between chapters two and three.

Chapter three conceptualises PPP. It considers PPP literature to offer a definition and evaluation of its growing popularity internationally. Chapter three also examines PPP in the UK and considers how PPP can provide 'more and better' infrastructure. The research appraises the key stages in a PPP project before finally undertaking a critical examination of literature to identify 19 challenges confronting the provision of 'more and better' UK PPP social infrastructure. Ultimately, the research determines collaboration is a pertinent knowledge gap, worthy of further investigation.

Chapter four assesses the PPP partnership boundary specification in preparation for the collaboration investigation. This encompasses identifying who is involved in the partnership and understanding how they are involved in the PPP project. To do this, the research deliberates on *stakeholder theory* and extracts the attributes of *legitimacy*, *power* and *urgency* to produce a boundary specification framework which is subsequently applied to the PPP project lifecycle. Premised on these findings, this chapter conducts a critical examination of this boundary specification and therein identifies 23 PPP stakeholder collaboration gaps.

Chapter five is centred on PPP stakeholder collaboration. This chapter considers the collaboration concept and examines *collaboration theory* to conceptualise how collaboration can improve PPP frameworks. Chapter five defines collaboration, identifies the motivations to collaborate and ultimately, consolidates the findings of the literature review to determine a list of 27 attributes necessary for PPP stakeholder collaboration. This list is a culmination of the PPP stakeholder collaboration gaps identified in chapter four, attributes identified in PPP literature, as well as additional attributes discerned specifically from collaboration theory. This list therefore provides the foundations for the empirical investigation.

Chapter six of this investigation outlines the research methodology by which to develop the PPP stakeholder collaboration framework. Adopting a positivist epistemological and objectivist ontological stance, this chapter delineates the bi-quantitative research methodology to be undertaken comprising a contemporary analysis of the UK PPP social infrastructure paradigm coupled with an electronic quantitative survey questionnaire design. It identifies the data analysis techniques employed to interrogate the survey responses before delineating the PCA design undertaken for the development of the PPP stakeholder collaboration framework.

Chapter seven consists of the contemporary analysis of the UK PPP social infrastructure market. It reflects on the transformations of the UK PPP markets and provides contemporary

context for the research. Data is considered according to project capital value, deal number, sectoral activity, jurisdictional market and financial structure. From this analysis, the research identifies that Health and Education continue to be the two preferred social infrastructure sectors which utilise PPP. Furthermore, of the four jurisdictional markets, all have been acutely impacted by the GFC. Furthermore, it was found that despite policy reformations, activity remains relatively muted; though there are burgeoning signs of growth in Scotland.

Chapter eight consists of an analysis of the SIS survey questionnaire responses. It reflects on the findings of the survey regarding UK PPP social infrastructure provision in addition to respondent perceptions of PPP stakeholder collaboration. Following this, the study applies the RII to determine the salience of the PPP stakeholder collaborative attributes to fulfil objective four. These findings are considered according to the weighted average (WA) of the respondent group, while the research also analyses the findings to discern nuances between SIS groups according to the Kruskal-Wallis H test. Having determined the salience of the PPP stakeholder collaborative attributes, chapter eight examines the statistical significance of the response cohort through the application of Kendall's Coefficient of Concordance in preparation for the PCA.

Chapter nine constitutes the development of the PPP stakeholder collaboration framework through the application of PCA to the survey responses. The PCA determined six PPP stakeholder collaborative components which are then contextualised to PPP literature. In doing so, the research presents a PPP stakeholder collaboration framework which delineates the dynamics of PPP stakeholder collaboration across the differing phases of the project lifecycle. By doing so, this chapter meets objective five of this thesis and offers a meaningful contribution to knowledge.

Finally, chapter ten reflects on the key findings of the research. It deliberates on the implications of the thesis and considers its contribution to knowledge. Following this, chapter ten reviews the relevance of the research findings and offers recommendations for enhanced performance in UK PPP social infrastructure provision. In concluding, chapter ten presents the limitations of the study before identifying areas for further research.

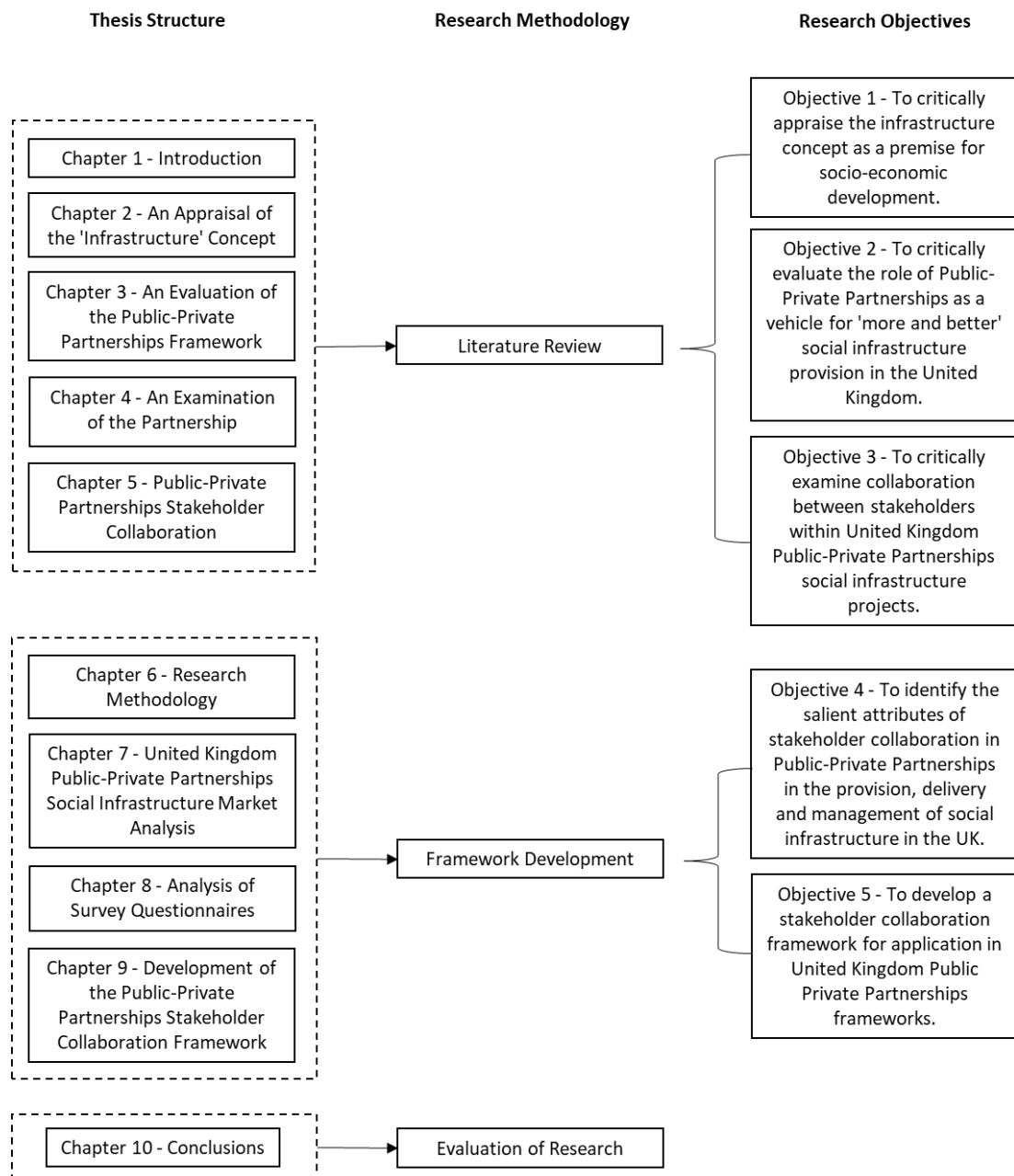


Figure 1.1: Structure of the Thesis

1.6. Summary

This chapter, chapter one, has outlined the framework for this thesis. It has considered the background to the research, determined the gap in knowledge pertaining to PPP stakeholder collaboration and established the pertinence of the study. To address this knowledge gap, it has identified the research aim and objectives as well as delineated the research methodology to be undertaken to address this information void. Furthermore, this chapter has summarised the contents of each chapter, identified how the research fulfils the research objectives and depicted the structure of the thesis to do so. The research will now

progress onto chapter two which introduces the infrastructure concept as part of the literature review.

CHAPTER TWO

AN APPRAISAL OF THE 'INFRASTRUCTURE' CONCEPT

2. An Appraisal of the 'Infrastructure' Concept

2.1. Introduction

This chapter introduces the infrastructure concept. It offers a definition of infrastructure and examines the important role of infrastructure development in a vibrant and functioning society. The research reviews the contribution of infrastructure across the macro, meso and micro levels of society and deliberates on its prevailing role in socio-economic development.

Moreover, chapter two scrutinises the infrastructure investment paradigm. This comprises analysis of historical expenditure as well as an examination of projected future needs. It examines changes within the infrastructure investment paradigm and identifies the increasing prominence of social infrastructure investment in Western developed nations.

The research considers the appetite for intensified participation of the private-sector in the provision of 'more and better' infrastructure. To do this, the research considers how private financing can be utilised to bridge the funding gap as well as how increased private-sector participation in the infrastructure delivery can delivery on improved services provision.

Finally, chapter two offers insights into social infrastructure provision in the United Kingdom (UK) and identifies Public-Private Partnerships (PPP) as a vehicle by which to bridge the current challenges associated with infrastructure provision.

Thus, to fulfil objective one of the research which is centred on the critical appraisal of the infrastructure concept as a premise for socio-economic development, chapter two is structured as follows:

- A conceptualisation of infrastructure;
- Determining the salience of infrastructure as a premise for socio-economic development;
- Analysis of the infrastructure investment paradigm; and
- Consideration of private-sector participation in the provision of 'more and better' social infrastructure in the UK.

2.2. Conceptualising Infrastructure

Infrastructure is integral in the micro, meso and macro levels of a functioning society, yet, despite its salience, it is a concept which remains somewhat ambiguous and disparate within literature. The term infrastructure emanated out of World War II (WWII) where it was initially employed as a military reference to denote 'underlying' structures. Subsequently, the

infrastructure term was adopted by development economists to describe 'social overhead capital' and is now a widely-recognised term (Howes and Robinson, 2005).

Historically, infrastructure has been characterised as capital intensive networks and services which are government provided and owned, and accordingly were referred to as 'public infrastructure capital'. Yet, as provision models have matured and developed, many of these facilities are now privately provided and paid for. Thus, the implications of this has meant this conventional interpretation of infrastructure accounts for only a minor portion of a much wider network of services and assets (Howes and Robinson, 2005). It is therefore no surprise that many have contended that infrastructure should encapsulate both public and privately provided assets.

In this vein, Rutherford (2002) defined infrastructure as "the basic services or social capital of a country, or a part of it, which make economics and social activities possible". Comparatively, Grimsey and Lewis (2002) deemed that infrastructure comprehensively includes public services, the economic sector as well as social contributors which influence living standards and quality of life. Differently again, Adetola et al. (2011) argued that rather than the traditional focus on physical 'hard' assets such as roads, ports, communications, energy, and water services, infrastructure should now be considered as an umbrella term additionally accompanying 'softer' services such as information technology and knowledge bases.

Premised on these disparate interpretations, several have attempted to reconcile literary differences through systematic classifications or categorisations of infrastructure. Jochimsen (1966) classified infrastructure into physical infrastructure such as hospital buildings, personal infrastructure pertaining to doctors, teachers and so on, and institutional infrastructure comprising financing systems. Alternatively, Beeferman (2008) pioneered a morphology and functionality taxonomy.

Notwithstanding these contributions, increasingly literature has expressed a proclivity for the of economic-social infrastructure dyad. Economic infrastructure conventionally comprises large natural monopolies such as highways, ports, airports, utilities, power, and communications systems (Gramlich, 1994). These are typically long-standing, capital intensive, engineering network structures to bolster economic activity. Comparatively, social infrastructure is constituted from municipal, leisure, education, emergency services, health, housing, justice and recreational assets which facilitate human development, quality of life and living standards (Howes and Robinson, 2005). In recent literature, this interpretation of

infrastructure seems to have gathered momentum and is now relatively consistent across industry, academic and government documentation. Thus, this research will hence adopt this systematic social-economic codification of infrastructure.

2.3. The Salience of Infrastructure Provision

Socio-economic development, as suggested by the name, is a two-faceted comprisal, constructed from 'social development' and 'economic development'. It encapsulates the civic and societal, and social and economic needs of a nations population. From a policy perspective, this encompasses the development of long-term strategies by which to meet these needs in the most practical approach (Palliyaguru et al., 2013). According to Hayami and Godo (2005) economic development is the concerted endeavours to improve the economic, political and social well-being and quality of life of a community. On the other hand, social development is defined by Hasmath and Hsu (2007) as the framework for the improvement of individual livelihood. Thus, socio-economic development is effectively a conjoined or bilateral approach for the betterment of the lives of people in a social and economic capacity.

Though on the face of it, socio-economic development can be easily defined, its composition and measurement is in fact a complexity of indices or metrics; all of which are compounded by inconsistencies. Palliyaguru et al. (2013) reviewed four research articles. From these offerings, the authors identified an amalgam of 38 unique indices used to measure socio-economic development. Some of these criteria captured input on Gross Domestic Product (GDP), infant mortality rate (IMR), environmental degradation, life expectancy and literacy rates. Alternatively, Stec et al. (2014) premised socio-economic development on 'synthetic measures' of 27 diagnostics within four themes: demographic potential and labour market, development of social infrastructure, economic potential and development of technical infrastructure. In this regard, it appears socio-economic development is now transcending beyond the conventional social-economic dyadic themes. This is now apparent in Eurostat (2017), who as part of the Sustainable Development Strategy (SDS) calculated socio-economic development through a culmination of economic development, innovativeness, competitiveness, eco-efficiency and employment factors. Hence, socio-economic development now can be distilled into social, economic, environmental and sustainable considerations.

Evidently, socio-economic development is multi-faceted, complex and dynamic. Yet, within this concept, infrastructure is viewed as a cornerstone by which to propagate and empower

other societal functions. Infrastructure can be the vector to facilitate urbanisation, generate social stability, and mitigate disasters (World Bank, 2014). It is therefore understandable that infrastructure investment occupies a pivotal role in governmental national development strategies. The research will now undertake an exploration of the social and economic benefits derived from infrastructure investment and therein underpin the validity and pertinence of this investigation.

2.3.1. The Socio-economic Implications of Infrastructure Development

Seminal work by Aschauer (1989a, 1989b, 1990) identified strong positive correlation between infrastructure provision and macroeconomic growth in the United States (US). In his work, Aschauer considered the relationship between public capital expenditure and private-sector productivity. Aschauer identified low private-sector production levels pre-1989 were attributable to under investment into infrastructure. When deliberating public expenditure to promote economic growth and productivity, Aschauer believed further consideration should be lent to 'core' economic infrastructure such as streets, highways, airports and mass transit systems.

Given the magnitude of Aschauer's ground-breaking work at that time, a series of studies ensued. Numerous empirical papers have exhaustively investigated the association between infrastructure investment and economic growth. Notably, several authors have questioned the viability of Aschauer's work (see Aaron, 1990; Hulten and Schwab, 1991; Jorgenson, 1991; Tatom, 1991). They opined results displayed spurious correlation, were consequent of causation running in opposing directions and that estimates were too fragile. Addressing many of these criticisms, Munnell (1992) reiterated Aschauer's previous findings; infrastructure investment increases economic growth and productivity. To do this, Munnell produced a summary of findings illustrating positive and statistically significant parallels between infrastructure investment and economic growth. Although the magnitude of Aschauer's earlier findings were reduced, ultimately, the studies reaffirmed the relationship.

Consequent of these earlier studies, voluminous research has further deliberated on this relationship. Devarajan et al. (1996) found negative correlation between public capital expenditure and economic growth in developing nations. This may be resultant of overprovision of services, therefore reducing the productivity. Oppositely, Egert et al. (2009) contended economic infrastructure positively impacts growth. Furthermore, the level of effect was deemed to vary across sector, time and country. Egert et al. (2009) also identified over investment as possible which may result in inefficient use of infrastructure. Srinivasu

and Srinivasa (2013) performed a summation of the literature to date. They identified de la Fuente and Estache (2004) as important research. De la Fuente and Estache (2004) evaluated 102 countries over a period of 15 years. They found that in the main studies identified affirmative correlation between the impacts of infrastructure on growth. Similarly, Straub (2008) explored 30 macroeconomic papers. Spanning 1989 to 2006, over half the studies found positive and significant results forming corresponding conclusions, 38% found no significant effect and 6% identified negative effects. Moreover, more contemporary research continues to reaffirm and validate earlier investigations.

On the basis there is wide spread acceptance that infrastructure correlates to positive growth, more recently the debate has evolved. Parallel to investigating the nexus between infrastructure and economic growth, some have attempted to quantify this correlation. By measuring the increase in GDP resultant of each dollar spent on infrastructure, several models have been formulated to assess the multiplier effect of government infrastructure investment on the economy. While there persists consternation over the accuracy of using GDP, in the main, it remains the most widely used form of measurement.

Within literature, the numerical value of the multiplier effect varies substantially. This may be explained by differences in country, policy and economic environment (Yanusevsky and Yanusevsky, 2014). Generally, the effect does not rise above 2.5, though there are some exceptions. Auerbach and Gorodnichenko (2012) examined the government purchasing multiplier effect in OECD countries¹. Findings revealed the multiplier effect measured as high as 2.5 and tended to be greater in a recession. Christiano et al. (2010) argued that the multiplier effect can be as much as 4 when nominal interest rates are constant whereas Ramey (2011) contends the figures are probably closer to between 0.8 and 1.5. Although no collective nor definitive conclusion has been categorically agreed, predominantly findings have confirmed positive and statistically significant findings.

In addition to a macro-economic approach, others have undertaken meso and micro-level investigations. Prud'Homme (2005) asserted that between one third and one half of infrastructure services are for final household consumption, particularly water, energy and telecommunications. In this context infrastructure is integral in social development. Infrastructure can influence working conditions, education provision, health levels, social

¹ The Organisation for Economic Co-Operation and Development (OECD) is an intergovernmental organisation with 35-member states including from North and South America, Europe and the Asia-Pacific region (OECD, 2017).

connections, quality of life, well-being, the environment and, civic engagement and governance (Sartori and Catakano, 2013). Discussing the importance of rural transport, Fouracre (2001) stated access to markets and farms, education, employment, and health and welfare were all dependent on access to transportation infrastructure. Furthermore, facilitating social cohesion to family, social or political gatherings, transport improved social well-being. In agreement, Gannon and Liu (1997) claimed transport facilitates other services, enabling wider civic growth rather than just economic benefits.

Other notable research such as the Washington State Institute for Public Policy (Aos et al., 2004) estimated that for every dollar invested in early childhood education, the cost-benefit ratio to the economy exceeds US\$2. The same study also recorded over US\$11 returns per dollar invested in youth development programmes. The RAND Corporation projected, for every dollar invested in pre-school education, there is a net-return of US\$2.60 (Karoly and Bigelow, 2005). Similarly, Psacharopoulos and Patrinos (2004) found returns to both social and private capital in OECD countries ranging from 8.5 to 13.4% as a direct result of education investment. Education provision also has wider long term, tacit advantages. Schultz (1975) and Welch (1970) argued education is fundamental in the development of skills and scientific knowledge incumbent for the long-term betterment of wider societal and technological advancement. Likewise, Brenneman and Kerf (2002) maintained, education is integral in the advancing and progression of other infrastructures such as road networks and energy systems.

As well as education, access to other social facilities and assets are important. The UK Office for National Statistics (White and Edgar, 2010) found statistically significant differences between social class and Health Life Expectancy (HLE) in England. Those with a lower social class were found to typically exhibit a shortened HLE. White and Edgar (2010) also claimed, socially disadvantaged were more likely to develop a limiting long-term illness (LLTI) and increased mortality rates (White and Edgar, 2010). Bebbington and Bajekal (2003) and Rasulo et al. (2007) correlated poorer general health, both in absolute and relative terms to social deprivation. Likewise, according to Aguilera and Marrufo (2007), over 70% of infant mortalities occur inside hospitals, therefore, by improving hospital quality through infrastructure provision, IMR may decline. In line with this, Leipziger et al. (2003) estimated that by improving a country's infrastructure index by as little as 10%, child mortality may be reduced by 5%, infant mortality by 3.7% and maternal mortality rate by 7.8%.

Increasingly, in literature there is greater awareness for a cohesive community. Indeed, over a decade ago Casey (2005), citing Marmot and Wilkinson (2001) estimated that for every US\$1 invested in community facilities, US\$10 could be saved through reduced crime, better employment opportunities and so on. Moreover, infrastructure provision creates employment opportunities. In the 2011 Northern Ireland (NI) census, almost 31% (213,352) of the national workforce were employed in the public-sector. Over 68,000 worked in education and 117,201 in health and social work (AgendaNI, 2017). Canning (1998) described infrastructure as the 'glue which holds communities together'. Equally, Casey (2005) discussed the importance of social infrastructure in fostering social capital. Social capital has been instrumental in achieving increased economic success, improved school performance, decreased crime, and all round better health and well-being. Furthermore, social capital has been correlated to lower levels of depression, reduced crime and reduced rates of suicide (Putnam and Feldstein, 2000).

From the foregoing discussion, it is evident infrastructure provision is integral to all aspects of societal functioning. There are both explicit benefits and implicit externalities derived from its provision. Fundamentally, infrastructure systems are convergent and are interdependent and this nexus should be reflected in government development strategies. Against this backdrop, the research will now explore into the infrastructure investment paradigm to offer insight into current state of infrastructure and the scale of the challenge ahead.

2.4. The Infrastructure Investment Paradigm

The infrastructure investment paradigm, over the previous ten years, has undergone a resurgence in terms of attention for socio-economic development to the extent that it is arguably more pertinent now, than it has been at any point before in history. Albeit a decade ago, the Global Financial Crisis (GFC) had an unprecedented impact on the infrastructure landscape. As a response to economic contraction, infrastructure investment was used as a catalyst by governments as part of stimuli packages to reignite economic growth, both in the short term through job creation, but also long term, as a mechanism to unlock greater business activity as well as a premise by which to entice inward investment (PwC, 2017).

Since then, the GFC has tacitly served to underpin and re-popularise the salience of infrastructure investment. Fundamental to a vibrant society and thriving economy, nationally and internationally, policy-makers are now positioning infrastructure investment central to their political mandates (RICS, 2013). Thus, as the salience of infrastructure, and

the so-called 'infrastructure investment challenge' continues to be promulgated across the public and private-sectors, many have forged attempts at quantifying the scale of the challenge ahead.

One of the foremost barriers when investigating the scale of infrastructure investment is the absence of standardised and reliable data. Allied with this, these data deficiencies are compounded by inconsistent methodological frameworks. While some have approached the data utilising top-down approaches, others have preferred to conduct bottom-up assessments. Also, set against the need for economic growth, many have exhibited a proclivity for economic infrastructure quantification. These forecasting frameworks, although theoretically robust, have resultantly rendered significantly disparate projections.

Notwithstanding these caveats, perhaps the most widely quoted appraisal of historical infrastructure outlay has been that of McKinsey Global Institute (MGI, 2013). McKinsey Global Institute (MGI, 2013) estimated that between 1992 and 2011, on average, 3.8% of global GDP was spent on infrastructure. Pertaining explicitly to economic infrastructure, this equated to an annual average of US\$2.4trillion (tn). Over this timeframe, PwC (2014) estimated that there has been a paradigm shift in developed and developing markets. Spending in advanced economies has markedly contracted from around 3.6% of GDP in the 1980s to just 2.8% in 2008. Consequentially, this downward shift has culminated in socio-economic signals indicating the necessity to upgrade and replace old infrastructure systems as well as the need to supply new developments.

Furthermore, greater salience has been attached to social infrastructure provision. According to Inderst (2013), though transport continues to dominate capital outlay, social infrastructure expenditure now accounts for around 1% of GDP in Europe, the US and Japan alike. Evolving from heavy industrialised economies centred on traditional manufacturing skills to technological, services-based, knowledge intensive economies, developed nations are prioritising access to public services and social infrastructure (PwC, 2014). Comparatively, emerging markets, premised on economic growth, have calibrated their capital investment strategies toward economic infrastructure development. Indeed, figures indicate in developing regions investment outlay has shifted from around 3.5% of GDP to 5.7% driven mainly by the Chinese economy (PwC, 2014).

Against this backdrop, combined with the vacuum of standardised data, some have forged ahead in attempting to quantify the scale of the investment challenge ahead. Collating data from multiple sources, in 2013, MGI (2013) proposed that to maintain economic growth

consistent with projections up until 2030, baseline figures of US\$57.3tn will be required for future infrastructure delivery². This equates to an increase of almost 60% over that already spent over the preceding 18 years (US\$36tn). Appropriating around 3.5% of global GDP to the provision of transport (road, rail, ports and airports), power, water, and telecommunications, it should be noted that these trajectories do not account for the backlog of underinvestment, the need for more resilient infrastructure to defend against climate change, nor do they take into consideration social infrastructure. Since this popular contribution, MGI (2016) has recalibrated their projections. Estimates have systemically climbed to circa 3.8% of GDP, equating to around US\$3.3tn annually.

Other prognosis conducted by the OECD (2006) valued future infrastructure needs at US\$53tn, equating to 2.5% of global GDP until 2030. Akin to MGI, these projections constituted road, rail, telecommunications, electricity and water.

Comparatively, utilising Oxford Economics data sets, PwC (PwC, 2014) reviewed infrastructure spending trends until 2025. PwC reported infrastructure outlay must increase from US\$4tn per annum in 2012 to over US\$9tn by 2025, equivocal to US\$78tn globally between 2014 and 2025. These figures were based on an annual growth rate that was predicted to rise to 7.5% by the middle of the decade, but slowly retreat, levelling off at 6.5% around 2020. Inderst and Stewart (2014) also appraised infrastructure requirements proximal to US\$80tn. Accounting for the limitations of the MGI report, Inderst and Stewart included social and green infrastructure in their estimates. Resultantly, projections increased from US\$3.5tn annually to US\$5tn per annum, equating to US\$80tn of investment by 2030.

From these findings, it seems that while comprehensive consensus may be absent from the above assessments in terms of exact quantities, it is nonetheless apparent benchmarked infrastructure investments needs are on an unprecedented scale. The research has also found that despite the paradigm shift towards social infrastructure provision in developed economies, economic infrastructure outlay continues to dominate investment literature. These findings are pertinent when set in the context of section 2.3 which acknowledged the interconnected nature of infrastructure networks.

While it is agreed that there is an important argument for economic infrastructure investment, predicated on the earlier findings, it is also suggested that the infrastructure

² MGI (2013) sourced infrastructure investment data from the OECD, International Energy Agency (IEA), International Transport Forum (ITF), Global Water Intelligence (GWI) and MGI Analysis.

investment paradigm should be considered holistically instead of unilaterally. In this respect, research should also server to offer greater consideration to social infrastructure provision.

2.4.1. The Paradigm Shift – From Public to Private Financing

Infrastructure investment can be sourced from either public or private options. The government may generate capital through taxes, or borrow directly from local and non-local institutions. The state may also lever infrastructure financing from the private-sector (Della Croce et al., 2015). Predominantly, the government has provided most of the funding for infrastructure provision either through taxes or borrowing warranted by the perceived socio-economic benefits.

However, in more recent years, in the current economic context, and the associated governmental capital retrenchment, there has equally been a paradigm shift in that there is appetite for greater mobilisation of private finance to alleviate the infrastructure financing gap. Advantageously, private finance can negate budgetary pressures on public capital and provide a means to overcome funding shortfalls on the part of the public-sector. Furthermore, it can act as a conduit for greater investment diversification of national investment portfolios as enables capital flow into sectors which may not be available elsewhere (Pisu et al., 2015).

Private capital can be channelled into infrastructure through two forms; *corporate financing* and *project financing*. Project financing is a subset of corporate financing though there are distinguishable characteristics. *Corporate financing* constitutes a private operator funding a project on-balance sheets (World Bank et al., 2016). In contrast, *project financing* typically is formulated from limited-recourse lending directly to a project (Gardner and Wright, 2011). Of the two financing mechanisms, corporate finance has historically been the preferred option. Instrumental in the provision of utilities and other regulatory services, private investment has a long track record in infrastructure provision (Della Croce et al., 2015). Still, against the backdrop of acute fiscal downsizing, project financing has garnered favour on the basis it is an additional capital source that can be used to bridge the infrastructure financing gap (KPMG, 2015). Predicated on this burgeoning interest, the research will further consider this form of private finance.

2.4.2. Infrastructure Project Financing

Though there is no conclusive definition of project financing, generally it is characterised as non-or limited recourse lending for the development of a large, highly specific, capital

intensive projects. Lending directly to the project by means of a special purpose vehicle (SPV), the assets of the SPV are leveraged as collateral for the loan with the liability being limited to the invested capital. Loan amortisation is dependent on internally generated project cash flows which commence post construction completion (Gardner and Wright, 2011). Risk sharing mechanisms are contingent on the wherewithal of project partners which are typically enforced through covenants imposed on the SPV by debt funders (Tan, 2007).

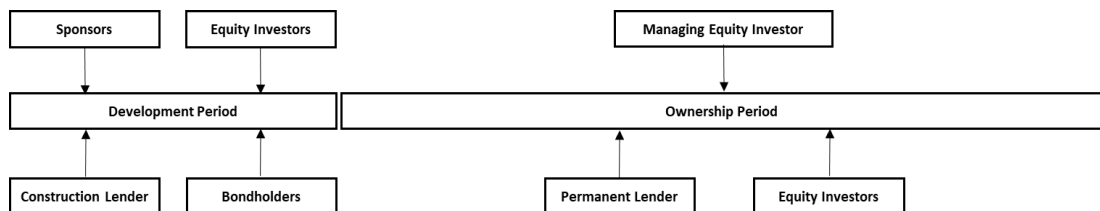


Figure 2.1: Typical Project Financing Structure (adapted from Tan, 2007)

Figure 2.1 is a typical project financing arrangement as per Tan (2007). Principally, project financing capital can be framed as debt or equity and different degrees of competencies are required to determine the appetite for risk / return profiles (Della Croce et al., 2015). These arrangements are typically highly leveraged with debt constituting around 70-90% of the investment. This high gearing is premised on several factors including the low volatility of cash flows because of low-to-manageable levels of risk particularly in the operational phase. Moreover, the high leveraging is warranted by the long-term necessity for infrastructure services as well as the high capital-intensive nature of these investment (Beeferman and Wain, 2012). Although project lending is capital intensive, debt financing is an attractive instrument for many reasons such as it is usually tax deductible and it can be kept off the balance sheets (Tan, 2007).

Typically characterised as fixed-income, project debt financing can be distilled into either greenfield or brownfield investments:

- Greenfield debt is normally supplied in two forms: project loans or project bonds. Conventionally, most of the debt instrument has been supplied in the form of project loans provided by commercial banks who are willing to absorb construction risk in exchange for a higher rate of return (Gardner and Wright, 2011). A single bank may supply all capital requirements or alternatively, if the scale of the loan is beyond the capacity of a solitary bank or if the lender wishes to spread risk, loans can be syndicated by a Mandated Loan Arranger (MLA) to comprise layered or mezzanine financing which typically offers higher interest rates and increased equity rates (Tan, 2007). By profiling the debt, mezzanine or subordinated debt can provide additional

capital support to senior debt. The debt instrument is arranged and serviced from senior to junior and loans and bonds are considered as the most senior tranches. Ranked lower, mezzanine and subordinated debt tranches can insulate senior debt from loss which in turn raises the quality of the senior debt issues. Furthermore, by ranking the debt instrument, this offers different risk/return profiles which may be more attractive to other investor profiles such as those with higher risk appetites and more content with higher returns (Ehlers, 2014).

- Comparatively, brownfield debt is usually post construction completion where other entities such as institutional investors, real estate investment trusts (REIT) and sovereign wealth funds can invest into long-term bonds issued by the SPV after the asset has been commissioned. With lower risk tolerance than commercial banks, these nonbanking institutions prefer to enter post construction completion where the risk profile has been reduced and typically seek stable, medium to long term assets to diversify equity holdings (Della Croce et al., 2015).

Project financing can equally be supplied in the form of equity. Typically, project 'sponsors' have been responsible for the capitalisation of project financing in the form of equity to the SPV. These are often organisations which are involved in the management and the provision of the infrastructure facility (Tan, 2007). Equity generally accounts for around 10 to 30% of the finance though this can change in dynamic economic environments. Project sponsors are exposed to significant asset-specific risks which in turn incentivises improved project performance. In this regard, the management and sharing of risks are fundamental as returns are predicated on the project success. While having the greatest exposure to risk, equity contributors correspondingly also expect to have the highest internal rate of return (IRR) on their investment; for this reason, infrastructure equity has emerged as an attractive proposition for other external institutions.

Third-party investors are now actively participating in infrastructure investment by providing a portion of the equity capital. These have tended to be insurance companies, pension funds, wealthy individuals and trade union funds who have a portfolio of assets and participate with the intention of diversifying risks (Tan, 2007). Advantageously, in markets where risk/return profiles are increased, the equity instrument can be an important avenue for capital provision where it may be more difficult to secure debt financing premised on unstable or unpredictable cash flows (Della Croce et al., 2015).

Having established debt and equity as the instruments which constitute infrastructure project financing, the research will now consider the contemporary developments in the project financing market.

2.4.3. Project Debt Financing Developments

According to Della Croce and Gatti (2014) project financing lending initially emanated out of the US in the 1930s as part of developments in the oilfields before later being adopted in Europe in the 1980s, systematically employed for large-scale infrastructure projects. Since then, the mobilisation of project financing loans in infrastructure has been expanded, peaking in 2008 with a global market value of US\$247bn.

Whereas the GFC had major implications on the availability of public capital, it also served to engender profound changes in the infrastructure project financing landscape. Proceeding the investment high leading up to 2008, much like the wider financial community, appetite for infrastructure lending was seismically curtailed in 2008 and the short term thereafter, That said, more contemporary data indicates the market has displayed noteworthy growth. Predicated on Thomson Reuters Project Financing International league tables, as of 2015, the debt lending market was valued at US\$277.7bn representing a significant growth of 23.3% from 2013 at US\$204bn (Thomson Reuters, 2016). Lending has now transcended multiple borders and is present worldwide with activity concentrated in Western Europe, North America, Africa and the Middle East and South Asia. In terms of sectoral breakdown, 2016 figures show that deal flow has been prevalent in power, oil and gas, as well as transport, though notably, project debt lending filtration via the Public-Private Partnerships (PPP) mechanism for the supply of social infrastructure is also intensifying (Thomson Reuters, 2016).

Comparatively, project bonds continue to hold a marginal presence in the debt market, though provision in this form has been ramping up following the GFC as a result of the mass exodus of conventional debt lenders from the project financing market. According to Della Croce et al. (2015), banking institutions conventionally have been responsible for providing most of the lending to infrastructure projects. However, premised on the introduction of Basel III³ in 2010, coupled with the capital retrenchment implications induced by the GFC, traditional sources no longer had either the capital availability nor risk appetite for project lending. Subsequently, because of capital illiquidity, a gap emerged for new investor types

³ Basel III was introduced in an effort to strengthen banking resilience and risk management when exposed to significant economic stresses through greater regulation of capital (Geetika, 2016).

and in the five-year period from 2007 to 2012, the compiled value of SPV issued bonds multiplied three-fold from US\$8.5bn to US\$27bn (Della Croce and Gatti, 2014). Continuing to exhibit growth in 2015, the total project bonds market was estimated to be worth US\$50.3bn equating to almost a quarter of the debt financing market. 2016 statistics suggest there has been a constriction which has been expressed through a 30% drop to US\$35.3bn, though this can be attributed to aggressive lending on the part of commercial banks in response to the growing strength of the project bonds markets as well as a reaction in the bond market to tightening credit conditions (Thomson Reuters, 2016). Nonetheless, despite this very recent retreat, project bonds now occupy a significantly larger space in the project financing debt sphere. In the main investment has been levered into utilities and social infrastructure services centred in North American and Western European jurisdictions (Della Croce and Gatti, 2014).

Along with this expansion in bond finance, increasingly there has also been wider appetite for institutional investor participation. Seeking long-term, predictable and stable cash flows, infrastructure investment via project bonds offers attractive investment characteristics which predominantly align with institutional investor investment profiles (Ehlers, 2014). Preqin (2013) found that 58% of institutional investors were considering increasing their exposure to infrastructure financing. This would potentially transpire in an additional US\$2.5tn of capital being channelled into infrastructure investment (MGI, 2013).

Notwithstanding the synergistic commonalities between infrastructure and institutional investors, there are several barriers which have served to disconnect the free-flow of private capital into project bonds. With banks, conventionally having undertaken the syndication, due diligence and arranging responsibilities, institutional investors in the main do not possess the expertise to organise this type of debt provision; at least not on this scale (Read, 2013). In an effort to unlock institutional investor capital, new innovative models such as the 'originate-to-distribute' framework has emerged onto the market which is a collaborative model between banks and institutional investors for debt capital supply. Highlighted by Della Croce and Gatti (2014), within this model, there are three innovative structures: the partnership/co-investment model; the securitisation model; and the debt fund model and direct origination. However, with limited operationalisation and information available, it is yet unclear how these collaborative investment vehicles are performing.

2.4.4. Project Equity Financing Developments

Just as the project financing debt market has undergone acute transformations, so too has the project financing equity market. Conventionally, most of the equity tranche has been sourced from project sponsors responsible for the facility provision, i.e. design and build, and operation and maintenance contractors. Ideologically, this was tied to the performance-based payments premised on the principle that this arrangement would safeguard the quality of the service delivery through threat of financial penalisation (Gardner and Wright, 2011). However, around the middle of previous decade, the dynamics of equity investment changed as investment funds exhibited nascent interest. Using datasets from Probitas Partners, Della Croce and Gatti (2014) determined that private equity contributions proliferated in the three-year period from 2004 to 2007 at US\$2.4bn to US\$39.7bn. Preferring to enter the project after construction completion in the presence of a reduced risk profile, these funds have tended to concentrate their investments on brownfield projects in mature markets such as Europe and North America (Della Croce and Gatti, 2014).

Advantageously, equity infrastructure investment enables these third-party funds to diversify their investment portfolios. Moreover, the increased returns from equity outlay has further supported this form of investment as an attractive proposition. Resultantly, over the previous two decades, increased attention for infrastructure has led to the separation of 'infrastructure assets' from the 'alternative investments' category and instead, it is now considered an asset class with its own distinct investment characteristics (MGI, 2016).

Equity investors can access infrastructure either through listed or unlisted instruments. Still, as new types of investors have entered the project financing equity market, so too has the number who have chosen to gain exposure to it in the form of unlisted assets (Ehlers, 2014). Insurance companies, pension funds and other private equity funds are now actively investing in unlisted infrastructure equity. The long-term investment horizon of these investors suggests they are a natural match to the infrastructure asset class. Furthermore, inflation tied assets can be exploited to hedge against future liabilities (Ehlers, 2014). However, with only a smaller number of larger institutions with the wherewithal to directly invest, for those smaller funds, to gain access, often this has been via pooled investment vehicles. Yet, the mismatch between investment tenors and vehicle life, the high investment and management fees, in addition to the highly geared leveraging arrangements have collectively acted as barriers (Della Croce and Gatti, 2014).

Despite the enthusiasm on the part of institutional investors, a recent survey found that only a minor portion of assets under the management by the top 100 alternative investment managers has been allocated to infrastructure; circa US\$120.6bn out of a potential US\$3.2tn (Della Croce and Gatti, 2014). To circumvent this barrier, several initiatives have been conceptualised to attract wider institutional investor participation. In the main these developments have derived out of this purported mismatch between fund managers and fund owners. Instead, to unlock these nascent investors, there is a need for better alignment between investor profiles with investment opportunities on the grounds asset funds are reluctant to contribute unless the investment fund matches their expectations. In this respect, there is a need for collaboration between the investment community and infrastructure providers to engineer attractive investable opportunities. Literature suggests through greater dialogue stakeholders can help infrastructure organisations have their viewpoints understood and their project expectations be managed accordingly (RICS, 2017). Notably, many of the larger investment funds are also now developing their own initiatives with the intentions of directly investing into unlisted assets to circumnavigate the costs associated with fund managers. This has manifested in the emergence of new collaborative in-house investment / co-investment platforms which enable investors with aligned interests to pool their resources (Della Croce et al., 2015). Noteworthy examples include the Pension Investment Platform (PIP) in the UK and the Canadian Pension Plan Investment Board (CPPIB) in Canada which operate a syndicated style model. Other pertinent innovations include the arrangement of public and private partnering co-investor funds such as the Pan African Infrastructure Development Fund (PAIDF) and the Marguerite Fund. These platforms are somewhat akin to the investment platforms in that they pool resources from multiple sources but are equally distinct insofar as they transcend the public-private boundary (Della Croce and Gatti, 2014).

At this juncture in chapter two, the research has identified that there is a compelling case for private capital in infrastructure investment. Utilising private capital, infrastructure financing can serve to alleviate budgetary constraints by freeing up public-sector resources that can be used elsewhere. Moreover, the long-term asset life of infrastructure places it as an attractive proposition for institutional investors and other alternative sources of capital. Notwithstanding these converging qualities, the main barrier prohibiting the flow of private financial resources appears not to be the case of where the capital will derive from, but rather, how can it be unlocked and levered more freely into infrastructure projects. In response, several collaborative investment vehicles have emerged onto the market. Even so,

the disconnect between the investors and infrastructure community has meant the movement of capital into infrastructure assets has not been quite as forthcoming as was previously anticipated.

2.5. Better Infrastructure Provision

While there is no doubt that there is a need for alternative sources of capital, to simply ascribe all infrastructure investment shortcomings explicitly to the curtailed availability of capital would be remiss. In addition to the need to lever alternative sources of capital in infrastructure, there is equally now the recognition that governments require greater impact from their investments in the current financial paradigm. RICS (2017) suggests that inherent inefficiencies within existing provision frameworks as well as shortcomings in strategic policies have undermined the impact of infrastructure development in the past. These inherent inefficiencies have coalesced in many lambasting the public-sectors ability to meet the needs of the society (PwC, 2017). As a result, governments are now confronted with a bilateral challenge of identifying *more* alternative sources of financing as well as the need to deliver *better* investment impact through greater efficiencies and performance in provision frameworks. The research will therefore now examine the need to improve provision frameworks and investment strategies as part of the bilateral challenge of ‘more and better’ infrastructure investment.

The wider infrastructure development community is now confronted with emerging economic, social, political, environmental and sustainability challenges. In a recent UN report, it was determined levels of urbanisation are to grow significantly over the coming decades (EY, 2017). Increased urbanisation will compound the demands for affordable housing in tandem with additional pressures being exerted onto existing services such as healthcare and education. Evolving population demographic indices signify people are living longer. Healthcare provision policies will need to reflect these manifestations through innovation and flexibility commensurate with health life-expectancies. Similarly, as the awareness of resilient and sustainable communities intensifies, globalisation has transpired in increased diversity and broader social ethnicity. These factors, coupled with concerns relating to reduced carbon emissions, climate change and technological advancements have forced policy strategists to reconsider their strategic investment pipelines (ULI, 2016). History suggests that decision-makers have, and in the main, continue to operate in a vacuum from peers with a siloed mentality and a singular vision of the future demands (KPMG, 2017). However, identified in section 2.2, infrastructure systems are symbiotic.

Realising the shortcomings of historical infrastructure investment frameworks, it is argued policymakers must now redress previous policy deficiencies through renewed vigour attached to integrated approaches for future public services to all members of society. Fundamentally, investment pipelines and priorities must be aligned with the socio-economic needs of a society driven through wider engagement and dialogue with the public and industrial practitioners (KPMG, 2017).

Yet, just as policy-makers should undertake decisive actions to address the shortcomings in strategic capital policies, in the current economic landscape, there is now equally the realisation that capital investments must go further and ultimately deliver better investment impact than that which has been available previously through procurement frameworks. The International Monetary Fund (IMF, 2015) estimated poor performance in provision frameworks has transpired in value leakage of up to 30% of investment and accordingly there is now a forthcoming argument that infrastructure mechanisms must be recalibrated to bolster productivity.

MGI (2016) argued that enhanced productivity from better provision frameworks could derive benefits of up to US\$1tn per year internationally and in this regard, as critics of conventional provision strategies continue to question the efficacy and aptitude of the public-sector to deliver infrastructure programmes, seemingly many are now intent on augmented private-sector participation in infrastructure provision. PwC (2017) argued that private-sector provision could foster efficiency savings of up to 33% above by adopting a long-term outlook from project conception to completion therein deploying a holistic perspective to performance and value creation. Furthermore, the alignment of incentivised management frameworks to long-term performance measurement can render additional efficiencies. Consequentially, the nature of infrastructure investment is evolving as public-private collaborative initiatives are increasingly being prioritised (ULI, 2016).

Emanating out of these policy shifts, a mechanism which continues to be extolled as a vehicle for 'more and better' infrastructure provision is PPP. Grounded in a cross-sectoral partnership, PPP mobilises private financing and is conducive to the current financial landscape. PPP also utilises private-sector resources and management skills to develop and operate public infrastructure. Distinct from conventional procurement frameworks, PPP is characterised by a whole life-cycle approach, harmonising what has traditionally been heterogeneous projects phases into a single long-term bundled solution (Roehrich and Caldwell, 2012). Indeed, it has been reported in the UK; a pioneer of PPP, that PPP

outperformed traditional procurement models with 69% of PPP projects having met construction timetables, 65% were financially on target, and 99% of projects were either of fairly good (46%) or very good quality (53%) (NAO, 2009). Liu et al. (2014) reviewed a number of articles which evaluated PPP in terms of cost and time. Predominantly, these papers found PPP offered superior performance than traditional approaches. Predicated on this superior service provision, coupled with the potential for PPP to channel private financing into infrastructure, it is therefore unsurprising these partnering frameworks have now permeated more than 40 national borders (Haran et al., 2013) and are being promoted as a viable mechanism in the current 'more and better' infrastructure investment environment.

The research has considered the infrastructure investment paradigm. It has identified future infrastructure provision is on an unprecedented scale and that infrastructure pipelines exhibit a greater propensity for economic infrastructure provision predicated on its economic implications. However, as the demands for better public services and social infrastructure continue to intensify in Western developed nations, there is a compelling argument now for greater social infrastructure provision. In addition to this, in the current financial landscape, there is now greater awareness of the increased role private financing could play in funding infrastructure provision. Likewise, there is appetite for increased private-sector participation in infrastructure provision in order to improve the efficiencies of procurement frameworks and provision strategies. Thus, governments are now confronted with the bifurcated challenge of providing 'more and better' infrastructure.

A framework which has been promoted for the delivery of 'more and better' infrastructure is PPP. Already these partnering frameworks have been an instrumental investment mechanism in the UK. Moreover, there is now strong argument for social infrastructure investment in the UK. The research will now therefore consider this region.

2.6. United Kingdom Social Infrastructure Investment

According to Rhodes (2014) the UK has long-suffered from underinvestment; however, in the absence of consistent data, like most other nations, it is difficult to accurately quantify the true extent of previous capital expenditure. Notwithstanding this vacuum, there are several converging articles which point towards a significant downward trajectory of total capital outlay; both in terms of economic and social infrastructure.

Pollitt (2002) claimed UK infrastructure investment has transcended three major milestones:

- I. In the 1970s, the completion of a number of housing schemes to address demands post WWII resulted in a decline of public spend;
- II. Later, the Thatcher privatisation of a number of public services was responsible for the transfer of around 7% of GDP from the public-sector to the private-sector; and
- III. Thirdly, the introduction of the Private Finance Initiative (PFI) has culminated in significant private financing of public services.

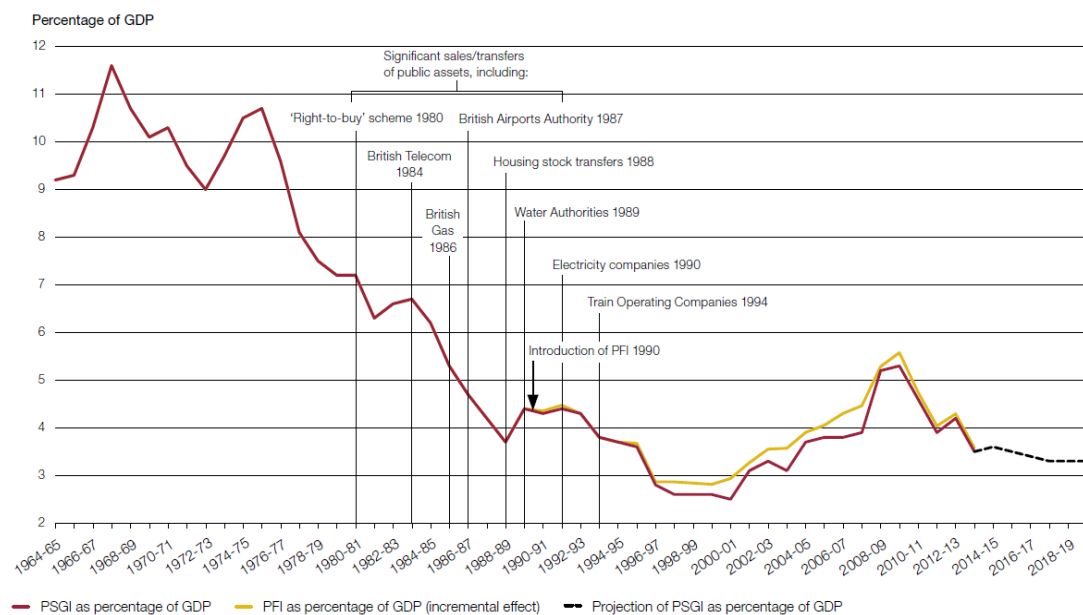


Figure 2.2 Public-Sector Gross Investment and PFI Investments of the Past 50 Years (NAO, 2015)

Depicted in figure 2.2, UK public investment peaked around 1965 to 1975 averaging around 10% of GDP. This acute expenditure was a response to reconstruction demands post WWII. However, following on from this period of investment high, the UK experienced a substantial decline in infrastructure spend (Pollitt, 2002). Clark and Root (1999) determined in the period from 1977 to 1994, UK investment levels fell short of comparable and similar sized European countries in addition to baseline international standards. Predicated on OECD statistics, according to Clark and Root (1999), by the 1990s, it was progressively evident UK infrastructure lagged its competitors particularly regarding housing, health, education and transport. In response to this, PFI was introduced. PFI was a vehicle capable of leveraging private capital into what had conventionally been publicly sponsored infrastructure services. All in all, according to the UK National Audit Office (NAO, 2015) PFI accounted for around 10% of additional infrastructure investment on top of public investment. Illustrated in figure 2.2, since then, publicly financed infrastructure in the main has continued to decline and has subsequently investment bottomed in 2000 at 1.7% of GDP before gradually levelling off at

an average of 2.5% (Hare, 2013; NAO, 2015), Generally, UK infrastructure investment has remained below OECD averages, and unsurprisingly the UK has been unable to close the gap between itself and other major nations (Hare, 2013).

More recently, infrastructure investment has become a focal point in the UK; both in mainstream media discussions as well in the political arena premised on its strategic importance. In 2010, infrastructure development was mobilised as part of a stimulus package to combat the implications of the GFC; in the short-term through job creation, as well as in the medium to long-term predicated on its socio-economic benefits (HM Treasury, 2010). This constituted a strategic pipeline of infrastructure needs which were delineated through the National Infrastructure Delivery Plan⁴ (NIPD). This was a part public, part private financed programme consisting of £200bn to be channelled into economic infrastructure over the following five years (HM Treasury, 2010). Economic infrastructure was to act as an anchor for inward business investment and a catalyst for economic prosperity (HM Treasury, 2010). Ranked 33rd out of 144 nations, indeed there were and still are forthcoming indicators signifying the necessity to upgrade and replace UK economic infrastructure (WEF, 2010). Similarly, others propagated the benefits of economic infrastructure investment to the UK economy (see CEBR, 2013; CBI, 2014). Collectively, this culminated in the expansion of the infrastructure pipeline with the latest edition of the NIPD (2016) outlining a £483bn commitment as the UK government⁵ prioritises a long-term strategy over short-term decision-making.

While economic infrastructure investment has occupied much of the spotlight, this research argues this has served to eclipse the need for significant investment into social infrastructure. In part, this preference for economic infrastructure can be attributed to the lack of awareness of the benefits derived from social infrastructure investment which has manifested because of difficulties in identifying and quantifying the benefits of its provision (Casey, 2005; McClements et al., 2016). But also, the array of research which has analysed and confirmed the nexus between economic infrastructure investment and economic prosperity has meant governments naturally have exhibited greater appetite of economic infrastructure development.

⁴ The 2010 National Infrastructure Plan was the first in a series of reports produced by the UK government for the purpose of identifying future economic infrastructure development, regionally and nationally. Since then, these plans have been updated annually and now include social infrastructure (HM Treasury, 2010; HM Treasury, 2016).

⁵ The latest WEF (2016) rankings reveal UK economic infrastructure has climbed to 24th.

As the population demographic of the UK continues to transform, so too will the need for social infrastructure and public-services. The Office for National Statistics (ONS) indicates the UK population will continue to exhibit marked growth over the coming decades. In the ten-year period from 2010 to 2019, it is anticipated this decade will be the largest period of expansion recorded yet. By the 2020s, the UK population is expected to reach an unprecedented 67 million (ONS, 2016), before increasing to 74.3 million by 2039 (ONS, 2015)⁶.

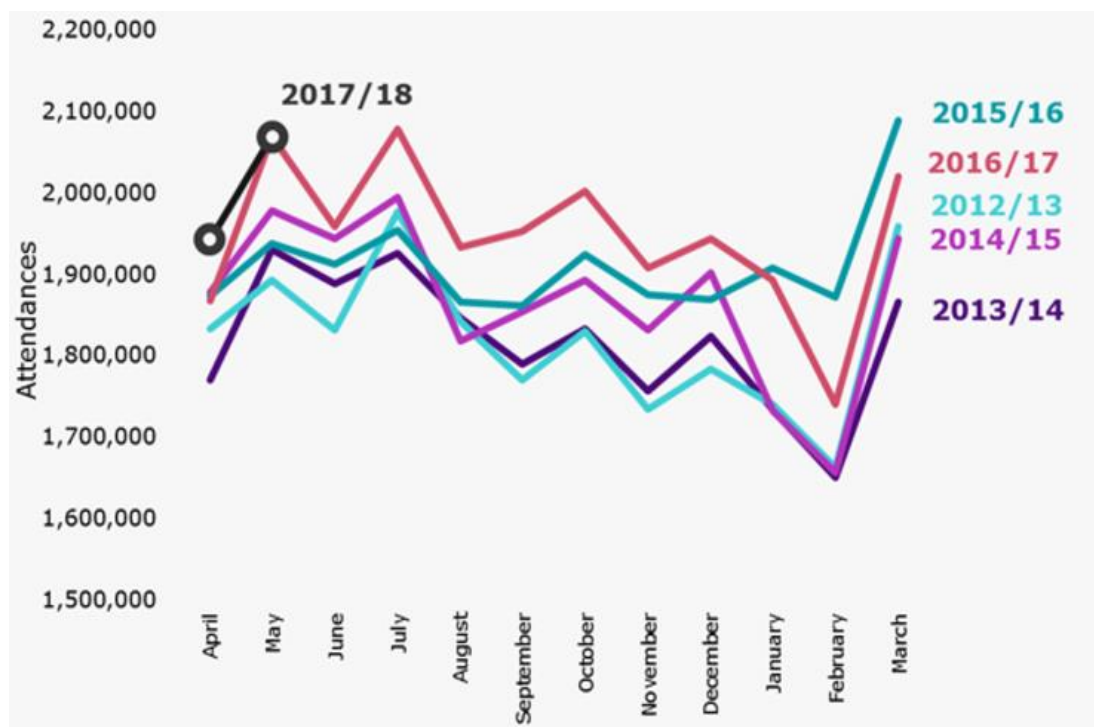


Figure 2.3: Total Monthly A&E Attendances in England from 2012 to May 2017 (QualityWatch, 2017)

As well as population size, ONS (2015) data reveals the average age of the population is rising and people are living longer. In the four decades from 1974 to 2014, the median age of the population increased from 33.9 years to 40.0 years and this trend is expected to continue to rise. The proportion of the population who are 65+ has consistently increased from 1974, and it is anticipated it will continue to climb until 2039 (ONS, 2016). Worryingly, this growing and aging population; and, an increased elderly population, will add to existing pressures on public services. It is estimated by the Department of Health, the cost difference between

⁶ These projections were made prior to the “Brexit” referendum. “Brexit” was the British-exit of the European Union, decided in a UK referendum on 23rd June 2016. Article 50 was triggered on 29th March 2017 which signified the activation of the official leaving process which is expected to span two-years.

providing health services to a person aged 65 years compared to someone of 85+ years is three times higher (ONS, 2015). Already, long-term health conditions account for around 70% of the total health and social care expenditure in England. These projected patterns indicate the population demographic will add to fiscal pressures which will be compounded by a decline in the working population.

This emerges at a time when existing services are currently struggling to keep pace with capacity demands. Displayed in figure 2.3, waiting times are already consistently increasing in Accident and Emergency departments (A&E). In 2016, an average of 1,477 people per day had to wait over four hours for admission into A&E daily across the UK. This is concerning when compared to 2010 figures where this number averaged 270 per day (Baker, 2017).

National Health Service (NHS) England (2017) statistics reveal that the number of patients waiting more than 12 hours to be admitted into A&E is also steadily climbing. In the first quarter of 2015 numbers peaked at 113,664. This is a marked increase from the lowest figures for this 12-hour juncture which was recorded between July and September in 2005 at 6,835; this represents an increase of 106,829. Several studies have already confirmed that A&E overcrowding leads to poorer outcomes for patients, for example, QualityWatch.org.uk (2014) estimated that for every one percent above occupancy capacity, this translates to a 0.3% decline in service performance.

The same report identified that in some instances, hospitals were operating at 190% capacity, suggesting around a 30% decline in hospital care. Yet, despite these statistics and the growing need for hospital care, Roberts et al., (2014) found that the number of major A&E units across the UK has in contrast declined by 8% since 2003.

In addition to A&E, other health services are being exposed to mounting pressures. Cancer Research UK (2017) estimates that one in two people born after 1960 will be diagnosed with cancer in their lifetime. Equally, the Mental Health Foundation (2016) warned over manifesting mental health problems. Contemporary data reveals almost half of adults (43.4%) now think they have had a diagnosable mental health problem at some point in their life. Almost a fifth (19.7%) of the population over 16 in the UK have exhibited signs of depression or anxiety. These increasing pressures require new facilities to support treatment which has culminated in a strategic overhaul. Policy-makers have shifted the emphasis of service provision away from hospitals toward homecare treatment conducted through community practices and bundled services (Thompson, 2016; Welsh NHS Confederation, 2016). To meet these demands, all this will require significant investment and state-of-the-

art services to keep pace. Also, despite this policy reformation, there is no available data which indicates this is serving to alleviate the current pressures placed on the health system.

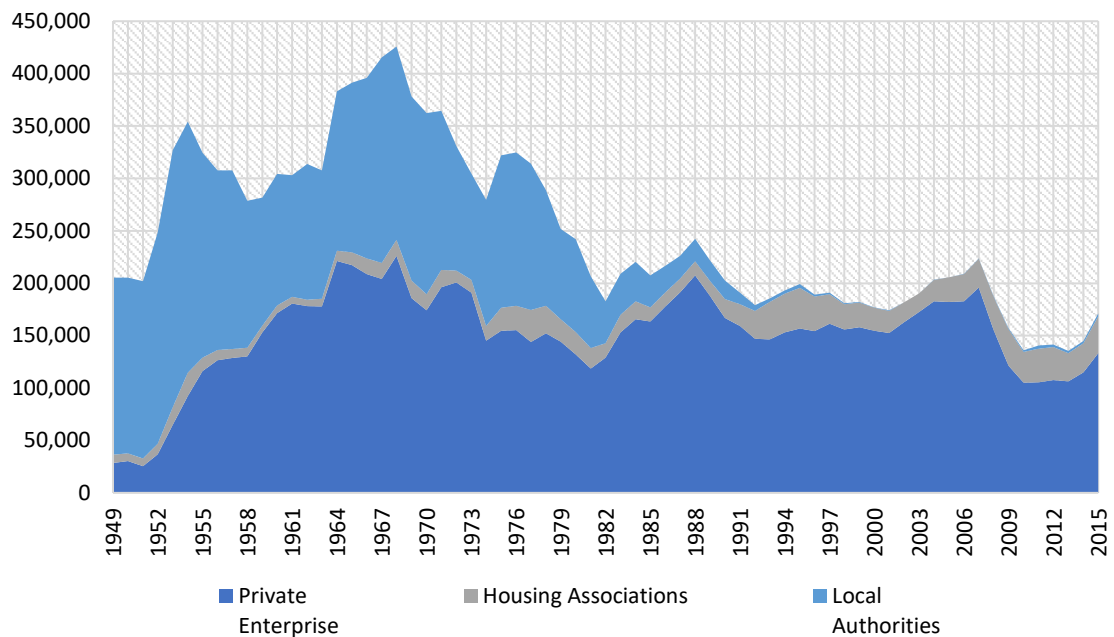


Figure 2.4: Permanent Dwellings Completed in the UK from 1949 to 2016 (Department for Councils and Local Government, 2017)

Health infrastructure are not in a vacuum. There is a chronic shortage of housing in the UK. The Town and Country Planning Association (2013) estimated that between 2011 and 2031 around 240,000 to 245,000 dwellings are needed per year to catch up with demands. Shown in figure 2.4, figures from the Department for Councils and Local Government (DCLG, 2017) indicate that there has been an overall decline in housing supply from 1949 to 2015. Peaking in 1968 at 425,460 dwellings provided in a year, more recently, public authority appetite for housing provision has been tapered by regulations on public borrowing. Likewise, housing associations have been undermined by the government's decision to implement reduced social rents, which has transpired in an acute decline in housing provision, compounded by a failure of the private-sector to compensate for this shortfall (House of Lords, 2016). A paper produced by the House of Lords (2016) encouraged for greater partnering with institutional investors on the grounds they can benefit from long-term funding rates and therein challenge the stronghold a small oligarchy of housebuilders currently has on the housing market. In the absence of adequate housing supply, in tandem with an increasing population, an Institute for Public Policy Research (IPPR, 2011) report calculated that if concerted efforts were not made to reconcile supply deficiencies, demands would outstrip supply, engendering a gap of 750,000 per year by 2025. Consequentially, as the demands for housing

continue to intensify, according to Niemietz (2016), housing prices have unprecedentedly multiplied by a factor of 4.5 after inflation; incomparable to any other OECD nation.

As well as health and housing, there are symptoms of a struggling educational system indicating the need for upgraded educational infrastructure. The Education Funding Agency (EFA, 2015) surveyed the condition of 18,830 schools in the UK across all educational stages. This accounted for 85% of the national schools in England, constituting an examination of 59,967 academic buildings. The survey presented worrying findings. This assessment found that 25% of the physical estate dated to the era between 1945 and 1966 and a 23% was supplied from 1967 to 1976. As part of this condition survey, it was found that only 5.1% was considered of grade A quality and was performing as intended and operating efficiently. The report identified school facilities were in the worst condition in the East of England and inadequate facilities were prevalent across all stages of education. Unsurprisingly, school facilities that were provided in the timeframe immediately post WWII are in the worst condition. Even so, primary and secondary education continues to be under funded and under invested. Instead, the authors of a building.co.uk (2014) white paper identified that much of the recent activity in the education sector has been driven through higher and further education. This has been to address the backlog of under investment dating back to the 1960s. The Association of University Estate Directors (AUDE, 2008) estimated that the conservative cost to replace university buildings equates to around £11bn. However, the provision capacity of these institutions has been dampened by capital spending reductions as resources curtailed in the 1970s. Resultantly, many are turning to the private-sector to bridge this funding gap as public sources dry up.

In addition to public services, there is now greater appreciation of the salience of community infrastructure facilities. A notable example is NI where there has been promotion of social infrastructure to bridge the divide between Catholic and Protestant communities. To cultivate social capital in an effort to address the legacy of the 'Troubles', infrastructure has been earmarked to plan an integral role as part of the 'Programme for Cohesion, Sharing and Integration' and the 'Together-Building a United Community' projects. These schemes comprise developing ten new shared education campuses, establishing ten new shared housing schemes, and developing urban village schemes, amongst other facilities (Potter, 2016).

2.6.1. 'More and Better' United Kingdom Social Infrastructure Provision

While in the context of this PhD it may not be possible to identify every indicator, from this discussion, it is nevertheless apparent that there is a need for social infrastructure investment across all regions of the UK. As these extenuated demands continue to intensify, this has coincided with the realisation that the public-sector no longer possess' the appetite to supply all social infrastructure needs.

The UK, like many others, was profoundly impacted by the GFC. As a result of the interventionist regime implemented to 'bail-out' the banking sector, borrowing levels in the UK grew unabated from 33.7% in January 2007 to 62.9% by January 2010. In response, the government imposed a series of austerity measures to redress these impacts through reduced public expenditure in what was termed as the 'age of austerity' (Cameron, 2009). This was a succession of concerted fiscal policies designed to impose a systematic period of curtailed public spending equating to £40bn (TheGuardian.com, 2010). Initiated as part of the 2010 budget, these expenditure measures were intended to eradicate the budget deficit within a cyclically-adjusted five-year programme by 2015-16 and thereafter make substantial inroads toward reducing the national debt as a percentage of GDP (HM Treasury, 2010). The five largest departments; Transport, Education, Health, Justice and Communities and Local Governments all experienced notable capital retrenchment constituting a reduction from £39bn in 2009/10, to £28bn in 2013/14. The Department of Education budget was reduced by 55%, Local Communities and Government experienced downsizing circa 62%, and Health was also constrained by around a quarter (NAO, 2015).

Still, falling short of their economic policy objectives, this period of austerity was extended and the 'goalposts' were shifted as the UK government announced in 2016 recalibrated targets of a budget surplus by 2020. More recently however, amidst the uncertainty of Brexit, these plans again have been reconsidered. Intent nonetheless on the continuation of this austerity policy, the Chancellor of the Exchequer, Philip Hammond, has reaffirmed the Conservative government's commitment to fiscal economising until the next election. This has been reflected through further annual public spending reductions by one percent in real terms, as well as an additional three to six percent cut to departmental budgets for the fiscal year of 2019-20 delineated in the 2017 manifesto (IFS, 2017). By May 2017, ONS figures indicate national debt equates to 87.4% and is expected to peak at 88% which has been the highest level since 1966.

According to a recent Institute of Fiscal Studies report, the UK has the fifth-largest deficit out of 35 advanced economies and the six-largest debt out of 26 advanced economies (IFS, 2017). Subsequently, in spite of the pronounced signs for 'more and better' social infrastructure provision, concerns encircling public-sector debt, coupled with austerity measures have served to engender an acute financing gap between infrastructure demands and capital supply. Worryingly, a failure to reconcile this gap may result in the 'bottlenecking' of social infrastructure provision and ultimately a moratorium on socio-economic development.

A model which has been endorsed in the current financial landscape is PPP. Indeed, private financing and PPP provision of public services and social infrastructure is not a new phenomenon in the UK. Already, private financing accounts for around 10% of infrastructure funding and PFI⁷ has been an instrumental provision mechanism in the UK over the previous three decades. Consequentially, the UK is considered to be one of the most sophisticated and mature private financing and PPP markets internationally (KPMG, 2015). Thus, the remit of the next chapter will be to critically examine PPP as a vehicle for 'more and better' social infrastructure in the UK.

2.7. Summary

Infrastructure can be categorised either social or economic facilities and assets. Yet, in spite of this categorisation, in fact, infrastructure systems are interconnected. A plethora of research has confirmed the correlation between infrastructure provision and socio-economic development and in the wake of the GFC, its pertinence appears to be more profound now, than perhaps ever before. Even so, a review of literature undertaken in this chapter found that future planned outlay is acutely imbalanced in future infrastructure provision pipelines. Economic infrastructure development has been prioritised premised on its extolled economic benefits. Nonetheless, infrastructure provision strategies should be reflective of societal demands. Moreover, premised on the convergent nature of infrastructure, it is argued there is a need for greater priority to be afforded to social infrastructure investment particularly in developed Western nations.

Still, in the current economic landscape, there has been a paradigm shift from public capital to private financing of infrastructure provision. Private financing can bridge the

⁷ The Private Finance Initiative (PFI) has been the predominant Public-Private Partnerships model in the UK. Subsequently, the terms are commonly used interchangeably in reference to the same infrastructure investment concept. These frameworks are discussed in depth in chapter three.

infrastructure investment gap; though, more recently, acute transformations in the project financing market has culminated in greater interest for new investor types, namely; institutional investors. Even so, with relatively limited exposure to the infrastructure investment market, these new organisations bring with them new expectations and project objectives. The research identified that there is a need for greater collaboration between these financial institutions and the infrastructure community to align investor needs with project objectives in an effort to generate investable opportunities which are equitable to all involved participants. In addition to new sources of investment, the study determined that there is a need to improve efficiencies and the performance of procurement frameworks and national policies. Predicated on access to more productive management skills and resources, some have asserted that the private-sector can offer superior efficiencies in provision frameworks, and therein enhance investments. Together, these considerations have transpired in a bifurcated 'more and better' infrastructure investment paradigm.

A provision framework which has been promoted for 'more and better' infrastructure provision is PPP. Already, PPP has been an instrumental mechanism in the UK. Moreover, there are now pertinent 'signposts' pointing towards the need for social infrastructure investment in the UK. However, derived from a prolonged period of austerity policies imposed following the GFC, capital budgets continue to be constrained as the UK government continues its austere policies to alleviate public-sector debt and reduce the deficit. Therefore, the next chapter, chapter three of this research will critically evaluate PPP as a vehicle for 'more and better' social infrastructure provision in the UK.

CHAPTER THREE

AN EVALUATION OF THE PUBLIC-PRIVATE PARTNERSHIPS FRAMEWORK

3. An Evaluation of the Public-Private Partnerships Framework

3.1. Introduction

Chapter two considered the infrastructure concept. It determined infrastructure can be categorised as social and economic; however, despite this categorisation, it was found that infrastructure systems and networks are interconnected. Infrastructure development is an important vehicle for socio-economic development and it is a cornerstone of a functioning and vibrant society. Even so, despite its importance, there is consensus internationally that governments have failed to keep pace with the requirements of society. It was found that future capital outlay is on an unprecedented scale. It was also determined in chapter two that infrastructure investment patterns are shifting. There is a need for greater social infrastructure investment particularly in Western nations. Yet, as governments continue to position economic infrastructure investment central to their political mandates to stimulate economic growth, social infrastructure has been eclipsed.

Despite the surge of interest in infrastructure investment, it was discerned in chapter two that there is now intensified appetite for increased private-sector participation in infrastructure delivery. Theoretically, this will serve two purposes: firstly, in the current financial landscape, private finance can bridge the gap between investment needs and capital outlay. Secondly, some have argued that the private-sector can provide better investment impact through better performance by addressing inherent inefficiencies in existing provision frameworks. This has been reflected through an investment paradigm shift as procurement policies have gathered traction for increased private-sector participation through cross-sectoral initiatives.

A provision framework which has been extolled as a vehicle to deliver 'more and better' social infrastructure is Public-Private Partnerships (PPP). PPP channels private financing and is a fulcrum to lever alternative sources of capital into public services. Also, PPP benefits from private-sector management skills and resources. Already, PPP has been an instrumental provision framework in the United Kingdom (UK) over the previous three decades. The UK is subsequently considered a pioneer for these partnering frameworks; however, more recently they have lost traction. Nonetheless, there are now pertinent indicators delineating the need for increased social infrastructure investment in the UK. These indicators, set in the context of a protracted period of UK austerity has meant that there are pertinent grounds to consider PPP as a viable framework for social infrastructure provision.

Thus, this chapter serves to critically evaluate the role of PPP as a vehicle for 'more and better' UK social infrastructure provision, and therein fulfil objective two. This chapter is hence structured as follows:

- A conceptualisation of PPP;
- An examination of PPP in the UK for social infrastructure provision;
- Critical evaluation of UK PPP as a provision mechanism; and
- The identification of an inherent knowledge gap which is serving to undermine the performance of PPP social infrastructure provision.

3.2. Conceptualising Public-Private Partnerships

Historically, Public-Private Partnerships (PPP), although falling under many synonyms, have been instrumental in infrastructure provision. The use of toll concessions for road and bridge upkeep has been recorded in 1286; although there are suggestions of private involvement in public infrastructure provision as early as the Romans. Noteworthy examples of this were recorded by Grimsey and Lewis (2005) who highlighted the use of turnpikes in the UK in 1663 and the United States (US) in 1785. Water distribution systems were delivered in France in the seventeenth century via the PPP concept. In relative terms, the first momentous era of private-sector involvement in infrastructure provision was ostensibly the British railway construction in the 1840s (Grimsey and Lewis, 2005).

More recently, the impetus on the use of the PPP terminology has expanded on a global platform. 'PPP' is a comparatively modern term which gathered momentum in the late 1980s and early 1990s (Chan and Cheung, 2014). Now, having permeated more than 40 national borders and used as part of everyday vernacular (Haran et al., 2013), the PPP concept has consequentially become nuanced with many interpretations. Utilised for a variety of purposes across diverse markets, globally, PPP has evolved from the conventional interpretation as a long-term public-private arrangement for the delivery of public services, to manifest in more sophisticated and mature partnering markets as an all-encompassing philosophy encapsulating any arrangement between the public and private-sectors (Haran et al., 2013).

Reflective of its malleability, PPP is now being mobilised for a variety of reasons. Differences in: government desired control; government capacity to provide a service; private-sector capacity; finance availability; and regulations and legislative frameworks (World Bank et al., 2016) together have culminated in a plethora of PPP characterisations. Subsequently, PPP

has been used to develop and manage greenfield infrastructure facilities. Also, PPP has been operationalised to renovate and regenerate existing assets and likewise have been adopted for brownfield project assets (World Bank et al., 2016). Emanating from this flexibility, these partnering initiatives are now integral in energy and power supply, waste and water facilities, transportation infrastructure, mining and utilities provision, telecommunications (Akintoye et al., 2015), hospital and housing supply as well as school operations (World Bank et al., 2016). This has transpired in a plurality of conceptual models and it is therefore no surprise, on a global scale, there is little consistency when conclusively classifying PPP modalities. To reconcile these disparities, several have made attempts. World Bank et al. (2016) suggested PPP essentially can be categorised into:

- Management and Lease: a private-sector entity is responsible for the management and operation of a government-owned business. Ownership and investment responsibility remains with the public-sector. In a management contract, the private-sector manages the asset or facility and holds the operational risk. In contrast, in a lease contract, the private-sector entity assumes the operational risk.
- Concessions: a private-sector entity taking over the management of a public enterprise. The private-sector assumes the significant financial investment risk.
- Greenfield projects are new builds.
- Divestitures: total or partial transfer of a public-sector owned equity to the private-sector entity which buys a stake in a government enterprise as part of asset sale, public offering or privatisation.

Alternatively, the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP, 2011) classified PPP modalities as:

- (i) Supply and management contracts - Part of, or a complete service is managed by the private-sector enabling the public-sector to avail of private-sector skills for the design, delivery and operation, equipment procurement and workforce management. Ownership remains with the public-sector and operates typically for three to five years.
- (ii) Turnkey contracts - Also known as Design-Build, turnkey contracts are a traditional procurement model for infrastructure provision. Contractors are paid a fixed fee for project delivery. This is a short-term arrangement with small scale investment from the private-sector.

- (iii) **Affermage / lease** - The leaseholder, also known as the operator, is responsible for the operation and running of already existing infrastructure facilities. Normally, as part of this arrangement, the private-sector is responsible for the facility and the equipment. The operator does not have any large investments, but rather most investment is source from the government who is responsible for absorbing investment risk. In contrast, operational risk sits with the operator. Typically, this model will be used in conjunction with other models.
- (iv) **Concessions** - A private company is responsible for the build and operation of a facility over a fixed duration. Ownership usually remains with the public-sector and payments can be paid through either the user or by the government. These are usually long-term arrangements where contract duration typically runs for 5 to 50 years.
- (v) **Private Finance Initiative and Private ownership** - The private-sector designs, constructs and operates the infrastructure service through the creation of a Project Company (ProjCo) or Special Purpose Vehicle (SPV) with the two terms often being used interchangeably. Through a long-term agreement, infrastructure services are purchased from the private-sector by the public-sector. Risks are allocated to the party best able to manage them and payment is performance orientated.

Notwithstanding this evolution of the concept, undoubtedly, the PFI can be considered as the archetypal PPP framework; to the extent where the two terms of PPP and PFI are often transposed and taken to imply the same mechanism (Fewings, 2013).

Derived from this array of modalities, this has served to engender challenges when comparing PPP on a like-for-like basis. Even so, there are ideological commonalities across the PPP spectrum. Generally, PPP is regarded as placing somewhere between traditional procurement and full privatisation. Full privatisation conventionally has no input into the operations of the service from the government, whereas, traditional procurement projects are one-off arrangements between the public and private-sectors to supply services under a commercial contract. PPP fits into neither of these categories (Grimsey and Lewis, 2005). Instead PPP is characterised as an arrangement involving two or more actors; one being from the private-sector and one being from the public-sector. Partners share equal power, and both can adequately negotiate and participate on their own behalf. The success of this arrangement is contingent on the conception of a sustainable partnership between parties which spans a long period of time. Each partner must be able to bring something to the

arrangement and inherent to this, roles and responsibility are shared for improved outcomes and performance as opposed to if either organisation were to carry out the work unilaterally (Akintoye et al., 2015). Hence, it is the partnering ideology that defines the PPP concept.

So far, chapter three has identified that PPP is a nuanced concept. These nuances have emerged out of PPP's adaptability to an array of factors, environments and service needs. PPP now is instrumental in the provision of facilities across the infrastructure spectrum including both social and economic assets. Notwithstanding these differences, ultimately, it is the partnership that is the prevailing characteristic of PPP and by virtue of this, it is the lynchpin of the mechanism. Having conceptualised PPP, the research will now consider PPP in the context of the UK.

3.3. Public-Private Partnerships in the United Kingdom

PPP in the UK can broadly be categorised as: private ownership of state-owned businesses; PFI and corresponding modalities; and the strategic selling-off of government services to either the marketplace or a partnering arrangement (HM Treasury, 2003). Despite these three broad definitions, it has been PFI and its corresponding modalities which have dominated the UK PPP concept (HM Treasury, 2015). Utilising project financing and having been the predominant PPP framework in the UK for social infrastructure provision over the previous three decades (NAO, 2018), this research will investigate these PPP frameworks for 'more and better' UK social infrastructure provision.

UK PPP is defined as a long-term arrangement between the public and private-sectors which requires the private-sector to design, build, finance and manage or operate infrastructure facilities (HM Treasury, 2012). These long-term cross-sectoral partnerships are characterised by joint working and risk sharing to deliver greater efficiencies, incentivised private-sector risk management and enhanced time and cost certainty (HM Treasury, 2012). Over the previous three decades, PPP has been a fundamental mechanism for infrastructure provision in the UK. According to recent NAO (2018) figures, there are currently over 700 PPP contracts in operation, constituting over £60 billion (bn)⁸. This equates to annual charges of circa over £10.3bn and a total of over £199bn into the 2040s if no further deals were agreed. Premised on its extensive roll-out, UK PPP is a global leader for private infrastructure investment.

⁸ This figure comprises specifically PFI and Private Finance 2 (PF2) deals and does not include other nuanced PFI modalities. Also, it should be noted that this figure is inclusive of both economic and social infrastructure transactions.

Figure 3.1 below is a depiction of the long-term financial commitments of PFI in the UK, equating to around £7.7bn per annum⁹.

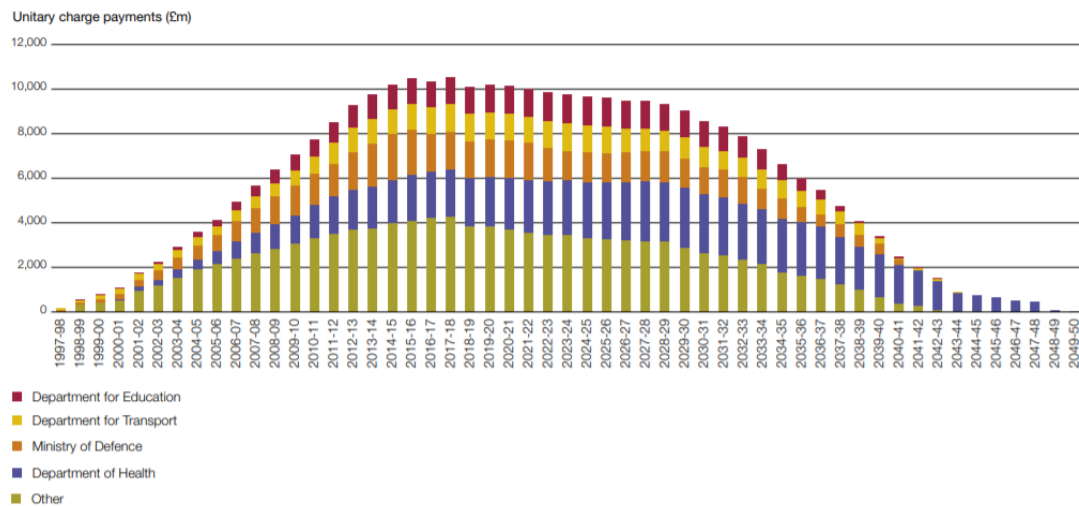


Figure 3.1: Past and Future PFI Forecasted Unitary Charge Payments (NAO, 2018)

PPP is distinct from traditional procurement frameworks in that rather than purchasing an infrastructure facility, in PPP, the government purchases a service and a facility. The private-sector is responsible for the provision of a service and its facilities across a 25+ year period in exchange for a unitary payment (Pretorius et al., 2008). In doing so, this enables the private-sector to adopt a long-term bundled strategy. The private-sector partner operates through a SPV which is alternatively referred to as the Project Company (ProjCo)¹⁰. ProjCo is a commercial entity or shell company formed by a private cohort specifically for undertaking, financing, developing and managing the project (Grimsey and Lewis, 2004). The use of the SPV enables the private-sector supplier to compile specific skillsets needed across differing phases of the project, Furthermore, for accounting purposes, the SPV acts as the conduit between sectors by which to channel capital (Roehrich and Caldwell, 2012).

Figure 3.2 is the archetypal PPP project structure based on a project financing arrangement as discussed in chapter two¹¹.

⁹ These figures comprise both economic and social infrastructure PFI transactions.

¹⁰ This research uses SPV and ProjCo interchangeably when referring to the private-sector shell company.

¹¹ In these arrangements, it is assumed all equity has been contributed by the private-sector.

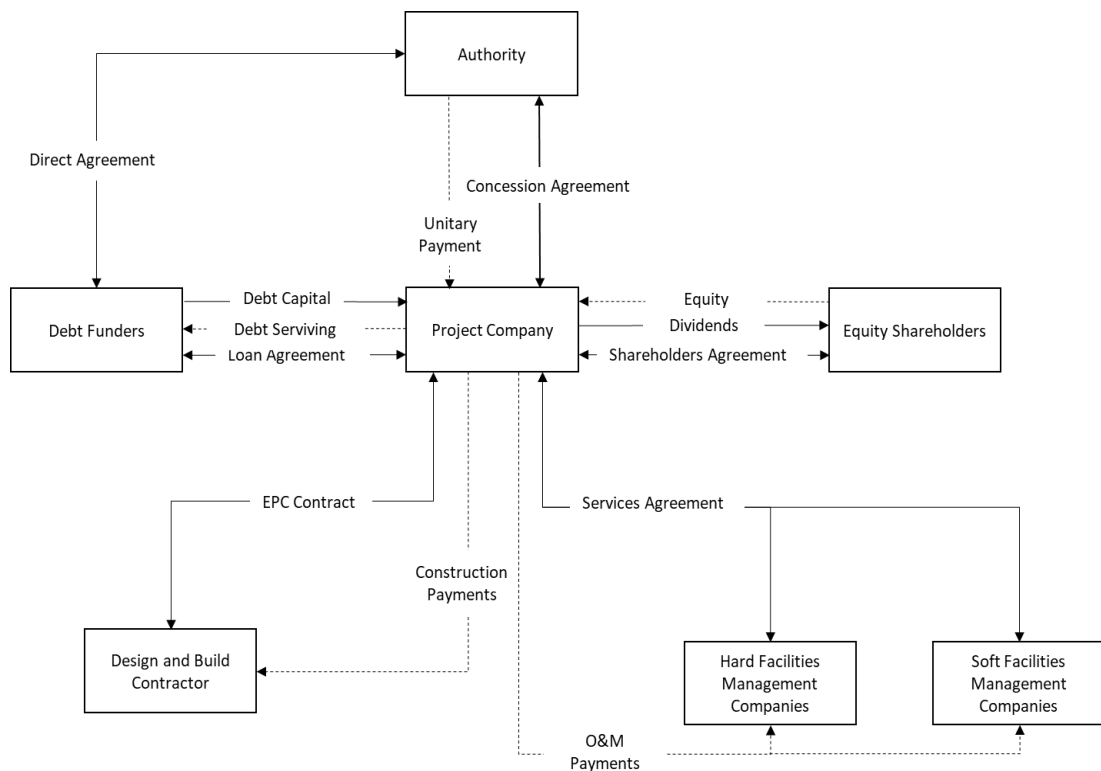


Figure 3.2: Typical PPP Organisational Structure (adapted from Hickman, 2000; NAO, 2007; World Bank et al., 2016)

The diagram shows the contractual arrangements between the organisations involved in the project as well as the corresponding internal cash flows. ProjCo directly negotiates and enters into a contractual Project Agreement (PA) with a procuring Authority. The PA is structured by the Authority and stipulates the rights, roles and responsibilities of the private-sector cohort (NAO, 2007). Correspondingly, the constituent organisations of ProjCo enter into separate collateral pass-through agreements between themselves and ProjCo rather than being directly contracted with the procuring client. This enables the private-sector to allocate roles and responsibilities, risk, obligations and cash flows (World Bank et al., 2016). These will be assigned according to the:

- Shareholders Agreement;
- Loan Agreement;
- Construction/engineering, procurement and construction (EPC) Contract; and
- Services Agreement.

Utilising project financing, PPP arrangements conventionally are highly leveraged; circa 90:10 debt/equity (Gardner and Wright, 2011). PPP operates according to an output specification, which acts as the control framework by which to measure the service provision

and performance. Typically, at the end of the contractual period, the operations and ownership of the infrastructure asset and along with the service returns to the public-sector coinciding with the termination of the contract (Pretorious et al., 2008).

3.3.1. Public-Private Partnerships Project Lifecycle

According to the World Bank et al. (2016), a PPP project is considered to transition through three phases: the initiation phase; the procurement phase; and the commissioning phase. Each phase contains two stages¹². Figure 3.3 delineates a typical PPP project lifecycle along with the key tasks and outputs from each stage.

Project Phase	Initiation		Procurement		Commissioning	
Key Stages	Identifying project and consideration of PPP mechanism	Appraisal and preparation of contract documents	Structuring and Preparation	Tendering and Contract Award	Contract Management - Construction and Commissioning	Contract Management - Operations, maintenance and handback
Tasks	<ul style="list-style-type: none"> Identify project solution Project Cost-benefit analysis (CBA) Consideration of the PPP mechanism Preparation of the project governance framework 	<ul style="list-style-type: none"> Refine project scope and develop outline business case (OBC) Further development of CBA (socio-economic feasibility) Assess commercial feasibility - Public-sector Comparator (PSC) Due diligence assessment Define procurement strategy 	<ul style="list-style-type: none"> Establish financial structure (financing source, risk, payment mechanism) Complete due diligence Update and complete PSC Finalising the technical design, output specification and project requirements Define final business case (FBC) and contract Determine a contract management strategy and tools Drafting of request for quotation (RFQ) - define qualification assessment criteria Structuring and development of request for proposal (RFP) - define proposal assessment criteria Finalise contract draft 	<ul style="list-style-type: none"> Initiating the tender process Qualifying bidders Negotiation and clarification of issues Dialogue - contract negotiations Complete RFP Evaluate bid proposals Dialogue and negotiation of proposals Negotiating the contractual conditions Awarding the contract Contract signing Financial close 	<ul style="list-style-type: none"> Construction of contract management team and strategy development Collectively agreement of solution design Site set-up Construction initiation Construction mapping and management Manage changes, claims and disputes Infrastructure commissioning and operations commencement 	<ul style="list-style-type: none"> Monitoring project performance Management of the project changes, claims, and disputes Manage and monitor stakeholder partnership Preparing for handover Handover and contract exit
Outcome and progress of contract documentation	<ul style="list-style-type: none"> Outline of technical solution Economic analysis Outline financial assessment 	<ul style="list-style-type: none"> Feasibility report (PSC) Refined project scope and objectives Preliminary PPP structure Consideration of procurement strategy and project management plan 	<ul style="list-style-type: none"> Finalisation of financial plan Finalisation of RFQ and RFP Contract draft 	<ul style="list-style-type: none"> Final RFP and contract Award decision Signing of the contract 	<ul style="list-style-type: none"> Potential renegotiation and changes to the contract documents 	<ul style="list-style-type: none"> Potential renegotiation and changes to the contract documents

Figure 3.3: Typical PPP Project Lifecycle (adapted from World Bank et al., 2016)

I. Initiation phase

¹² In 2016, the World Bank along with the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the Inter-American Development Bank through its Multilateral Investment Fund (IADB through its MIF), the Islamic Development Bank (IsDB), the World Bank Group (WBG) and the Public-Private Infrastructure Advisory Facility (PPIAF) produced a contemporary PPP guidebook. This guidebook was produced to act as a best-practice knowledge capital Centre for efficient and sustainable PPP provision and has been informed from a review of 48 credible official governmental reports and reputable publishings. As per this guidebook, generally,

The initiation phase is composed of two stages. This is the project identification stage, as well as the project appraisal and preparation stage. In the initiation phase, the primary tasks concern the assessment of the PPP mechanism as a provision strategy and the VfM assessment to determine if this provision mechanism is to be implemented. The main objectives from the initiation phase pertain to the selection of the appropriate project option and an assessment of the suitability and feasibility of the PPP mechanism to the project requirements.

- Project identification and consideration of PPP mechanism - the project identification process is a constituent component of all infrastructure provision lifecycles regardless of the procurement approach. In the project identification and consideration stage, the fundamental outcome of this process is to identify the best project option and to assess the viability of PPP; hence, key tasks in this stage comprise of activities such as identifying, scoping and determining the correct project solution. This typically can be determined through activities such as a Cost-Benefit Analysis (CBA) or a VfM assessment. At this juncture, with no determined provision strategy, the PPP mechanism should be considered along with all other procurement frameworks to examine which solution is best suited for the provision of social infrastructure. Part of this should include the identification of the socio-economic implications, an assessment of the viability of each project delivery strategy, the technical needs of the project as well as the determination of the governance approach to be employed. Usually, the scope of the project will be an overview, coupled with an outline feasibility appraisal which can be developed as the project progresses. At the conclusion of this phase, the PPP procurement strategy; where offering best VfM, will be formally selected and the project will progress to the appraisal and preparation stage.
- Appraisal and preparation of contract documentation - when the project enters the appraisal and preparation stage, the remit of this undertaking is to assess the viability of the PPP mechanism and to determine if PPP is conducive to the project requirements. This is an important stage on the grounds it will define the nature of the PPP venture going forward and will establish the tender procedure to be utilised. Like the previous stage, this is a constituent element of all infrastructure procurement approaches and is not unique to PPP; however, predicated on the scale and complexity of PPP transactions, this is typically much more resource intensive than conventional procurement strategies. Key tasks in this stage will include

refinement of the project scope and the development of an outline business case (OBC). Additional work will also be undertaken in regard to the CBA; this may include greater scrutiny of the socio-economic feasibility as well as an extensive examination of the commercial feasibility. Fundamentally, the purpose of this feasibility examination is to establish whether PPP can provide optimum VfM. This is measured through a Public-Sector Comparator (PSC) which is a means to compare the cost of a PPP deal against a traditionally procured asset. Ultimately, key outputs from this stage will culminate in: the production of a VfM report; a refined project scope and project objectives; an outline development of the procurement and project management plan; and the construction of a preliminary PPP structure.

II. Procurement phase

In the procurement phase, there are also two stages: the structuring and preparation stage where much of the contract documentation is prepared, and the tendering and contract award stage where private-sector consortiums compete for the contract. In this phase, the private-sector cohorts compete for the project which culminates in financial close as a preferred bidder is awarded the contract.

- Structuring and preparation - as the project progresses into structuring and drafting, the main outputs from this will be: the development and finalisation of the financial plan; a draft of the contract documentation; and a finalised version of the request for quotation (RFQ) and the request for proposal (RFP) documents to be used as part of the tendering procedure. Building on the preliminary work from the previous phase, in this stage, key tasks will include updating the PSC, finalising the technical design, the output design and project requirements. The contract will also be developed and refined to consider aspects such as the financial structure, the payment mechanism and how risk is to be allocated. In preparation for the tender procedure, the RFQ and RFP will be designed to consider important aspects such as the qualification criteria, submission timescales, the negotiation and dialogue procedures and the award process. Much of the development for this will be informed from the previous phase and can therefore only be carried out when these tasks have been completed.
- Tendering and contract award - premised on the procedures defined as part of the structuring and preparation, the project will transition to the tendering procedure. The purpose of this is to identify the best VfM proposal from the private-sector as

part of a competitive bidding process as designed through the RFQ and the RFP. Generally, the tendering process is considered to be comprised of four steps: pre-qualification / shortlisting; bid submission; bid evaluation; and contract signature though this may be adjusted contingent on the project requirements. As part of this tendering procedure, there will be on-going negotiations between sectors and clarification of issues until eventually a preferred bidder is selected. The tendering and contract award stage closes as the public and private-sector parties agreeing terms culminating in the formalised signing of the contract and financial close.

III. Commissioning phase

As the project then transitions to the commissioning phase, it is likewise constituted of two stages. These are the construction and commissioning stage, where the private-sector develops the facilities, and the operations and maintenance whereby the private consortium provides and maintains the service. The contract concludes with handback as the operations and ownership of the facility and its service is returned to the public-sector.

- Construction and commissioning - in the construction and commission stage, the key output emerging from this is the mobilisation of the project asset. Having achieved financial close and signing of the contract, many of the management roles pertain to managing risks and potential threats to safeguard the performance of the contract. Key tasks in this stage encompass agreement of the solution design; management of communication and stakeholders; managing payments, deductions and delays; and monitoring the performance and compliance of the private-sector consortium regarding their contractual obligations. It is also important that any changes in the contract are managed including any amendments to risk allocation. The construction stage will end as the project is commissioned and operations of the service commence.
- Operations, maintenance and handback - transitioning from the construction stage, the management strategies in principle remain the same. This is the longest stage of the lifecycle and it is therefore important to proactively manage the venture to avoid disputes and mitigate against risks. Key tasks in this stage comprise monitoring and managing the performance of the partnership; managing claims and disputes; and ownership transfer of the facility to the public-sector at handback. In this stage, it is common for refinancing to occur and for ownership and/or shares to be transferred. Thus, this stage of the project has a permeable boundary as organisations may

choose to enter and exit the venture. As new unknown stakeholders enter the venture, this may influence the performance of the project as each organisation carries with it unique and individual project objectives. It is accordingly important that there is a proactive partnering management strategy.

Having examined the PPP lifecycle and determined the key tasks to be completed, the research will now consider the attributes of PPP which support the argument that PPP as a credible framework for 'more and better' social infrastructure provision. These are discussed in the following.

3.3.2. Partnering for 'More and Better' Social Infrastructure Provision

The decision to adopt PPP is predicated on Value for Money (VfM). VfM is a combination of both the costs of providing the service as well as the quality of the service. According to World Bank et al. (2016), PPP can provide better VfM as well as 'more and better' infrastructure through three principal avenues:

1. As a financial mechanism and the associated benefits of private finance;
2. Improved productivity and efficiencies; and
3. The wider efficiencies offered to governments.

Beginning with the financial merits of PPP, this can be dichotomised into access to alternative sources of capital and access to cash. PPP provides an alternative financing vehicle for infrastructure provision. By channelling private financing into infrastructure, PPP can expedite infrastructure provision strategies and accelerate capital investment pipelines (Demirag et al., 2015). Discussed in chapter two, PPP utilises project financing arrangements comprising private debt and equity. Advantageously, the public-sector can avail of social infrastructure while repayments of this service are accounted for systematically over the operational phase. Repayments do not immediately compromise government budgets and for this reason, PPP is particularly attractive in times of fiscal consolidation as alternative sources of capital enables infrastructure development continuation in times of constrained public budgets (Hare, 2013). Though ultimately the government still pays the cost, the government is afforded the flexibility of repaying the capital in smaller payments and thus PPP in the main is favourably kept off capital balance sheets. Use of private financing can also offer governments greater flexibility in that it mobilises alternative sources of capital, frees up public-sector resources to be deployed elsewhere and can be used to compliment publicly funded programmes (Della Croce et al., 2015).

Notably however, the benefits derived from private financing should be concomitant with several caveats. Governments must be mindful of accumulating debt imposed by PPP and the long-term outgoings as a result (Gardner and Wright, 2011). Also, the efficiencies accrued from the project performance should outweigh the additional costs of private financing, and therefore should be chosen premised on better VfM over alternative financial mechanisms.

Another area where PPP has been promoted for its wherewithal to provide 'more and better' infrastructure derives from its streamlined efficiencies and effectiveness. In essence, better efficiencies fall under the categories of: cost management; lifecycle management; reliability and effectiveness; innovation, and risk management (World Bank et al., 2016). PPP harmonises what has traditionally been heterogeneous projects phases into a single long-term bundled solution. Theoretically, this holistic perspective enables the development of an integrated solution for the duration of the contract which should translate to better investment impact than traditionally procured facilities. This should transpire in improved overall quality of the service, expedited provision of the facility, enhanced operational efficiencies and improved maintainability over the lifecycle (PwC, 2015; KPMG, 2015). This bundled and integrated solution design in principle is permitted using an output specification which grants the private-sector greater space to innovate, design an optimal solution and utilise better technological resources (World Bank et al., 2016). It is also noteworthy, the private-sector is not subjected to the same constraints, social pressures and business frameworks as the public-sector is. In this context, the private-sector has greater flexibility to innovate and manage costs. These benefits are underpinned by the usage of the performance-based payments to guarantee these efficiencies (NAO, 2018).

Others have also argued that PPP offers superior risk management efficiencies. PPP advocates claim that the disparity between funding options can be offset through savings derived from effective risk management and risk transfer. Being long-term complex arrangements, PPP inevitably will be exposed to significant risks. Ideologically, within the PPP framework, risks and responsibilities are transferred to the party best able to manage them (Pretorius et al., 2008). This allows the public-sector to divert construction, financing and operating risks away from the state and onto private organisations. In return, risks are quantified, priced and managed through sound private-sector risk management practices. The optimal transfer of risk; rather than total, in theory, can produce enhanced VfM above and beyond that if the project stages were disentangled and contracted unilaterally (Schwartz et al., 2014). Furthermore, bearing the risk of construction, there is a strong incentivisation for the asset to be provided on-time and within budget (NAO, 2018).

Finally, the third avenue PPP can provide 'more and better' infrastructure is by means of the overall efficiencies afforded to the government. PPP ensures that there is an up-front commitment to the provision of the infrastructure. The funds allocated to the operations and maintenance of the facility and service are ringfenced as part of future budgets and thereby ensures the reliability of the asset and service (HM Treasury, 2013). Furthermore, PPP may pave the way for efficiencies to be adopted and imported into future infrastructure provision as well as ensures transparency premised on the large number of organisations involved (World Bank et al., 2016). Indeed, while some have been critical of the earlier costs of PFI, others have noted how the superior performance of PPP has driven up standards across the board in the built environment.

The research has defined PPP in the UK. It has identified the phases of a typical project as well as considered how PPP can deliver 'more and better' social infrastructure. The research will now review PPP specifically in the context of social infrastructure provision.

3.4. An Overview of United Kingdom Public-Private Partnerships for Social Infrastructure Provision

In the 1980s, against the backdrop of constrained capital finances, the UK government began to explore the option of increased private-sector involvement in the provision of public services. Many felt the private-sector can deliver better VfM than the public-sector. Equally, the success of several early economic infrastructure projects garnered support for private-sector financing of public services (Pretorious et al., 2008). In 1981, a UK government committee, chaired by Sir William Ryrie, was tasked with the responsibility of assessing and reporting on the nascent potential of private-sector financing in public services. This committee produced the "Ryrie Rules", providing the basis on which project financing could be utilised by the government. One notable stipulation endorsed the testing of a privately financed project against a public funded alternative. From this burgeoning landscape of infrastructure project financing, several distinguished projects were conceived including the Channel Tunnel in 1985, the Queen Elizabeth II Bridge and the Second Severn Crossing in 1990 (Pretorious et al., 2008).

By the early 1990s, private financing had been utilised for several transport projects; however, it was clear there were comings which needed to be addressed before it could permeate other sectors (Pretorious et al., 2008). This changed in 1992. Under the auspices of the financially constraint Conservative Government, Norman Lamont, the then Chancellor of the Exchequer, announced the launch of PFI in his autumn statement to Parliament. PFI

was 'an initiative to increase the amount of private finance being used to invest in what had previously been publicly sponsored infrastructure' (Carty et al., 2008). Up until then, private financing had predominantly been mechanised for economic infrastructure assets, nevertheless, PFI enabled greater 'private financing of capital projects' in the public-sector (Fewings, 2013). Since its introduction in 1992, PFI has been the preferred choice of PPP in the UK. Although the term PPP was previously introduced in Australia, in the UK, PFI was a precursor to the PPP terminology which correspondingly emerged some years later (Cartlidge, 2011).

After the privatisation of many public-sector services pursued by the Thatcher government during the 1980s, for some, PFI was deemed to be a logical continuation of this agenda (Cartlidge, 2011). Designed to benefit from private-sector financing as well as private-sector skills, resources and experience, it was argued PFI would provide better VfM across the whole-life than that which could be attained from the public-sector (Hare, 2013). Between 1992 and 1997, the Conservative's PFI policy was shepherded by the Private Finance Panel (PFP). This was a department within the HM Treasury comprising representatives from the public and private-sectors responsible for guiding the rollout of PFI. Notably, the PFP recalibrated the government's strategy by implementing the policy that capital projects would not be approved until a costing had also been explored via the PFI option (Pretorious et al., 2008). This profound shift in attitude expedited the expansion of PFI bidding, so much so, that any project which could not exhibit VfM or was unsuitable for private financing was approved for PFI provision. Eventually, the voluminous number of projects, in conjunction with escalating bid costs transpired in the cessation of the previously stipulated testing measures. Instead, the public-sector comparator (PSC), a hypothetically costed project was implemented; however, not mandatory (Pretorious et al., 2008).

In 1997, the Labour party replaced the Conservatives in government. As part of their mandate, partnering was integral for the modernisation of Britain. In response to escalating bid costs, one of the first measures carried out was the appointment of Sir Malcolm Bates to review PFI. The so-called "Bates Review" produced 29 recommendations, but also importantly, it advocated the continuation of the PFI mandate. Concurrently, the Labour Government Treasury Taskforce replaced the PFP. The Taskforce was centralised within the government and their remit was to support and advise on best-practice and critical success factors (CSF) of this nuanced PFI, reflective of the Bates Review (Pretorious et al., 2008). PFI, and project financing, being relatively unexplored phenomena within the context of the public-sector meant there was an information imbalance between arrangement counter-

parties. To strengthen the public-sector position, the taskforce produced extensive publications extending from pro-forma policy briefings to detailed case studies and technical notes. Emanating from this, there were three noteworthy manifestations: there was greater appreciation by public-sector of project risks and their allocation; procurement became more unified, standardised and consistent across departments reducing transaction costs; and finally, much of this documentation lent to PPP best practice, internationally (Pretorious et al., 2008).

Following a second review of PFI, again by Sir Malcom Bates, Partnerships UK (PUK) were founded. PUK replaced the projects division within the treasury taskforce. Similarly, the policy arm was exported to the Office of Government Commerce (OGC). PUK cooperated with public and private bodies to facilitate deal arrangements. In 2001, PUK became a PPP in its own right as a result of the majority sale to private investors (51%). It was primarily operated by private-sector procurement specialists including investment bankers, lawyers and consultants (Hellowell, 2007). PUK was subsequently dissolved in 2011, with Infrastructure UK undertaking the responsibility for stewarding PPP policy (PUK, 2011).

Despite being a Conservative pioneered initiative, PFI has been considerably expanded under the Blair / Brown Labour government. Investment was flourishing by the turn of the millennium. Appetite for PPP social infrastructure was at an all-time high, and resultantly, several novel PPP innovations were developed to function within the PFI framework, permitting other departments to similarly avail of the benefits of PPP and private financing. The National Health Service (NHS) Local Improvement Finance Trust (LIFT), Express LIFT (eLIFT), and the Building Schools for the Future (BSF) schemes were the most notable programmes introduced to deliver social infrastructure. PPP was thus utilised by a plurality of government departments for various ventures but predominantly social housing, transportation, education facilities and hospitals (Asenova and Beck, 2015).

3.4.1. Building Schools for the Future

The BSF scheme was the 2003 capital investment programme implemented by the Department for Children, Schools and Families (DCSF). It was the highly ambitious scheme mobilised to transform the capital stock of schooling facilities across England and Wales. The plan for BSF was to deliver 250 schools per year until 2020; over half of schools were to be rebuilt, a third to be remodelled, and the remainder, refurbished. In addition to development works, all schools would be modernised with Information Computer Technology (ICT) equipment. In total, the BSF programme was estimated to be worth £55bn, spread over 15

years (NAO, 2009). The BSF was unique for other schemes in that it was a hybrid programme; part private financed and part public funded. New builds were to be paid for through PFI, while the remainder were to be funded through capital budgets (DfES, 2003).

Predicated on expedited lead in times and cost savings, long-term joint ventures between the public and private-sectors referred to as Local Education Partnerships (LEPs) were developed to coordinate the procurement and maintenance of BSF schools at the local level. These LEPs were overseen and managed at a centralised level by Partnerships for Schools (Pfs). Pfs was a non-departmental national body responsible for driving the implementation of the programme. Acting as both the financial gatekeeper as well as providing consultancy support to local authorities, Pfs was tasked with the responsibility of ensuring projects were delivered on time and within budget (NAO, 2009).

However, preliminary estimations by DCSF and Pfs were overly optimistic. By the end of 2008, only 42 of the planned 200 schools had been delivered. Original estimates, both in terms of cost and time had inflated by £10bn and three years, respectively (NAO, 2009). Associated with “massive overspends, tragic delays, botched construction projects and needless bureaucracy”, under seismic political pressure, ultimately BSF was cancelled in 2010. The 715 schools which had signed up to the scheme, but yet to achieve financial close, were discarded (BBC, 2010).

3.4.2. Local Improvement Finance Trust and Express LIFT

The NHS LIFT initiative was introduced in England in 2000 to address the legacy of under-investment into primary care provision, historically side-lined to hospital provision. LIFT was innovative insofar as, rather than forming a project-based partnership, instead, much like the BSF, it established a long-term joint-venture (JV) between the public and private-sectors, both nationally and regionally. The national JV company was constituted of representatives from the Department of Health and PUK (NAO, 2005). This JV operated formally as Partnerships for Health; however, in 2006 the Department of Health acquired full shareholding and subsequently renamed it Community Health Partnerships (CHP). Comparatively, at the regional level, a JV company referred to as a LIFTCo was comprised of local health professional representatives, CHP and a private-sector partner. This partnership was responsible for the provision of batches of small scale works which theoretically better aligned with localised priorities.

Under the stewardship of a Strategic Partnering Board which was constituted from local health economy stakeholders, LIFT facilitated a long-term investment strategy reflective of community needs, coupled with the acquisition of private-sector expertise (NAO, 2005). In 2008, the eLIFT scheme was launched to replace LIFT. In a change from the predecessor, Authorities selected a private partner from a pre-selected list, contingent on a previous bidding round. It was expected this would improve delivery times through simplified contracts, reduced bureaucracy, and eventually drive down overheads and costs (Asenova and Beck, 2015). In total, there are 49 LIFT and eLIFT companies, which have provided 339 new facilities, accumulating a capital value of £2.5bn (CHP, 2017).

3.4.3. The Demise of the Private Finance Initiative

In the period leading up to the GFC, social infrastructure PPP ventures were consistently expanding both in terms of numbers and value. However, the 2008/09 Global Financial Crisis (GFC) had a profound impact on the UK PPP marketplace. In fact, a decade on from the collapse of the Lehman brothers, the ramifications of the recession continue to somewhat resonate through the project financing market. As banks diverged from capital intensive lending, discussed in chapter two, conventional sources of debt no-longer had neither the wherewithal, nor risk appetite for infrastructure investing. The introduction of Basel III; aimed at strengthening banks capital requirements through increased liquidity and decreased leveraging (BIS, 2010) made infrastructure investing more expensive in capital adequacy terms. This served to curtail the appetite of private-sector creditors, and resultantly, banks were no longer lending, at least not on the scale once exhibited (Standard & Poor's, 2013).

This mass exodus from the marketplace of traditional lenders, in tandem with tightened regulatory requirements of those who remain, has posed significant problems for the UK PPP social infrastructure market which been manifest as a financial void between needs and availability. Reflective of this, in the short-term period after the GFC, the number of agreements achieving financial close dropped significantly. Whereas, remarkably, the capital value of ventures significantly grew between 2008 and 2009. This can be explained by the need to offset high procurement costs against commercial viability (Haran et al., 2013), but also fundamentally, PFI was a strategic mechanism by which to insulate industries such as the construction sector from the acute effects of the GFC (Asenova and Beck, 2016). The New Labour government, declaring its commitment to PPP and PFI, set aside £3bn in 2009/10 to provide bridging loans to projects in jeopardy to counter the effects of the banking

retrenchment. Through the Infrastructure Finance Unit (IFU) as well as state-owned banks, namely; the Royal Bank of Scotland (RBS) and Halifax Bank of Scotland (HBOS), the government lent both directly and indirectly to PFI projects. Added to this formal directive, in addition to supplying bridging loans, on occasion the state surpassed its remit by contributing the full lending amount, as well as underwriting bank loans and providing equity bridge loans (Asenova and Beck, 2016). Fundamentally, by doing so, this undermined several of the key benefits of PFI: the high costs of private financing which previously had been justified through risk transfer had been eroded on the grounds that ultimately the public-sector was now holding all the risk. Likewise, the ideology that risk transfer would incentivise project performance was equally now null and void (Asenova and Beck, 2016). In response, the Liberal Democratic and Conservative opposition lambasted the Labour government and PFI, questioning its intent, legitimacy and efficacy.

Notwithstanding these criticisms of PFI induced by the GFC, for some time there had been speculation encircling the credibility of these frameworks. Cartlidge (2011) remarked that as early as the late 1990s questions were being raised as to how two inherently different sectors could tangibly collaborate; this problem being exacerbated by the disparity in skills between opposing contractual parties. Furthermore, over-eagerness to deploy PFI on the public-sector behalf had resulted in PFIs inappropriate rollout in some instances (Cartlidge, 2011). Other emergent problems such as the private-sector exorbitant profits during refinancing in the secondary market also served to erode confidence in PFI. Notable examples such as the Dartford and Gravesham hospital PFI and the Norwich and Norfolk University recorded windfall gains of £34m and £115m, respectively (NAO, 2002). Eventually, it was discovered average annual equity IRR sales (29%) were twice the rates (12% to 15%) in the business case at contract signing (Whitfield, 2012). In the wake of the GFC, these findings were heavily criticised set against the poor reputation of the financial sector.

Following Labours exit from incumbency, being replaced by the Conservative-Liberal Democrat Coalition, PFI, having been heavily criticised, the National Audit Office was commissioned to undertake an extensive review of PFI in an effort to determine the true delivery of VfM. The key findings from this report were summarised as (HM Treasury, 2012):

- Insufficient contract flexibility across the operational period when wanting to adjust the service so that it is reflective of the Authorities requirements;
- Excessively slow and expensive procurement process, and ultimately poor VfM;

- Insufficient transparency pertaining to future liabilities imposed on the taxpayers and investor returns;
- Inappropriate risk transfer resulting in increased risk premiums being charged to the Authority; and
- Windfall gains made by equity investors has manifest in concerns as to the true extent of public-sector VfM.

3.4.4. A New Approach to Public-Private Partnerships

Despite these findings and the PFI diatribe, in the current financial and political landscape, the UK government declared its commitment to PPP and the future mobilisation of private financing for social infrastructure provision. Subsequently, across the UK, the PFI framework has been overhauled and replaced with several reformed partnering arrangements. Principally, these changes have been implemented with the joint purpose of stimulating and leveraging alternative sources of capital into public services as a response to the constriction of private capital liquidity, as well as to address many of the inherent inefficiencies of PFI (HM Treasury, 2012). Grounded in a cross-sectoral partnership, there is now greater appreciation of the importance of collaboration in improving project performance (HM Treasury, 2012). Also, determined in chapter two, collaboration has an important role to play in facilitating engagement between the PPP community and alternative sources of capital in an effort to engineer bankable deals which align to investor profiles and thereby unlock these additional financial resources (Della Croce et al., 2015). Hence, nuanced modalities have emerged onto the market. The research will now examine the reformed policies of the four jurisdictions of the UK to identify the main changes implemented in these reconceptualised modalities.

3.4.4.1. England

In England, against the backdrop of austere policies to lessen public-sector debt; in December 2012, George Osborne announced Private Finance 2 (PF2). One of the principal differences between PF2 and PFI has been the introduction of the public-sector as an equity co-investor. By directly investing into the project, it is anticipated this will cultivate greater stakeholder collaboration reflected through an improved partnership between contractual stakeholders. Better objective alignment; greater transparency and information sharing; improved risk allocation and management; and joint decision-making, all potentially will enable the government to obtain a share of investment returns, reduce project costs and

ultimately deliver better VfM. This investment will be managed by a central unit positioned within the Treasury and agreed on equal terms to the private-sector (HM Treasury, 2012).

As well as co-investing, the previous PFI framework has been nuanced to reduce procurement timescales, circa 18 months. Soft services have also been removed from the contract to facilitate greater long-term flexibility, efficiency and transparency. This will equally remove the risk premium which had been previously attached to investments, thus ring-fencing excessive profits (HM Treasury, 2012).

In today's economic climate, HM Treasury (2012) regards banks no longer as a sustainable source of debt provision. Going forward, suggested divergence from conventional funders has been expressed through greater weight attached to institutional investor involvement. Traditionally, PFI projects have been circa 90:10 debt/equity ratios. However, by reducing the gearing ratio to 75:25, it is anticipated this recalibration will ignite greater earlier activity in the markets, increasing competition and serving to reduce returns to levels which are more reasonable and politically defensible. Furthermore, and arguably more pertinent, this new leveraging arrangement will insulate traditionally risk averse institutional investors from construction risk exposure. By doing so, there will be less dependence on banks, as well as freer, earlier and greater filtration of newer capital sources, resultantly lowering prices on less restrictive terms (HM Treasury, 2012).

While PF2 has seemingly addressed many inherent issues of PFI, its arrival should be concomitant with several caveats. Lower gearing will likely increase transaction costs. Likewise, there are no guarantees institutional investors will necessarily want to be involved any earlier (Read, 2013). Indeed, NAO (2018) identified that out of the six deals signed under PF2, institutional investors have not invested into debt. Additionally, Solvency II; introduced to reconcile and codify solvency requirements against risk profiles, will possibly limit long-term investments (Mittnik, 2011). Banks, having historically undertaken the syndicated arranging responsibilities, has meant institutional investors do not possess the requisite due diligence skillsets; at least not on this scale (Read, 2013). It is therefore no surprise that since its introduction, PF2 activity has been muted and has subsequently been used for only a small number of projects. Poignantly, a pipeline of PF2 projects which was due to be announced in June of 2017 has been abandoned with the future of PF2 still uncertain (ConstructionNews.co.uk, 2017). Moreover, there are outstanding concerns regarding transparency and performance measurement, flexibility and the underlying motivations behind the utilisation of PF2.

3.4.4.2. Northern Ireland

Northern Ireland (NI) has also developed its own Third-Party Development (3PD) model which utilises a design, build, finance and maintenance contract; though, the 2015 proposed pathfinders are yet to achieve financial close (Education Authority, 2015) and it remains unclear if they are still in discussion. Notwithstanding the launch of 3PD, PPP in NI has been subjected to notable criticism and indeed the Executive has expressed little appetite for PPP. A 2009 report disseminated by the then Northern Ireland Public Service Alliance (NIPSA) (Hellowell, 2009) heavily criticised PFI in NI. This report, together with other publications, this has culminated in PPP being a contentious topic amongst strategic decision-makers which has been reflected through sedate market activity. Even so, there is recognition now on the part of the NI Executive that if it is to close the gap between itself and competitors, it can no longer rely on the lump capital transfer from the UK.

3.4.4.3. Scotland

To replace PFI, Scotland has introduced the Non-Profit Distribution (NPD) model. NDP was launched to be a more practical and viable alternative to PFI, and in 2015, the NPD framework delivered £0.46bn worth of capital projects. While NPD is effectively grounded in the foundations of PFI, it additionally includes measures to address many of the criticisms of its predecessor. NPD caps excessive private-sector gains; instead, profits are reinvested into the public domain. Moreover, the SPV board is steered by subordinated debt-holders, as well as a public Authority, charity or community representative. In this regard, NPD has been extolled for its capacity to collaboratively facilitate stakeholder engagement in the decision-making process (Asenova and Beck, 2015).

Scotland has also developed the Scottish-Futures-Trust (SFT) Hub initiative. The SFT Hub resembles other 'PFI-lite' schemes such as the BSF and LIFT programmes, so much so, according to Asenova and Beck (2015), Hub guidance documentation specifically acknowledges the parallels between itself and other existing arrangements in the UK. The first Hub project was undertaken in August of 2009 for the provision of social infrastructure in the south-east region of Scotland. The project was valued at £64m and comprised the provision of health and education facilities. Similar to other PPP programmes, it is a 20-year JV partnership between a private partner and public-sector cohort encompassing the SFT, local councils and other public-sector bodies within the region. The Hub initiatives key objectives are to (Scottish Executive, 2006):

- I. Improve local services through public-private joint service provision;
- II. Deliver a sustained programme of community infrastructure investment through public-private collaboration;
- III. Provide a sustainable and effective procurement model for public bodies; and
- IV. Develop a best-practice framework.

Like other PFI modalities, a local 'HubCo' is allocated the responsibility of designing, building, financing and managing a portfolio of projects; however, through greater flexibility and community inclusion, it is argued, the Hub will be better positioned to accrue better investment impact than that on offer through conventional procurement channels (Scottish Government, 2006). Over its initial 10 years, it is expected the Hub will channel £2bn of investment into social infrastructure (SFT, 2016). Despite these changes in Scotland, as early as 2010, Wamuziri (2010) raised concerns over the timescales and costs incurred to bring projects to financial close in this nascent PPP modality. Moreover, concerns have been raised in regard to competition and excessive profits closely reflecting many of the inherent criticisms of PFI (McCall, 2017).

3.4.4.4. Wales

Just as all other regions have reformed their PPP frameworks, so too has the Welsh Assembly. In 2017, the Mutual Investment Model (MIM) was announced as a successor to PFI. Much like PFI, this is a design, build, finance and management contract between the public and private-sectors, though there are distinctions within this framework from PFI. The MIM now has a requirement whereby during the development of the facilities, the private-sector cohort will create apprenticeships and traineeships by which to benefit the community (Welsh Government, 2017). Currently, MIM is available for both social and economic infrastructure development and it is actively being considered for three projects, namely; the Velindre Cancer Centre in Cardiff, the A465, and the 21st Century Schools Programme, which collectively comprise around £1bn of investment (Welsh Government, 2017). The first project is due to come onto the market in July 2018.

Notwithstanding the introduction of these changed policies, UK PPP has failed to recover to the previous levels of activity exhibited prior to the GFC. The latest figures reveal that on average, over the previous two years, the total value of UK PPP transactions to achieve financial close; comprising both economic and social infrastructure, equates to around a tenth (£0.5bn) of those which were agreed in 2007-08 (£5.5bn) (NAO, 2018).

NAO (2018) identified that there are still challenges confronting the utilisation of PPP; with some questioning whether these new models are in fact rebranded permutations of PFI. NAO highlighted concerns over the true extent of VfM and performance efficiencies. Significantly, NAO identified how, in 2011, rather than collect data, investigate the lessons to be learnt from PFI and apply these findings to the replacement models, the motivations to reform PFI were financial driven and implemented in response to: the higher private financing costs; to address the public and governmental criticisms of PFI; and to address uncertainty in the marketplace (NAO, 2018). Set against these findings, this research argues that these modified frameworks have failed to address the inherent inefficiencies of the previous PFI; this assertion being ratified by the limited uptake of PPP since the GFC. Hence, the purpose of the next section is to investigate the true inherent inefficiencies of UK PPP preventing its resurgence to the position where it is a credible vehicle for 'more and better' social infrastructure provision.

3.5. Inefficiencies Confronting United Kingdom Public-Private Partnerships Social Infrastructure Provision

PPP is considered more complex than traditional procurement methods which serves to exacerbate the complexities inherent to the infrastructure concept. Project financing, long-term contracts, the need for cross-sectoral governance, balancing stakeholder needs and a new involvement capacity for the public-sector, these factors have culminated in a complex delivery model. As such, practitioners and participating organisations require a unique set of skill-sets which are multi-dimensional across all aspects of infrastructure investment and provision. This has meant that often many of the participating organisations of PPP do not have the skills in-house and therefore must employ external advisors and consultants to fill legal, financial and technical skills gaps. By doing so, this drives up transaction costs, which when combined with the costs of bid preparation and an expensive procurement process, collectively PPP is associated with high costs. Indeed, Zhang et al. (2012) calculated that on average, UK PPP tendering costs equated to 2.6% of the project value and spanned an average of 34 months.

The seismic resource demands associated with PPP has meant private-sector appetite to bid on PPP ventures has been curtailed and that that only a limited number of organisations have the wherewithal to participate. This has created barriers to entry into the marketplace, and therein diminished market competition (DeSchepper et al., 2015). This is an important point when set in the context of uncertainty of project progression. Consequentially, this has

engineered a highly pressurised environment as SPVs compete for the project and it is no surprise that literature highlights that this competitive procurement process has been highly contentious. Emanating out of this contentious environment, it has been challenging to agree terms which has driven up bidding costs and elongated project timescales (DeSchepper et al., 2015; Wong et al., 2015). Some have already identified the procurement process as the fulcrum in the PPP lifecycle and in response research has offered contributions to address the inefficiencies inherent to this process. Nevertheless, interviews carried out by Liu et al. (2016) revealed that the procurement process still requires significant streamlining and cost reduction.

Appetite to participate in PPP has also been impacted by the absence of a defined project pipeline. Literature demonstrates that a proactive deal flow has a positive effect on competition and project cost, for example Iyer and Sagheer (2012) considered the nexus between bid-winning and price increase in the presence of a project pipeline. Xu et al. (2012) also in their system dynamics model included competition for pricing ventures. These papers found that strategic proactive planning is a central component to stimulating market confidence. Equally, Xu et al. (2012) found that statistically, in the presence of an investment programme, mark-ups were lower which culminated in reduced private-sector transaction costs as well as lower government procurement costs. Accordingly, in the absence of a strategic pipeline, there is now an opportunity for greater research into innovative financial vehicles capable of leveraging the requisite capital into the market and proactive strategic planning to encourage greater private-sector participation.

Another inefficiency of PPP has been the cost of private capital. Typically, a government can borrow capital at a cheaper rate than private financing offers derived out of the lower risk of default (IMF, 2004; Wolf, 2008; OECD, 2008). The Financial Times (2013) estimated that the average cost of borrowing from the private-sector equates to around 2.2% more than conventional borrowing. When contextualised to over 700 PPP ventures, this poignantly equates to around 40 new hospitals.

Also, change in the markets following the GFC has meant the availability of private capital has been acutely reduced. Demirag et al. (2015) identified that financing appetite has been curtailed both on the part of debt funders as well as equity shareholders as a result of the introductions of Basel III and Solvency II. Basel III has been a watershed for the infrastructure lending community as it necessitates greater levels of liquidity and capital availability. This has meant that the long-term capital-intensive nature of infrastructure is less attractive as

an investment opportunity. Of the investors who have preferred to enter the market via project bond instruments, the collapse of the monoline insurance market and the evaporation of the wrapping previously offered has also resulted in greater levels of illiquidity and restricted capital availability (Della Croce et al., 2015). The situation is much the same for equity investment fund managers and other institutional investors which have been constrained by the introduction of the Solvency II directive. This has reduced the number of private institutions in an already limited market. For those who have remained, they are adopting a more cautious approach which is serving to drive up the cost of private capital (Haran et al., 2013; RICS, 2013). Moreover, many conventional lenders who historically have been willing to provide all senior debt, are now mitigating risk exposure through syndicated loans.

PPP has also become heavily criticised. Referred to as a political football, for some time, the increased cost of borrowing from the private-sector has been a source of much political condemnation. Also, the windfall profits gained by the private-sector, combined with the inefficiencies of PFI has meant there is little appetite for PPP. Instead, some have argued there are other superior mechanisms with the wherewithal to provide social infrastructure (Demirag et al., 2015). The politicisation of PPP impacts private-sector appetite by engendering uncertainty and thereby adding to the risk profile. If the UK government is to lever alternative sources of capital in UK PPP frameworks, there is scope for further research to investigate the correlation between political risk, the cost of capital and commitment.

Literature proposes that the public has been marginalisation in PPP frameworks. This has resulted in scepticism and dissatisfaction with partnering frameworks. The argument against directly involving the public in PPP decision-making has been premised on the notion that these ventures are too complex to be understood by the layman. Instead, the public has had to rely on the public-sector Authority to represent their stake. Notwithstanding this, Rwelamila et al. (2014) argued that the Authority has failed to represent the needs of the public. This poor involvement and engagement has consequentially engendered distrust of these frameworks, and ultimately, this has transpired in project failure.

Risk has been an important justification for PPP mobilisation over conventional procurement vehicles. Ideologically, in PPP, risk is allocated to the party best able to manage it. However, the residual prevalence of risk in research suggests it remains an outstanding area commanding further development. Many have already forged attempts at defining and quantifying risk in PPP. Such examples include Chang (2013) who investigated risk allocation

in PPP contracts through the lens of transaction cost economics. Cheung et al. (2013) assessed risk in a dynamic PPP environment. Whereas, Xiong et al. (2017) approached risk management from an ex-post scenario. Despite these offerings, Akintoye and Kumaraswamy (2016) felt research must offer wider consideration to risk on the grounds construction risk no longer is as prominent as once thought.

Spanning multiple decades, the requirements of a PPP project can change over time. Hertogh and Westerveld (2010) suggested that the main sources of change typically are brought about by project stakeholders. However, as project dynamics evolve, the incompleteness and poor flexibility of PPP contracts is an inefficiency associated with PPP. An example of this is the use of the output specification. The output specification is the control framework used to measure the service provision. By stipulating the service performance through the output specification, it has been suggested that the private cohort is given space to innovate and design an optimal solution. Yet, set against the scale and longevity of these contracts, some have argued that it is impossible to specify all relevant service requirements and as a result this inevitably transpires in required alterations to the services or physical facilities (Henjeweile et al., 2011). Indeed, a recent NAO (2018) report indicates the poor flexibility and incompleteness of the contract is still a major inefficiency in current PPP models.

Transparency and information sharing have been on-going inefficiencies confronting use of PPP. In 2011, NAO was critical of the opaqueness of PFI. This problem has persisted, and it was identified as a prevailing concern in an updated NAO (2018) assessment. It was observed that in the vacuum of quantifiable data, it has been impossible to accurately assess the performance of PPP projects, and as a result, this has compounded concerns over VfM. Poor transparency and information sharing has derived from both the public and private-sectors. Mukhopadhyay (2016) identified two examples of this. The authors highlighted that despite calls for greater transparency from the public-sector from the private-sector, the contractual nature of PPP has discouraged ProjCo from sharing project costs particularly pertaining to the lifecycle. In much the same way, when private-sector investors have sought greater clarification on the performance of other projects on which to base their investments, the public-sector has been unwilling to share this information. Transparency is hence a two-way channel and has been propagated across literature. The identification of transparency and information sharing as part of the NAO (2018) findings indicate there are appropriate grounds for research.

Transcending multiple phases and spanning several decades, Akintoye and Kumaraswamy (2016) highlighted the need to develop a strategy to retain experience and knowledge as a means to bolster the productivity of these frameworks. Knowledge should be shared within projects, across sectors, and inherent to sectors. This can facilitate the development of a best-practice framework. Roehrich et al. (2014) agreed, identifying that a failure to centralise and retain intellectual capital has meant best-practice lessons from previous ventures have not been taken advantage of. This inefficiency has been exacerbated by the high specificity and heterogeneity of PPP and infrastructure provision (Pretorious et al., 2008).

Hall (2015) was also critical of PPP because it enables the private-sector to influence public services provision. Hall (2015) felt that by involving the private-sector in public-sector decision-making may result in the embedding of commercial values in public services. He argued this may transpire in staff downsizing and service cuts, and ultimately, an impact on service quality. Hall (2015) based this contention on the grounds that only those projects which are the most commercially viable proceed rather than those most in need. This serves to crowd out and divert investment away from public services that are not profitable.

In a similar vein, naysayers of PPP have claimed that the long-term tenor of PPP diverts resources away from other public-services. To meet the affordability gap, Hall (2015) claimed that resources are often channelled away from other public-sector departments and on some occasions the PPP cohort has deliberately reduced the size and availability of services which were not financially fruitful to maximise profits. With this in mind, research could explore the areas of PPP decision-making, coupled with the relationship between stakeholder behaviours and motivations.

Contractual governance has been identified as an important inefficiency in PPP infrastructure provision (Leiringer, 2003; Teisman and Klijn, 2003; Smith and Wohlstetter, 2006; Waring et al., 2013). Ho and Tsui (2009) suggested that project costs have been escalated predicated on contractual governance. Contractual governance has engender partnership-based problems; has delayed and aggravated renegotiations; and has constituted hold-up problems. Cruz and Marques (2013) argued PPP should adopt a proactive governance approach instead of a reactive approach. Nevertheless, the prevalence of alternative governing systems in research suggests there is space for further investigation into governance protocols.

In line with collaborative governance, literature suggests collaboration should extend beyond key stakeholders and include the supply chain. Comprising a network of both public

and private-sector organisations, there is a large matrix of stakeholders in a PPP project; all of whom possess different objectives and roles. Many now assert that there is a need for a greater alignment of objectives, trust and communication, better stakeholder engagement and relational procurement. This requires a fundamental recalibration of the partnering ethos. These issues have further been compounded by power asymmetry, skills imbalances and opportunistic behaviour (DeSchepper et al., 2013). Against the background of contractual governance, research points towards the degeneration of the partnership and the stakeholder network as a primary source of poor project performance (Zou et al., 2013; Jefferies et al., 2014; Roehrich et al., 2014; Jefferies and Rowlinson, 2016; Burke and Demirag, 2017; O’Nolan and Reeves, 2017).

Indeed, stretching as far back as to the conception of PPP in the UK, there were questions asked how the public and private-sectors could reconcile their differences and tangibly work together. Resultantly, the notion of collaboration has been a touted as a central component of PPP project success; something which continues to be prioritised in newer PPP models in order to ensure long-term sustainability. The importance of collaboration, while having been recognised for some time, has accordingly gathered momentum lately in PPP discord as a concept to bridge the gap between sectors and to address many of the inefficiencies identified above.

It is therefore no surprise that within industry and academia alike, there has been an increase in the number of collaborative investigations; case in point, Burke and Demirag (2017) investigated how better collaborative relationships can improve risk in PPP. In doing so, they determined that collaborative partnering correlated to better risk transfer. Akintoye and Kumaraswamy (2016), in their PPP roadmap, discussing the contract in PPP, they argued that through greater collaboration, as unforeseen circumstances arise, stakeholders are less reliant upon the contract to determine the outcome. Instead, issues can be resolved in an equitable manner. Similarly, Liu and Wilkinson (2014) determined that collaborative governance structures and a partnership-based consortium was instrumental in driving PPP project success in their research. Whereas, Walker and Lloyd-Walker (2015) examined collaboration in large infrastructure projects. Through 36 expert interviews, they established that collaboration was a lynchpin in nurturing trust. Cohen (2010) examined six case-studies which undertook an Integrated Project Delivery (IPD) strategy. From their findings, it was found that cost and time certainty was improved through greater transparency, as well as knowledge and information sharing; all of which was facilitated through greater collaboration. Jefferies et al. (2014) reported collaboration as an integral component of long-

term flexibility in infrastructure provision and an enabler of growth and evolution. Furthermore, Ibrahim et al. (2013) recognised that collaboration improved project performance in New Zealand infrastructure provision, while Waring et al. (2014) pointed towards collaboration as an important concept in bringing organisations together with heterogeneous project objectives.

Of the 19 inefficiencies identified above, literature continues to promote collaboration as a concept by which to improve PPP project success. Table 3.1 is a matrix which displays the 19 inefficiencies identified in literature, the corresponding authors who listed these inefficiencies, and authors who have promoted collaboration as the concept by which to address these inefficiencies. Against this backdrop, this research will therefore investigate stakeholder collaboration in PPP for the provision of 'more and better' UK social infrastructure.

Table 3.1: Inefficiencies Confronting ‘More and Better’ UK PPP Social Infrastructure**Provision**

Attribute	Author(s)	Collaborative Author(s)
Complex delivery model	Cantarelli et al. (2012); LAO (2012); Akintoye and Kumaraswamy (2016)	Cantarelli et al. (2012); Liu et al. (2014); Akintoye and Kumaraswamy (2016)
Contract	Henjeweile et al. (2011); Roehrich and Caldwell (2012); Reynaers (2013); Akintoye and Kumaraswamy (2016); Demirel et al. (2017)	HM Treasury (2012); Roehrich and Caldwell (2012); Reynaers (2013); Akintoye and Kumaraswamy (2016); Demirel et al. (2017)
Contractual governance	Cruz and Marques (2013); Liu and Wilkinson (2014); Akintoye and Kumaraswamy (2016); Demirel et al. (2017)	Clifton and Duffield (2006); Jefferies et al. (2014); Demirel et al. (2017)
Output performance specification	Barlow and Köberle-Gaiser (2008); Henjeweile et al. (2011); Javed et al. (2014); Lam and Javed (2014); Roumboutsos and Saussier (2014); Akintoye and Kumaraswamy (2016)	Javed et al. (2014); Lam and Javed (2014); Akintoye and Kumaraswamy (2016)
High specificity and limited repeatability of projects	Pretorious et al. (2008)	Pretorious et al. (2008); Buchanan et al. (2014)
High transaction costs	Ho and Tsui (2009); DeSchepper et al. (2015); Wong et al. (2015)	Ho and Tsui (2009); Ng et al. (2012); DeSchepper et al. (2015); Wong et al. (2015); Liu et al. (2016)
Higher project value	Vecchi et al. (2013)	HM Treasury (2012)
Increased cost of private finance	LAO (2012); Vecchi et al. (2013); Demirag et al. (2015); Hall (2015)	Buchanan et al. (2014); Della Croce and Gatti (2014); Ehlers (2014); Della Croce et al. (2015)
Long-term financial commitment	Vecchi et al. (2013); Demirag et al. (2015); Zou and Yang (2016)	HM Treasury (2012); Della Croce and Gatti (2014); Ehlers (2014); Della Croce et al. (2015)
Market Competition	Iyer and Sagheer (2012); LAO (2012); Xu et al. (2012); Vecchi et al. (2013); Liu et al. (2014); Demirag et al. (2015); De Clerck et al. (2016)	Demirag et al. (2015); De Clerck et al. (2016)
Partnership and stakeholder network	DeSchepper et al. (2013); Shaoul et al. (2013); Zou et al. (2013); Jefferies et al. (2014); Roehrich et al. (2014); Jefferies and Rowlinson (2016); Burke and Demirag (2017); O’Nolan and Reeves (2017)	Smyth and Edkins (2007); Foo et al. (2011); Zou et al. (2013); DeSchepper et al. (2014); McErlane et al. (2016);
Politicisation	Willems and Van Dooren (2014); Asquith et al. (2015); Demirag et al. (2015)	Demirag et al. (2015)
Poor external stakeholder engagement and involvement	Henjeweile et al. (2013); Rayneers (2013); Tang et al. (2013); Rayneers and DeGraff (2014); Ng et al. (2014); Rwelamila et al. (2014)	Foo et al. (2011); Henjeweile et al. (2013); Ng et al. (2013); Rayneers (2013); Tang et al. (2013); Zou et al. (2013);

Poor knowledge retention and management	Roehrich et al. (2014); Akintoye and Kumaraswamy (2016)	Roehrich and Caldwell (2012); Roehrich et al. (2014); Akintoye and Kumaraswamy (2016)
Poor transparency and Information sharing	Koontz and Thomas (2014); Hall (2015); Akintoye and Kumaraswamy (2016); Mukhopadhyay (2016)	Liu et al. (2013); Koontz and Thomas (2014); Akintoye and Kumaraswamy (2016); Mukhopadhyay (2016)
Procurement Process	Ng et al. (2012); Zhang et al. (2012); Tang and Shen (2013); Demirag et al. (2015); Wong et al. (2015); Liu et al. (2016)	Zhang et al. (2012); Tang and Shen (2013); Demirag et al. (2015); DeSchepper et al. (2015); Liu et al. (2016); O’Nolan and Reeves (2017)
Project Pipeline	KPMG (2010); Iyer and Sagheer (2012); Xu et al. (2012); De Clerck et al. (2016)	KPMG (2010); Xu et al. (2012); De Clerck et al. (2016)
Reconfiguration of services	Hall (2015)	Roehrich and Caldwell (2012); Tang and Shen (2013); World Bank et al. (2016)
Risk	Vazquez and Frederico, (2012); Chang (2013); Cheung et al. (2013); Roehrich et al. (2014); Demirag et al. (2015); Hall (2015); Loosemore and Cheung, (2015); Akintoye and Kumaraswamy (2016); Xiong et al. (2017)	Cannings (2014); Demirag et al. (2015); Akintoye and Kumaraswamy (2016); Burke and Demirag (2017)

3.6. Summary

This chapter has considered the PPP concept to fulfil objective two of the research which was centred on critically evaluating the role of PPP as a vehicle for ‘more and better’ social infrastructure provision in the UK. It has identified PPP is now a nuanced concept with many interpretations and uses. Notwithstanding these differences, ultimately it is the cross-sectoral partnership which is the defining characteristic of PPP.

The research has also examined PPP in the context of the UK and determined how it can deliver ‘more and better’ infrastructure. It was found that UK PPP has undergone major reformations following the GFC. These reformations, theoretically, were introduced for the bilateral purpose of addressing the inherent inefficiencies of the previous PFI framework and also to identify and lever alternative sources of capital into PPP. Despite these changes, it was identified that PPP has lost momentum and there are still inefficiencies confronting ‘more and better’ PPP social infrastructure. In total, the research identified 19 inefficiencies.

Grounded in a cross-sectoral partnership, collaboration has been a prevailing theme extolled as a mechanism to address the inefficiencies of these frameworks. Moreover, literature asserts that collaboration has an important role in encouraging wider participation from alternative sources of capital in infrastructure investment. Despite the salience of

collaboration, as part of this chapter, it was unearthed that historically UK PPP has been contractual, and these arrangements have been more reflective of an outsourcing arrangement as opposed to a partnership. It is therefore argued that there is a knowledge gap pertaining to PPP stakeholder collaboration. The next chapter, chapter four, will thus examine collaboration between stakeholders in UK PPP social infrastructure provision to fulfil objective three.

CHAPTER FOUR

AN EXAMINATION OF THE PARTNERSHIP

4. An Examination of the Partnership

4.1. Introduction

In chapter two, the study identified that there are pertinent indicators signifying the need for social infrastructure investment in the United Kingdom (UK). It also established that Public-Private Partnerships (PPP) is a credible mechanism to provide 'more and better' social infrastructure in the UK. Still, more recently, UK PPP has undergone profound transformations as the UK government has reformed this mechanism to stimulate new sources of finance as well as to address many of the inherent inefficiencies within previous partnering frameworks.

Fundamentally grounded in a cross-sectoral partnership, there is now acknowledgement that collaboration must play a central role in improving the project performance of PPP as well as underpinning the sustainability of the partnership. In addition to this, as alternative sources of capital enter the PPP space, there is a need for greater collaboration between these financial institutions and the PPP community to unlock these wider sources of finance. Notwithstanding the importance of collaboration, determined in chapter three, collaborative partnering remains a pertinent knowledge gap.

The purpose of objective three is to critically examine collaboration in the partnership of UK PPP social infrastructure projects. However, despite the prominence of the collaborative concept throughout PPP literature, there is much discord in research as to who should be included in these partnering arrangements, as well as an information void pertaining to a system by which to understand how they are involved. Against this backdrop, in preparation for the PPP stakeholder collaboration investigation to fulfil objective three, the research must determine the PPP social infrastructure stakeholder (SIS) boundary specification. By doing so, this will provide the research with the necessary foundations by which to develop PPP stakeholder collaboration.

To bridge this knowledge gap, this chapter considers *stakeholder theory* as the framework to develop this boundary specification. This constitutes an extensive exploration of stakeholder theory to determine the normative characteristics which define stakeholders in addition to the mechanisms used to understand them. The findings from this consideration will subsequently be applied to the PPP context to identify SIS organisations and assess the dynamics of the partnership across the PPP lifecycle. Having done this, the research will then undertake a critical examination of this PPP SIS boundary specification to determine the

sources of collaboration gaps in preparation for chapter five. This chapter is therefore structured as follows:

- Consideration of the PPP partnership boundary specification;
- The identification of PPP SIS;
- An assessment of the partnership boundary specification; and
- A critical examination of the partnership boundary specification.

4.2. Public-Private Partnerships Partnership Boundary Specification

Carrol and Buchholtz (2006) explained that during any undertaking, a project will associate itself with a number of organisations, which will in-turn present these parties with claims, rights and expectations. Being intrinsic to any project, both success and failure are often contingent upon stakeholder contributions, therefore the capture of stakeholder input should form a critical component of any project development (El-Gohary et al., 2006). Huxham and Vangen (2005) agreed, explaining, collaborations are complex structures. This complexity is often the source of ambiguity and confusion which historically has served to undermine the collaborative dynamics. In this regard, a fundamental cornerstone of collaboration is the determination of a 'boundary specification'. A boundary specification is the process of determining *who* should be included in the collaboration and understanding *how* they are involved. Still, in-spite of the salience of a boundary specification, within PPP literature there has been much discord over who is considered as a PPP social infrastructure stakeholder (SIS).

In 2003, Newcombe reported that the structure and nature of the construction industry had undergone significant changes over the last 50 years with normative approaches of that time being no longer reflective of stakeholder arrangements. He contended that the organisation or the project, rather than being a single entity has instead transformed to a pluralism of multiple stakeholders with shifting and often conflicting goals. Consequentially, there is now a realisation of the importance of deploying a wider, holistic approach to SIS inclusion. Chinyio and Akintoye (2008) deemed this transition to a more modern inclusive mind-set to have emerged out of the introduction of complex forms of construction procurement; particularly that of PPP.

In PPP literature, the discussion of who are the SIS worthy of inclusion remains topical. Subscribing to Newcombe's standpoint of multiple stakeholders, PPP SIS generically can be termed as either public or private derivatives; however, according to Henjewe et al. (2013),

a narrow approach has conventionally been undertaken for PPP SIS identification. In view of this, this has transpired in little agreement on SIS, which has been expressed through many; both in academia and industry, propagating cases for wider stakeholder inclusion.

In the past, PPP SIS have been determined by their involvement in the project. Foo et al. (2011) were of the opinion that logically the decision-makers directly involved in the delivery of the infrastructure are the key stakeholders, i.e. those appointed with roles and responsibilities. Following this line of thinking, many have embarked upon investigations pertaining to the public-sector Authority and the private-sector Project Company (ProjCo) and its constituent members (Chinyere, 2013; Zou et al., 2013). Henjeweale et al. (2013) remarked that the strength of this partnership between these actors is fundamental to the project success and felt that the arrangements between these organisations was the lynchpin of Value for Money (VfM). Agreeing, others have sought to improve the sustainability of these working arrangements (Grubnic and Hodges, 2003; Smyth and Edkins, 2007; Zou et al., 2013).

Whereas many consider the Authority as the key public-sector SIS, Patel and Robinson (2010) believed consideration ought to be lent to other government bodies such as local councils, as well as social and educational institutions. Roehrich and Caldwell (2012) and Henjeweale et al. (2012) both testified to this inclusion of other governmental departments, although differently they maintained approving authorities within the government hold significant influence and should be considered SIS. In addition to this, Shaoul (2005) reported that government bodies outside the bureaucratic chain including staff of the facility and trade unions, despite being critical to the project success, have historically been overlooked, and their voices unheard. In a similar manner, others claimed that private-sector consultants who are appointed to address complex matters including legal, financial and other specialist roles should be included (Grimsey and Lewis, 2005; Consoli, 2006). Alternatively, some have considered wider private-sector inclusion of the supply-chain encompassing suppliers and subcontractors as SIS (NAO, 2007; Tan, 2007). Differently again, more recently, it has been claimed that the public-sector Authority failed to effectively represent the sentiments of society; therefore, it has been argued that further SIS inclusion should be extended to the public. Many agreed with Henjeweale et al. (2013) who termed the public as the 'principal stakeholder' constituted from community members, customers, environmentalists, the media and other third parties (Foo et al., 2011; Chen et al., 2013; Chan and Cheung, 2014). El-Gohary et al. (2006), Henjeweale et al. (2013) and Rwelamila et al. (2014), though recognising ProjCo and the Authority as the key stakeholders, suggested, failure to include

wider society has generated scepticism of PPP projects. In line with this, Rwelamila et al. (2014) believed the public has been marginalised premised on the assumption PPP is too complex to be effectively understood.

Table 4.1: Proposed SIS in Literature

Stakeholder	Author(s)
Advisors and Consultants	Grimsey and Lewis (2005); Tan (2007)
Community members	El-Gohary et al. (2006); Patel and Robinson (2010); Foo et al. (2011)
Customer / user	El-Gohary et al. (2006); Foo et al. (2011); UNESCAP (2011); Chen et al. (2013); Chan and Cheung (2014)
Employees	Patel and Robinson (2010); Foo et al. (2011); Chan and Cheung (2014)
Environmentalists	El-Gohary et al. (2006)
Public	Chen et al. (2013); Henjeweale et al. (2013); Ng et al. (2013); Rwelamila et al. (2014)
Insurers	Grimsey and Lewis (2005); Tan (2007)
Local councils	Patel and Robinson (2010)
Media representatives	El-Gohary et al. (2006)
Other governmental bodies	Shaoul (2005); Tan (2007); Patel and Robinson (2010); Roehrich and Caldwell (2012)
Other third parties	Tan (2007); UNESCAP (2011)
Politicians	Shaoul et al. (2013)
Public-sector Authority	RICS (1998); Grimsey and Lewis (2005); El-Gohary et al. (2006); Smyth and Edkins (2007); Tan (2007); NAO (2007); Patel and Robinson (2010); Blanken and Dewulf (2010); UNESCAP (2011); Foo et al. (2011); Chinyere (2013); Zou et al. (2013); Chen et al. (2013); Chinyere and Xu (2013); Henjeweale et al. (2013); Ng et al. (2013); Waring et al. (2013); Chan and Cheung (2014); DeSchepper et al. (2014); Rwelamila et al. (2014); Burke and Demirag (2017)
Ratings agencies	Grimsey and Lewis (2005)
Social institutions	El-Gohary et al. (2006); Patel and Robinson (2010)
Project Company and its constituent members; Debt Funders Construction Contractors Equity Shareholders Service Providers	RICS (1998); Grimsey and Lewis (2005); El-Gohary et al. (2006); Smyth and Edkins (2007); Tan (2007); NAO (2007); Patel and Robinson (2010); Blanken and Dewulf (2010); UNESCAP (2011); Foo et al. (2011); Chinyere (2013); Zou et al. (2013); Chen et al. (2013); Chinyere and Xu (2013); Henjeweale et al. (2013); Ng et al. (2013); Waring et al. (2013); Chan and Cheung (2014); DeSchepper et al. (2014); Rwelamila et al. (2014); Burke and Demirag (2017)
Sub-contractors	Hickman (2000); NAO (2007); Tan (2007)
Suppliers	Hickman (2000); NAO (2007); Tan (2007)

Against this backdrop, there is evidently much disparity over PPP SIS inclusion. Listed in table 4.1, literature suggests 21 organisations. To reconcile this disparity, the research will turn to *stakeholder theory* to determine a theoretically robust PPP SIS boundary specification. Stakeholder theory has been used in similar research and it has grown in popularity as a lens by which to examine business relationships as well as partnering in PPP (see Newcombe, 2003; Henjeweale et al., 2013; DeSchepper et al., 2013; McErlane et al., 2016; Burke and

Demirag, 2017). Premised on this popularity, the research will now consider stakeholder theory.

4.2.1. Stakeholder Theory

The emergence of stakeholders in literature can be recorded back to Stanford Research Institute in 1963, appearing in an international memorandum; however, Freeman (1984) is often credited with the origination of stakeholder theory into the management domain with his seminal publication “Strategic Management: A Stakeholder Approach” (Donaldson and Preston, 1995). According to Moloney (2006) and Freeman (1984), stakeholder theory evolved out of corporate social responsibility (CSR), organisation theory, systems theory and corporate planning, giving consideration to ethical, social and economic concerns. Stakeholder theory is separate from other theories insofar as it considers morals and values central to the management of an organisation (Phillips et al., 2003). Freeman (1984) claimed stakeholder theory fundamentally is centred on “the principle of who or what really counts”, offering approaches for organisational management to consider the interests of other parties.

The introduction of ‘stakeholding’ was predominantly created to differentiate and understand business organisations as opposed to the traditional shareholder view. Freeman observed that practices at that time were unequipped to deal with the acute changes going on in the business environment; particularly with those externally associated with the firm, i.e. beyond shareholders. Freeman (1984) conversely felt managers should “take into account all those groups and individuals that can affect, or are affected by, the accomplishment of the business enterprise”. Accordingly, stakeholder theory attempts to categorise stakeholders, understand them and their interests, and forecast their behaviour (Freeman, 1984).

The popularity and realisation of the importance of stakeholders has been steadily growing; particularly in the UK. Over the last decade, the UK has been the largest national academic producer of stakeholder related literature accounting for almost a quarter (22%) with construction being the sector of primary attention (Littau et al., 2010). A potential justification for rise in popularity may be due to the practical value in understanding stakeholders (Choi and Wang, 2009; Henjewe et al., 2013; DeSchepper et al., 2014; Tantalo and Priem, 2014). Further reasoning may potentially be attributed to stakeholder theory’s ability to be merged with other fields and theories. Originating in strategic management, stakeholder theory has developed and grown, and now is instrumental in various fields

including organisation theory (Rowley, 1997) and business ethics (Starik, 1995). Other examples include that of Mitchell et al. (1997) who combined stakeholder theory with agency, resource dependence and cost transaction theories while others have merged stakeholder theory into 'theory of the firm' (Bouckaert and Vandenhove, 1998) and principal agency theory (Van Puyvelde et al., 2012). Carrol (1989) incorporated stakeholder theory into organising business and society topics, while Hill and Jones (1992) blended 'stakeholding' with corporate social performance (CSP). Resultantly, stakeholder theory extends beyond business and society fields and has been exported into other industries including Information Technology (IT), facilities and utilities, process industries, manufacturing, agriculture, construction (Littau, 2010), sport and recreation (Mason and Slack, 1997) and urban affairs (Friedman and Mason, 2004).

Despite stakeholder theory's growing enthusiasm, some have been critical of the approach, premised on what Phillips et al. (2003) termed; 'critical distortions and friendly misinterpretations'. Jensen (2000) claimed stakeholder theory is actually an excuse for managerial opportunism, asserting that the theory lacks a specific objective function for the firm. Others argued that it acts as a barrier to entrepreneurial risk and complicates corporate governance (Sundaram and Inkpen, 2004). Possibly the most significant criticism surrounds whether stakeholder theory is a theory in its own right. Jones (1995) reported stakeholder theory lacked empirical validation. This argument was reiterated over a decade later by Laplume et al. (2008). In line with this, Koschmann (2007) deemed that the theory contains little theoretical development in and of itself, but rather most growth has been derived from other theories. Rowley (1997) argued that stakeholder theory is in-fact a handmaiden theory i.e. one that is used to support the development of other theories, rather than one becoming the subject of its own development.

In response to these criticisms and to nullify these objections, Freeman collaborated with Phillips and Wicks (Phillips et al., 2003) to directly respond to these criticisms. Phillips et al. (2003) deduced and concluded that these proposed faults were resultant of two widely deployed critical approaches i.e. the straw persons and the evil genie arguments, which are criticisms apparent in all theoretical approaches. Moreover, Freeman (1984) in his earlier work, although acknowledging the importance of empirical development, promoted 'conceptual rigor' as an adequate means of negating a lack of empirical research.

In their concluding remarks, Laplume et al. (2008) found empirical stakeholder theory literature to have 'plateaued' in recent years. Freeman et al. (2010) promoted the idea of

further investigation into stakeholder interaction, stakeholder relationships over time and stakeholder metrics development (Cooper, 2014). Nevertheless, despite these calls for further research, stakeholder theory's ubiquitous arrival into multiple disciplines may indicate its proclivity for moral and ethical organisational management.

4.2.1.1. Defining Stakeholders

Although now commonly used, the term 'stakeholder' remains a word which is not properly understood nor completely agreed upon (Friedman and Miles, 2006). Within stakeholder literature, Weiss (2006) asserts a 'stake' is a share or an interest in an enterprise and therefore a stakeholder can be inferred to be an individual with a 'stake'. According to Littau et al. (2010), principally there are two typologies of stakeholder definitions delineated throughout stakeholder related literature. The first is those 'who have a stake' represented by one of the most commonly accepted definitions of a stakeholder by Freeman (1984); "a stakeholder in an organisation is (by definition) any group or individual who can affect or is affected by the achievement of the organisation's objectives". His description of stakeholders is one of the most widely deployed and accepted definitions appearing in management, business, organisational, network, communication and environmental science literature. The second typology pertains to those 'who have a vested interest' denoted by Cleland (1985). Although Littau et al. (2010) acknowledges there are other definitions, they are deemed to be either minor or mixed nuances of these two primary pillars of classification.

The deployment of simplified themes i.e. those which can affect or be affected, ostensibly facilitates the extensive inclusion of a wider network of stakeholders, for example, employees, suppliers, financiers, environmentalists, communities, customers, competitors, consumer advice groups and so on (Freeman, 1984). However, the inclusion of multiple stakeholder groups has resulted in some considering this approach too broad to be effectively helpful in defining stakeholders (Mitchell et al., 1997). Intended to be all-inclusive, these broad and simplified approaches are premised upon the assumption that these groupings will undergo further break-down (Freeman, 1984); however, some have suggested this tactic runs the risk of greater imprecision (Henjeweale et al., 2013). By contrast, a narrow approach may be undertaken to identify stakeholders. A narrower approach is predicated on the idea that pragmatically all claims cannot be managed and hence must be prioritised. This approach determines stakeholders by those who have a vested stake, offering higher

accuracy and precision but potentially excluding important stakeholders (Clarkson, 1995; Mitchell et al., 1997).

In addition to broad and narrow approaches, other academics have endeavoured to define stakeholders through classification into differing typologies. De Kluyver and Pearce (2006) organised stakeholders into internal and externals depending on their role in achieving the mission statement and the values which they carry with them. Rawlins (2006) presented stakeholders as functional, normative, diffused or enabling, while Newcombe (2003) reported that conventionally stakeholders have been classified as primary or secondary. Primary stakeholders are the integral actors and are directly involved in the survival of the organisation; conversely, all others outside this relationship are termed as secondary and can either influence or be influenced by the organisation (Clarkson, 1995).

Literature has equally considered the role of attributes in defining and determining stakeholders. Before discussing these attributes, it is pertinent to note that stakeholders are not static, but rather, they are dynamic (Freeman, 1984), meaning that their stand-point or position can shift over time. This point is relevant when coupled with Savage et al. (1991) who believed that to identify stakeholders, they must have an interest in the actions of a firm and can influence the firm. Accordingly, several theoretical models have been proposed to determine stakeholders and their salience across the life of a project (see Mitchell et al., 1997; Frooman, 1999). Within these models, the construct of legitimacy is central; however, its exactitude and importance are inconsistent. Frooman (1999) questioned the significance of legitimacy comparative to other influencer's ability to affect the direction of the firm. Nevertheless, although misaligned, legitimacy remains prevalent in relatively recent construction stakeholder literature (Chinyio and Olomolaiye, 2010; DeSchepper et al., 2014). Chinyio and Olomolaiye (2010) defined legitimacy as the validity a stakeholder has on the claim to a stake. Differently, older research proffered more extensive descriptions. Suchman's (1995) terming of legitimacy as "a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" is popularly cited (Mitchell et al., 1997; DeSchepper et al., 2014; McErlane et al., 2016).

Disagreeing with the foregoing, Freeman (1984) was of the opinion that anyone with a stake who can affect the organisation should be regarded as being legitimate, and subsequently, is deserved of attention regardless of the nature of their claims. Equally, Donaldson and Preston (1995) were of the opinion legitimacy seeks to differentiate between those who can

influence, and those who have a moral claim, and indeed, Mitchell et al. (1997) concurred. In their offering, Mitchell et al. (1997) noted the centrality legitimacy should play in preventing influencers exerting power over legitimate claims. Differently, Phillips (2003) argued, that by possessing influence regardless of a moral claim, these parties, in line with the very notion of stakeholding, cannot be excluded. Rather than discount these actors, he proposed a nomenclature of stakeholders consisting normative, derivative and non-stakeholders. Normative stakeholders 'are those whom the organisation has a moral obligation', derivative 'are those whose actions and claims must be accounted for by managers due to their potential effects upon the organisation and its normative stakeholders', and non-stakeholders are those who possess neither influence nor a moral claim and can be excluded. Yet, just as this approach accounts for those with influence and those with claims, Phillips (2003) noted it may be difficult to distinguish between normative and derivative stakeholders.

4.2.1.2. Understanding Stakeholder Involvement

Just as stakeholder theory has produced many approaches to identifying stakeholders, it has also been an influential approach to understanding their involvement. As well as Freeman, others have profoundly added to the stakeholder theory stock of knowledge; in particular, work of that by Donaldson and Preston (1995). Donaldson and Preston's (1995) major contribution demonstrated that stakeholder theory is principally divided into three theoretical taxonomies:

- a. Descriptive - describes and explains the behaviour and characteristics of the corporation, their nature, how they are managed, make decisions and operate, as well as its perspective to stakeholders.
- b. Instrumental - seeks to verify the linkage between organisations which are more responsive to stakeholders and the achievement of corporate objectives such as profitability and growth.
- c. Normative - describes the role of the organisation, and the identification of moral guidelines for operation and management of corporations.

In addition to Donaldson and Preston, Mitchell et al. (1997) are often cited for their seminal contribution to stakeholder theory. Their paper sought to identify stakeholders and to determine their transitional salience. The authors suggest that stakeholding methods were too broad at the time and thus a framework was needed to determine who stakeholders are, and to what degree they should be afforded attention. Based on the possession of three

attributes: power; the coercive, utilitarian or normative ability a party has to impose its will on a relationship; urgency; the extent of the claim calling for immediate attention; and, legitimacy (see before), stakeholder's can be identified, and the strength of their involvement defined. Emerging from this influential contribution, a number of papers have empirically reaffirmed Mitchell et al.'s (1997) findings. Parent and Deephouse (2007) ranked power to be the most prevalent attribute, trailed by urgency and legitimacy respectively. Driscoll and Starik (2004) questioned the parameters and sustainability of their findings, instead proposing for the further inclusion of 'proximity'.

In contrast, Frooman (1999) considered the role of resources to determine the nature of influence strategies. Applying resource dependency theory, in his research, he suggested four types of influence strategies can be identified to explain transitional stakeholder involvement: direct withholding; direct usage; indirect withholding; or indirect usage. Building on this earlier proffering, Frooman and Murrell (2005) further considered the influence of structural and demographic determinants. Despite these contentions, the salience framework offered by Mitchell et al. (1997) continues to be the prevailing appraisal model adopted in stakeholder assessment frameworks (Yang et al., 2011; DeSchepper et al., 2014; Yang and Shen, 2014)

At this juncture, the research has considered the prevalent rudiments of stakeholder theory. It has identified that stakeholder theory has tendered several approaches to stakeholder identification. Although approaches remain somewhat disputed, the construct of *legitimacy* is commonly central to these frameworks. This research therefore also adopts legitimacy as a central construct to identify PPP SIS. Moreover, inherent to the stakeholder concept, this investigation has established there have been several approaches by which to understand stakeholder involvement. Despite these nuanced strategies, the *power/urgency* nexus proposed by Mitchell et al. (1997) remains the prevalent approached in stakeholder and construction literature (Newcombe, 2003; Chinyio and Akintoye, 2008; DeSchepper et al., 2014; Yang et al., 2014; Yang and Shen, 2014). This research therefore will also utilise these attributes to delineate PPP SIS involvement. The research will now apply these findings to the context of PPP to determine the PPP SIS boundary specification.

4.3. Identifying Public-Private Partnerships Social Infrastructure Stakeholders

Identified in chapter three, PPP is unique from other infrastructure provision mechanisms insofar as it is a transactional relationship situated between privatisation and traditional procurement, and hence displays both public and private characteristics (Grimsey and Lewis,

2005; Zou et al., 2013). As a result, structurally, these schemes and the stakeholders involved differ from in other procurement models. While stakeholder theory is effective at identifying stakeholders in the traditional confines of infrastructure provision, to contextualise stakeholder theory to PPP, the fundamentals of this concept must be recalibrated. In stakeholder theory, its descriptive stance dictates the 'firm', i.e. the client, is the central organisation and thus their perception of others determines the involvement and management of these bodies. However, defined as an arrangement for the collaborative provision of a public service between the public and private-sectors, organisations inherent to each sector share roles, responsibilities and financing which in turn, blurs the conventional position of the client as the focal organisation and instead indicates the appointment of at least two or more focal partners (DeSchepper et al., 2014).

With this in mind, returning to Phillips' (2003) notion of legitimacy, DeSchepper et al. (2014) adopted the contractual relationship and relationships of the perception of norms, values and beliefs as the determinant values in distinguishing normative and derivative PPP stakeholders. This research, similarly utilising Phillips' (2003) taxonomy, conversely argues that relationships of norms, values and beliefs are subjective on the assertion these perceptions will differ predicated on the sectoral position. The private-sector, traditionally motivated by returns and profit holds markedly different perceptions to that possessed by the public-sector who characteristically pursue improved social well-being (Grimsey and Lewis, 2005). As a result, the only tangible measure can be the project contract and an organisations relationship with it defined in figure 3.2.

Premised on this understanding of stakeholder theory; and in particular, the construct of legitimacy, as per McErlane et al. (2016) this research identifies PPP normative SIS as the Authority and ProjCo, and its constituent members¹³. By contrast, all other organisations can be defined as derivative. Having classified these stakeholders, to identify the key SIS, it is noteworthy to consider Donaldson and Prestons' (1995) proffering, namely, stakeholder theory is fundamentally normative at its core. It is therefore reasoned the *key* SIS to be considered for the development of PPP stakeholder collaboration are the Authority and ProjCo, and its constituent members. Contrastingly, it is suggested a stakeholder

¹³ ProjCo in and of itself is only a shell entity, thus it will enter into direct contracts with other organisations to undertake and fulfil duties regarding the supply and delivery of the facility. Being directly contracted with ProjCo, these organisations are the 'constituent members'.

management approach may be more appropriate for derivate stakeholders. Table 4.2 displays this classification. The research will now consider these SIS.

Table 4.2: PPP SIS Taxonomy

	Public-Sector	Private-Sector
Normative	Public-sector Authority	Project Company and its constituent members: Construction Contractors Service Providers Equity Shareholders Debt Funders
Derivative	Community members	Advisors and consultants
	Customer / user	Insurers
	Environmentalists	Ratings agencies
	Public	Sub-contractors
	Media representatives	Suppliers
	Other governmental bodies	
	Other local councils	
	Other third parties	
	Owners	
	Social institutions	

4.3.1. Public-sector Authority

In PPP, the Authority is the public-sector organisation directly involved in the delivery of the infrastructure asset. It is traditionally driven by VfM, cost savings, improved services provision, and social and public benefits¹⁴ (Zou et al., 2013). Through defining objectives and outcomes, the Authority can ensure the requirements of the project are achieved and thus safeguard the interests of the wider public. The Authority will, as Grimsey and Lewis (2005) describes, ‘wear many ‘hats’ meaning they will fulfil several roles, including: defining the business case, determining output and performance requirements, planning and executing the procurement process, govern the contract, liaise with the community and co-operate with ProjCo to overcome changes in the project. Notably, despite being directly involved in the project delivery, the Authority is ultimately accountable to central governmental departments and, by extension, parliament (Shaoul et al., 2013).

4.3.2. Private-Sector Special Purpose Vehicle and its Constituent Members

In contrast, the private-sector provider is a consortium of organisations which collectively operate through the SPV which in this research is termed as ProjCo. This is a commercial entity formed specifically by the private cohort for the purpose of undertaking the project.

¹⁴ It is also noteworthy, in a change from the traditional transaction structure of PFI, PF2s initial operation in the PSBP will see the central government acts as the Authority, the EFA.

ProjCo is responsible for producing, funding and delivering the infrastructure asset (Grimsey and Lewis, 2005). ProjCo negotiates and enters into a contractual agreement for the financing, designing, building, management and operating of the facility with the Authority. It thereafter discharges roles and responsibility to constituent members who enter separate contracts between themselves and ProjCo. In doing so, this allows ProjCo to bundle together solutions and specific skillsets needed across differing phases of the project (Roehrich and Caldwell, 2012). Moreover, this facilitates the achievement of economies of scale, innovation and risk sharing among other benefits. This consortium is traditionally commercially driven, seeks profitability and increased revenue (Zou et al., 2013). Typically, it is comprised of financiers and infrastructure delivery organisations:

- Debt Funders are commonly sourced from financing institutions such as banks, infrastructure funds or institutional investors (Della Croce et al., 2015). Their interests are centred on consistent returns.
- Equity Shareholders may comprise two forms of investors. Typically, ProjCo members, for legal and accounting purposes appointed with the responsibilities for the development and operation of the facility will invest as equity sponsors and pool resources and share risks (Tan, 2007). Generally, sponsors hold a smaller share of the equity in comparison to other third-party equity investors who may also directly invest into the project¹⁵. Equity capital can be sourced from investment trusts, insurance companies, pension funds, trade union funds, Real Estate Investment Trusts (REIT) or wealthy individuals who own a portfolio of assets (Tan, 2007)¹⁶. Post construction, it is not uncommon for Equity Sponsors and Debt Funders to sell off shares to a secondary market or refinance their investments at lower interest rates following the reduction in risk (Demirag et al., 2015).
- Construction Contractors (BuildCo) work to an output specification and are granted the freedom to design innovative solutions. Typically, their roles and responsibilities include collaborating with the Authority and other ProjCo members to design and construct the facility (Grimsey and Lewis, 2005). BuildCo usually has short term

¹⁵ In some instances, the public-sector may also contribute an equity share. This can be a commitment display as well as a result of the ability to acquire land, or in an effort hasten the regulatory bottleneck (Tan, 2007). This may also be in an effort to increase day-to-day control as well as to grant access to accounts. It should be noted this may be viewed unfavourably by the private-sector and discourage bidding (World Bank et al., 2016). Private Finance 2 (PF2) will now also see the inclusion of a central public-sector equity stakeholder positioned directly within ProjCo and on ProjCo's Board of Directors (HM Treasury, 2012).

¹⁶ More on these financial SIS organisations is discussed in section 2.4 of chapter two.

objectives, seeking to maximise profits and the flexibility to move onto other projects post construction (Demirag et al., 2015).

- Service Provider (FMCo) roles incorporate inputting into the design and liaising with BuildCo, collaborating with the Authority, and ultimately being entrusted with the responsibility of the management, operations and provision of the infrastructure service in the operations phase. FMCo can be comprised of hard and soft FM organisations as well as other operational services providers such as IT (Hardcastle and Boothroyd, 2003). It should be noted that with the introduction of PF2, soft FM services are now optionable.

Having identified the key SIS as the public-sector Authority and the private-sector ProjCo and its constituent members, the research will now examine the partnership through the application of the power/urgency dyad as proposed by Mitchell et al. (1997).

Within PPP literature, it is widely agreed, SIS dynamics are transient. Applying power and urgency to the PPP project lifecycle that was delineated in chapter three, figures 4.1 has been constructed to depict the transitional boundary specification in a PPP project. Transcending the initiation, procurement, and commissioning phases, the partnership is identified as shifting predominantly in the tendering process as the private-sector enters the project, at financial close as the agreement is formalised, in the construction as BuildCo develops the facility, and in the operations and maintenance as FMCo provides the service.

Inherent to the PPP lifecycle, two levels of the partnerships have been determined. This is the inter-sectoral macro partnership which constitutes the nexus between the Authority and ProjCo. This is represented by the arrowed line. In addition to this, micro inter-sectoral partnerships were identified in literature. These secondary relationships are between ProjCo members, their relationship to the SPV, and between ProjCo members and the Authority. This is signified by a single line.

The research will now assess the SIS boundary specification using the attributes of power and urgency to understand how the dynamics of these partnerships transform across the PPP lifecycle predicated on the findings from literature.

4.4. Assessing the Partnership Boundary Specification

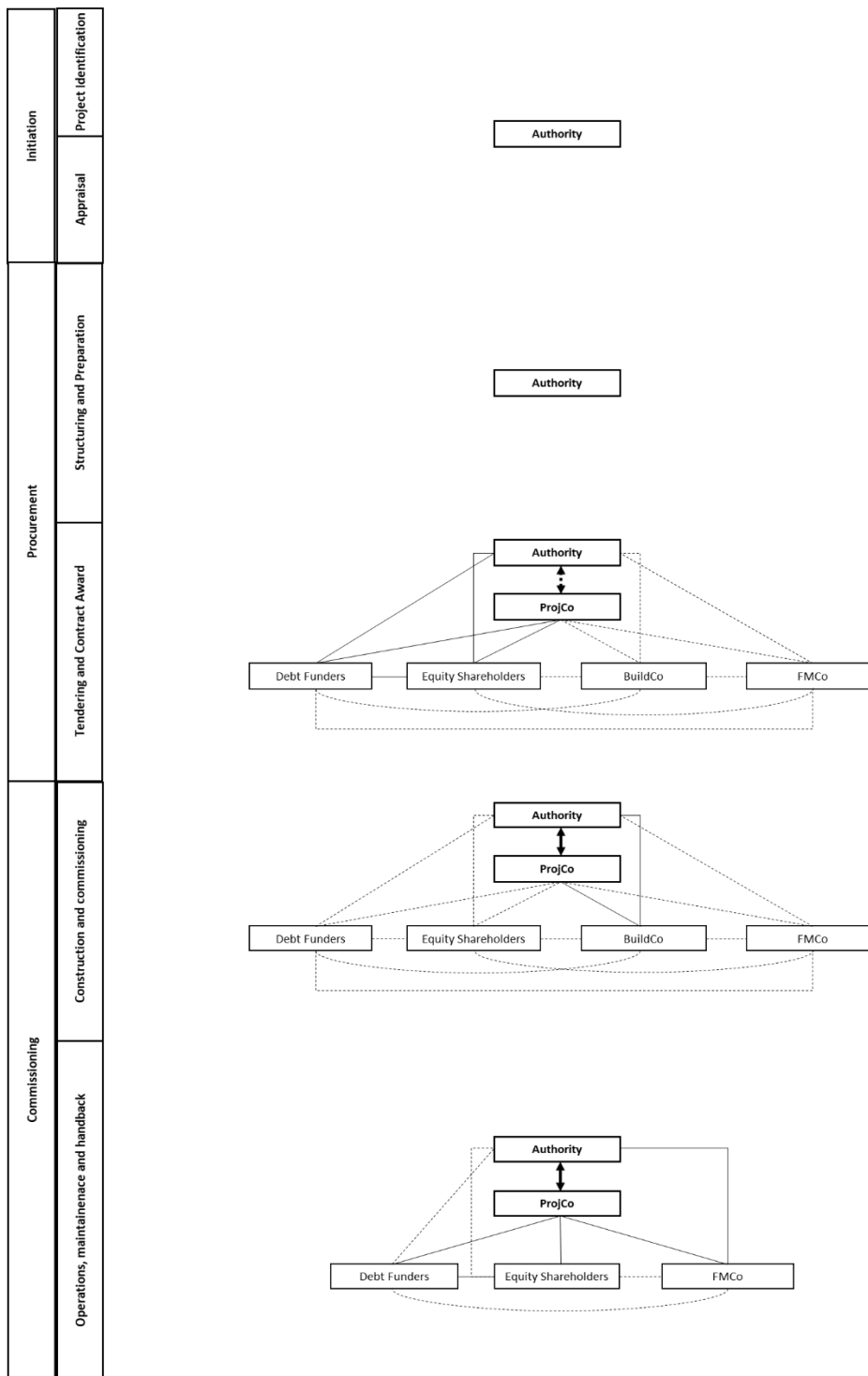


Figure 4.1: PPP Boundary Specification

4.4.1. Inter-sectoral Partnership

The macro partnership is the nexus between the public and private-sectors and constitutes the public-private Project Agreement (PA) between the focal SIS, i.e. the Authority and ProjCo. This is an on-going partnership that will span the duration of the project, though

literature signposts the principal dynamic shift in this relationship occurs at financial close as partners become formally contractually bound (Chinyere and Xu, 2013). Pre-financial close, the nature of the environment is commercially charged as the Authority seeks to encourage competition to maximise VfM (Barlow and Köberle-Gaiser, 2008). This is represented through the broken arrowed line.

Prior to financial close, the Authority is responsible for undertaking tasks in the initiation phase including: defining the required service, appraising of project viability and evaluating alternatives, producing a business case, and commencing the project development¹⁷ (Grimsey and Lewis, 2007). SPV teams compete for the project, with a preferred bidder being selected to enter into contract negotiations (Barlow and Köberle-Gaiser, 2008). Leading up to financial close in the tendering stage, as the urgency of ProjCo increases, the nature of the PPP environment is tentative, with little security of project progression. However, as both partners approach contractual agreement, the platforms of the purchaser/provider together with the dynamics transition (Barlow and Köberle-Gaiser, 2008). Power and urgency is shared equally between these focal organisations. Previously, both partners are separate entities, nevertheless, by formalising the agreement through signing the PA, both SIS agree to enter into a partnership for the collective delivery and management of the project with funding supplied by the private-sector. From this point, the construction of sustainable partnership becomes critical as these SIS are now co-dependent on each to fulfil their contractual obligations and therein secure the delivery the project. This is indicated through the solidifying of the broken arrowed line.

4.4.2. Intra-sectoral Partnership

While the macro level partnership is relatively straightforward, comparatively, the organisational partnerships are much more intricate and complex. Under threat of potentially incurring monetary penalties for poor asset provision, the nature of the internal ProjCo relationships are performance orientated. Pursuing economic advantage, consequently, all SIS actions affect all other ProjCo SIS. Though there is continual interaction between all organisations across all stages of the project, to understand the shifting dynamics it is pertinent to contextualise these dynamics through the findings of Roehrich and Caldwell (2012) who identified that ProjCo will unbundle roles and responsibilities contingent upon the project phase. By virtue of this unbundling of tasks, the power and urgency dynamics will transition, therein determining SIS involvement not only inherent to

¹⁷ See section 3.5.1 in chapter three.

ProjCo, but also corresponding to the Authority as these SIS become the outward looking 'face' of the SPV.

In the procurement phase, though BuildCo and FMCo are involved, literature indicates they are lesser roles compared to the front-ended financier involvement (Zheng et al., 2008). Comprised of Debt Funders and Equity Shareholders, literature points to the Debt Funders being distinctly instrumental in the procurement phase. This heavy early involvement can be explained by the high levels of uncertainty and risks in the procurement phase prior to financial close (Chinyere and Xu, 2013). This is pertinent when coupled with Demirag et al. (2015) who claimed that conventionally Debt Funders are risk averse; seeking to balance risk/reward profiles. Chinyere and Xu (2013) asserted financial SIS; both Debt Funders and Equity Shareholders, in the earlier phases are instrumental in undertaking strong supervisory roles comprising organising ProjCo, negotiating arrangements with the Authority, and identifying and appointing partnering SIS. On these grounds, allied with the knowledge that these SIS are committing to the largest resource outlay in capital terms, the financial stakeholders; in particular the Debt Funders, are deemed to possess high levels of both power and urgency. This dimension is reflected through the solid line between the financiers, ProjCo, and the Authority in figure 4.1. The lesser constituent roles of the SPV, i.e. BuildCo and FMCo are represented through the broken lines on the grounds that these SIS are not yet directly involved in the provision and delivery of the service and therefore possess lower levels of urgency.

Following financial close, the dynamics of the partnership shift as the project enters construction. Having secured the project, financier interests lessens as progression uncertainty is reduced; though there are still high levels of risk during the construction phase. These can be managed through fixed price contracts (Demirag et al., 2015; Burke and Demirag, 2017). It is also noteworthy, when a risk of delay is presented, the interests of financiers can shift which will be manifested through the exertion of pressure onto BuildCo; this is also the case during operations. In this regard, literature suggests it is the financial SIS who hold the highest levels of power in the partnership (Zheng et al., 2008).

Different to the procurement phase, BuildCo are now directly involved and possess higher levels of urgency. BuildCo are typically responsible for the construction and commissioning of the asset and are now directly cooperating with the Authority and ProjCo to construct the asset on time and within budget (Roehrich and Caldwell, 2012). During construction, again similar to the procurement phase, FMCo may have input into the design although they have

no direct involvement in the construction of the asset. These dimensions are reflected in figure 4.1. The solid lines between BuildCo, the Authority and ProjCo indicate these dynamics in the construction phase. Also, the broken line between financial SIS and ProjCo and the Authority represents less involvement on the part of these organisations.

Having completed its remit of designing and building the facility, the project will progress to the operations and maintenance phase. FMCo interests increase and therefore so does its position as the outward facing SIS responsible for the performance of the service and asset provision. This is portrayed by the changing dynamics between FMCo, ProjCo and the Authority (Roehrich and Caldwell, 2012). Following construction, the profile for risk is dramatically reduced. There is resultantly less requirement for direct financial involvement, and thus, interest on the part of the financial SIS again wanes. However, with the aforementioned caveat concerning returns. It is also common for Debt Funders and Equity Shareholders to refinance their investment or sell off their shares to a secondary market (Demirag et al., 2015). With a permeable boundary specification, it is common for bond shareholders such as pension or insurance funds to enter a project, replacing primary financiers. Identified in chapter two, these SIS are typically risk averse, preferring not to invest until the asset is operational (brownfield) thereby avoiding construction risks (Buchanan et al., 2014). Equity shares are also often sold by BuildCo sponsors to other SIS or to less active third-party equity investors as they seek to recycle funds in an effort to grant them the freedom to move onto other projects (Demirag et al., 2015). Reduced risk, little involvement, re-financing as well as the entering of secondary market SIS, direct interests in the provision of the asset of financiers remain low and as such this is represented through the staggered line with the Authority. However, the relationships and interests within this SIS group are changing. This dynamic is represented through the solid line between Debt Funders, Equity Shareholders and ProjCo. Furthermore, by selling off their equity investments and moving onto other projects, BuildCo have been removed from the diagram¹⁸.

At this juncture, the research has defined the PPP boundary specification. It has identified the *key* SIS and determined how they are involved across the PPP project lifecycle. The

¹⁸ It should be noted, usually the PA is wrapped by a deed which requires BuildCo to remain involved for a twelve-year period after asset mobilisation to address latent defects. This has not been included in the diagram as this is not always the case, and it is also similar to a 'bolt-on' to the main contract.

research will now critically examine this PPP boundary specification to identify the inherent sources of poor PPP SIS collaboration.

4.5. Critical Examination of the Partnership Boundary Specification

Noted in chapter three, PPP by its very nature is a complex investment framework. Deriving out of this complexity, many have suggested there has been an innate failure to cultivate a collective environment which has been manifested through a plethora of inherent barriers to collaboration. Moreover, the high specificity of infrastructure provision and PPP more specifically has meant it is difficult to learn lessons from these transactions and develop best-practice collaborative frameworks (Pretorius et al. 2008).

One of the fundamental challenges of PPP is that it conjoins diverse organisations. These organisations have disparate project objectives, skills and resources. Equally, SIS remits significantly vary within the confines of the project. Stemming from this; in the absence of collaboration, SIS have pursued their own project objectives which has transpired in autonomous behaviour (Zou et al., 2013; O Nolan and Reeves, 2017). This autonomous behaviour has been replete through all phases of the PPP project life and thereby affects all aspects of the partnership.

When acting autonomously, the construct of power, and its authoritarian ownership has been a mechanism to enforce and fulfil heterogeneous SIS objectives. Lonsdale (2005), evaluating PPP from a resource theory and transaction cost economics approach, reported power asymmetry, often has derived from resources imbalances. This has detracted particularly from the macro inter-sectoral partnership. Literature suggests that ultimately it is Debt Funders who hold the greatest levels of power premised on their capital contributions. This disproportionate distribution has undermined the equal partnering ethos of PPP as one partner's platform becomes more authoritative. This asymmetrical imbalance has been particularly apparent during early years of PFI where these arrangements were often referred to as 'the only show in town' and were utilised as a mechanism to circumnavigate governmental capital constraints (Hare, 2013).

In addition to capital imbalances, research identifies a skills imbalance between the public and private-sectors as a source of poor collaboration. The complexity of PPP means that stakeholder organisations require a portfolio of infrastructure provision skills. However, literature suggests that the public-sector has not possessed this expertise in-house. To mitigate against these shortfalls, the Authority has often had to employ and rely on the

expertise of external consultants and advisors. This is problematic in a number of areas. Firstly, it adds to project costs. Secondly, with their own project objectives, Hall (2015) queried the intentions of these organisations. Moreover, employment of these external consultants has also been a problem on the grounds that the over-reliance on external advisors has obfuscated decision-making as well as accountability (Reynaers and de Graaf, 2014). Driven by VfM, others have suggested the Authority lacks the commercial expertise necessary for PPP.

Allied with in-house skills and resource shortages, DeSchepper et al. (2014) argued that the multiple institutional levels within the public-sector dilutes accountability and fuels opportunism. Others have been critical of the public-sector culture, maintaining that the engagement processes of the Authority were not conducive to PPP collaboration. Being rule bound, risk averse, as well as resistant to change, the public-sector has little experience and understanding of the true essence of collaborative partnering. Instead, the Authority has relied upon the contract to govern stakeholder engagement (Roehrich and Caldwell, 2012). These deficiencies have been compounded by the high staff turnover and the failure to retain knowledge across the project lifecycle and between ventures (Roehrich and Caldwell, 2012).

Aforementioned, a barrier to collaboration has been poor accountability. Akintoye and Kumaraswamy (2016) asserted that there is a pertinent need for greater accountability on all sides of a PPP project. Shaoul et al. (2013) attributed poor PPP accountability to three pillars: the role of private finance; relationships and organisational structures; and, performance measures. On the public-sector side, there have been issues of accountability particularly in the project appraisal stage. It is essential that accountability spans all organisational levels of the decision-making process at the initiation phase (Shaoul et al., 2013). Others have equally argued that the hybrid nature of PPP, which dissects the public and private-sectors, convolutes accountability. Comprising a large network of stakeholder organisations on both the public and private-sector sides, there remains concerns of poor accountability across all aspects of the project provision (Grossi and Thomasson, 2015). Moreover, the utilisation of private financing and private-sector provision, in contrast to conventional public procurement models, means that expenditure sits outside the scope of the public-sector and is instead governed by a system of 'decision-useful reporting'.

In line with this, Shaoul et al. (2013) argued that there needs to be greater public accessibility to the information shared between project partners. Poor information sharing and transparency has meant that, according to NAO (2018), there are prevailing contention over

the long-term project performance of PPP which has brought about VfM questions. As well as performance measurement, the opaqueness of PPP has been a source of poor collaboration on the grounds that continuous learning is important for a sustainable partnership. However, stemming from this information void, it has not been possible to ascertain the inefficiencies of these frameworks, which has served to constrain the evolution of the partnership.

Transcending multiple phases and decades, as the dynamics of the project shift, the partnership should be malleable to these transformations. Akintoye and Kumaraswamy (2016) contended that there is a need to develop a strategy by which to retain experience and knowledge on a project as a means to bolster performance and streamline the project. Roehrich et al. (2014) agreed, remarking that a failure to centralise and retain intellectual capital has meant lessons learnt from previous partnerships have not been shared within and across projects and organisations. Nonetheless, while the notion of improved transparency and information sharing has been promoted across literature, it remains a source of poor collaboration.

Risk transfer has been an important justification for PPP over other mechanisms. Premised on the view that PFI has been an outsourcing arrangement, it has been recorded in literature that the Authority has conventionally preferred to transfer all project risk away from the public-sector onto the SPV to permit off-balance sheet accounting (Hall, 2015). This wholesale transfer has been detrimental to collaborative partnering as SIS within ProjCo have been acquiesced into accepting risk which may be better positioned elsewhere (Barlow and Köberle-Gaiser, 2008). Subsequently, these risks have been mismanaged and mispriced which has transpired in reduced efficiencies and increased project prices. This has permitted the private-sector to have disproportionately gained. Demirag et al. (2015) explained that derived from the perceived prominence of construction risk, the private-sector has been willing to absorb project risks in return for a premium. This has served to engender distrust of the private-sector and has added to the poor reputation of PPP and intensified the politicisation of the model.

For some time, the concept of governance in PPP has been debated. Earlier research by Teisman and Klijn (2003) opined the governance structures historically in PPP were predicated on the contract. Zheng et al. (2008) and Demirel et al. (2017) shared this view and argued there is a need for greater emphasis placed on collaborative governance. Yet, noted in chapter three, across an extended 25+ year venture, it is impossible to predict all

unforeseen events. Over reliance on the contractual governance, combined with ambiguity in the contract, has culminated in the breakdown of partnerships, as SIS have turned to the incomplete contract to resolve disputes. To address this, several have considered proactive and collaborative governance. Liu and Wilkinson (2014) asserted that relational governance structures and a partnership-based consortium was instrumental in driving PPP project success. Moreover, Demirel et al. (2017) suggested that it was fundamental for project managers to understand the complexity of the PPP environment and have contingencies in place to cope with eventualities. Cruz and Marques (2013) argued PPP should adopt a proactive approach to addressing changes rather than a reactive response predicated on the contract.

Lending to the contractual governance, others have claimed that the poor flexibility and incompleteness of the contract has stifled collaboration. Inevitably, the dynamics of the project will evolve. This can be induced by a number of factors such as the introduction of new technologies, changes in the service requirements, or the introduction of new SIS. Hence, it is important that the PPP contract is sufficiently malleable to adapt to these manifestations (Hertogh and Westerveld, 2010; Shaoul et al., 2013). Notwithstanding this, poor flexibility in the contract has prevented the partnership from adapting as the dynamics have shifted and thus insufficient contract flexibility remains a prominent concern among researchers.

One of the most commonly cited barriers to PPP collaboration has been the procurement process. The procurement process has been characterised as being unnecessarily elongated, associated with high transaction costs, lacking competition and exhibiting poor transparency. To address these prominent criticisms, one of the fundamental changes introduced through PF2 has been the implementation of an 18-month timeframe to achieve financial close. Also, some in literature have offered contributions in an effort to improve the procurement process. Tang and Shen (2013) considered the briefing stage of PPP procurement and conducted survey questionnaires to gather perceptions of factors necessary to streamline and improve the efficiencies of this process. Ng et al. (2012) analysed the feasibility stage and carried out interviews to develop a tripartite comparison of the factors to improve the assessment process. Nonetheless, interviews carried out by Liu et al. (2016) reveal the procurement process still requires significant streamlining and cost reductions. Moreover, Zheng et al. (2008) claimed that, deriving out of the uncertainty in the procurement phase, the private-sector has been unwilling to commit and allocate resources to the venture without assurances of the contract. Consequentially, the procurement phase

has been identified as one of the foremost barriers to PPP collaboration (Demirag et al., 2015; DeSchepper et al., 2015).

Others have argued that a lack of trust has detracted from collaborative partnering (Henjewele et al., 2013; Rwelamila et al., 2014). An absence of trust in both the macro and micro partnerships has been identified as a prominent source of poor project performance. Barlow and Köberle-Gaiser (2008) argued that there is little trust exhibited between the Authority and ProjCo. Equally, in their case-study, their research found that rather than promoting collaboration, ProjCo was untrusting of the micro partnerships between SIS and the Authority. As such, ProjCo set about fragmenting these relationships by channelling all communication through the SPV. Consequentially, BuildCo's loyalties were torn between ProjCo and their ability to design a facility to best suit the Authority. Others found trust issues stemmed from a failure to engage and include all SIS early during the decision-making. This transpired as limited buy-in, in both macro and micro partnerships and gave rise to feeling excluded from the decision-making (Roehrich and Caldwell, 2012). By doing so, this engendered scepticism of the project and culminated in distrust among all relationships in the partnership.

Soomro and Zhang, (2014) identified how the failure to involve all SIS early and throughout the decision-making resulted in not only the fragmentation of the partnership but also in teams working to different agendas. This disconnect was prevalent within ProjCo concerning BuildCo and FMCo (Patel and Robinson, 2010). A failure to communicate and agree to the project brief culminated in myopia as SIS followed their own project remits as opposed to a collective long-term integrated solution (Roehrich and Caldwell, 2012).

Poor communication and engagement among SIS has engendered problems downstream in the lifecycle as a failure to involve all SIS has served to convolute roles and responsibilities as well as misalign project goals. Unsure of the ultimate aim of the project, poor communication has detracted from the decision-making process and has resulted in disagreement of the project brief. Demirag et al. (2015) described how Debt Lenders have been unwilling to engage with the project. Instead, they have preferred to remain remote and therein displayed poor commitment, reflective of an arm's length involvement. This remoteness, together with their lack of knowledge about the underlying project created uncertainty among Equity Shareholders. Likewise, Barlow and Köberle-Gaiser (2008) reported that in some instances there has been also a reluctance from the Authority to participate in the delivery. Their investigation indicated that while the Authority displayed

interest in the asset acquisition, they were uncommitted, unwilling or unable to participate to the extent desired by ProjCo, especially during the construction phase. Moreover, viewing the project as an outsourcing arrangement, Authorities did not deem they were obligated to participate in the decision-making.

Table 4.3: PPP SIS Collaboration Gaps

Attribute	Author(s)
Absence of trust	Henjeweale et al. (2014); Rwelamila et al. (2014)
Advisor obstruction	Reynaers (2013)
Complexity	Cantarelli et al. (2012); Akintoye and Kumaraswamy (2016)
Contract incompleteness and poor flexibility	HM Treasury (2012); Roehrich and Caldwell (2012); Reynaers (2013); Akintoye and Kumaraswamy (2016); Demirel et al. (2017)
Failure to agree project brief	Roehrich and Caldwell (2012); Tang and Shen (2013)
High staff turnover	Roehrich and Caldwell (2012)
Inadequate communication	Foo et al. (2011); Wang et al. (2013); Love et al. (2015)
Ineffective risk transfer	Roehrich et al. (2014); Demirag et al. (2015); Hall (2015)
Insufficient accountability	Reynaers (2013); Shaoul et al. (2013); Grossi and Thomasson (2015); Akintoye and Kumaraswamy (2016)
Insufficient Authority resources, skills and expertise	Patel and Robinson (2010); Roehrich and Caldwell (2012); Reynaers (2013)
Lack of early and collective stakeholder involvement	Roehrich and Caldwell (2012); Chen et al. (2013); Henjeweale et al. (2014); Rwelamila et al. (2014); Soomro and Zhang (2014)
Poor governance and management	Cruz and Marques (2013); Reynaers (2013); Demirel et al. (2017)
Poor information and transparency	Reynaers (2013); Akintoye and Kumaraswamy (2016); Mukhopadhyay (2016)
Poor knowledge management and lessons learnt	Roehrich and Caldwell (2012); Roehrich et al. (2014); Akintoye and Kumaraswamy (2016)
Power asymmetry	Roehrich and Caldwell (2012); Chen et al. (2013); Reynaers (2013); DeSchepper et al. (2014); Henjeweale et al. (2014); Rwelamila et al. (2014)
Procurement process	Ng et al. (2012); Zhang et al. (2012); Tang and Shen (2013); Demirag et al. (2015); DeSchepper et al. (2015); Liu et al. (2016); O’Nolan and Reeves (2017)
Project heterogeneity	Pretorious et al. (2008); Buchanan et al. (2014)
Public-sector bureaucracy and culture	Reynears (2013); DeSchepper et al. (2014)
Public-sector hierarchy and structure	Zou et al. (2013); DeSchepper et al. (2014)
ProjCo progression insecurity	Roehrich and Caldwell (2012)
SIS autonomy and self-serving behaviour	Tang and Shen (2013); Zou et al. (2013); O’Nolan and Reeves (2017)
SIS values and objective misalignment	Roehrich and Caldwell (2012); Tang and Shen (2013); World Bank et al. (2016)
Undefined roles and responsibilities	Patel and Robinson (2010); Reynaers (2013)

Collectively, from this critical examination of the PPP SIS boundary specification, the research has identified 23 PPP collaboration gaps. These findings are an important component of improving PPP stakeholder collaboration. Table 4.3 identifies these collaboration gaps together with their corresponding authors.

4.6. Summary

Chapter three identified that there is a need for collaboration in PPP for social infrastructure provision. Despite the importance of this concept, this chapter has unearthed that there is much discord in research as to who are the key SIS organisations worthy of inclusion in the collaborative process, as well as disagreement regarding mechanisms for understanding how they are involved in the project. The purpose of this chapter was to address this information gap by determining the partnership boundary specification.

To do this, the research examined *stakeholder theory* and identified the attributes of *legitimacy, power* and *urgency* by which to develop a boundary specification framework. This was then applied to the PPP context. This framework enabled this study to identify five organisations as the key SIS and understand the dynamics of their involvement over the duration of the venture. In doing so, the research developed a nomenclature of PPP SIS organisations.

Inherent to this partnership boundary specification, two dynamics were identified. Firstly, there was the macro inter-sectoral public-private partnership which exists between the two focal SIS. Also, secondary micro intra-sectoral partnerships were determined which exist between ProjCo members, ProjCo and the Authority. It was found that the dynamics of these relationships fundamentally shift at financial close as the agreement is formalised, in the construction as BuildCo develops the facility, and in the operations and maintenance as FMCo provides the service.

Having defined the partnership boundary specification, the research then undertook a critical examination of these relationships and identified 23 PPP collaboration gaps. In doing so, this fulfilled objective three of the research which was intended to critically examine collaboration between SIS within UK PPP social infrastructure provision. These findings will therefore now be carried forward to chapter five and used to inform the PPP stakeholder collaboration investigation.

CHAPTER FIVE

PUBLIC-PRIVATE PARTNERSHIPS STAKEHOLDER COLLABORATION

5. Public-Private Partnerships Stakeholder Collaboration

5.1. Introduction

In chapter three the research identified that attempts have already been undertaken to improve collaboration in the built environment and Public-Private Partnerships (PPP). Despite these efforts, there is a pertinent knowledge gap. Hence, this research argues that there are grounds to look beyond the built environment to address these shortcomings and specifically to the collaboration concept to better understand collaboration and to identify the attributes of PPP stakeholder collaboration. Having determined the PPP partnership boundary specification in chapter four, the purpose of this chapter is to investigate PPP stakeholder collaboration.

In this chapter, chapter five, the research turns its attention to *collaboration theory* to widen the research's understanding of the collaboration concept. This comprises conceptualising collaboration, defining collaboration and identifying the motivations to collaborate. Following this, predicated on the findings of chapter four, combined with additional PPP literature and collaboration theory literature, this chapter identifies the attributes of PPP stakeholder collaboration which are to be the basis of the empirical investigation delineated in chapter six. This chapter is hence structured as follows:

- An exploration of collaboration theory;
- Defining collaboration;
- An examination of the motivations to collaborate; and
- The identification of PPP stakeholder collaboration attributes.

5.2. An Overview of Collaboration

Along with the arrival of stakeholder theory, so too emerged the value of nurturing relationships, not only inside the firm, but also inter-organisationally. Collaboration is a specific dimension of inter-organisational relationships that derived out of the need to manage the complexity of the organisational environment (Huxham and Macdonald, 1992). Fundamentally, collaboration seeks to synergise organisations around the notion of common goals in an effort to cultivate a community-like environment whereby stakeholder organisations work together as part of a venture to provide a superior outcome (Huxham and Vangen, 2001). Huxham and Vangen (2001) attribute this shift to cooperative project delivery to the need to improve production efficiency, as well as the increasing role of the private-sector in public service provision. Subsequently, emanating out of this more inclusive

mind-set, the notions of relationships, partnering and alliancing have gained traction and has witnessed increased popularity, proliferating out of organisational management literature particularly during the 80s and 90s (see Gray, 1985; Huxham and Macdonald, 1992). Falling under many synonyms such as partnering, cooperation, coordination, networks, alliances, bridges, and joint-working among many others (Jones and Thomas, 2007), much research has investigated the structures of collaboration and the associated advantages which come with it (see Huxham and Macdonald, 1992; Hardy et al., 2003; Huxham and Vangen, 2005). Accordingly, as awareness grows of its potential benefits, inter-organisational collaboration has been exported beyond strictly organisational studies and is now gathering momentum within the construction industry, and more pertinently, PPP (see Smyth and Pryke, 2008; Co and Barro, 2009; Chinyio and Olomolaiye, 2010; Bouchlaghem, 2012; Herazo and Lizzaralde, 2015).

Gazley (2017) conducted a systematic literature review of collaborative literature. According to her findings, collaboration has undergone a resurgence recently and has been re-popularised as the notion of cross-sectoral alliancing continues to gather momentum. As part of her state-of-the-art analysis, Gazley (2017) found that over time, as a result of its complexity, collaboration has over time been examined across all levels of the organisation. Also, to further its understanding, it has equally been scrutinised through multiple theoretical lenses. Noteworthy examples of this includes Alexander (2000) who considered collaboration through a matrix of sociological, institutional and economic theories. Equally, Conner et al. (2015) adopted cultural theory to investigate the motivations of public managers to collaborate. Reflective of this adaptability, Gazley (2017) found that a third of investigations are now approaching collaboration through theories and disciplines which do not include institutional and organisational dynamics. Thus, collaboration has transcended the conventional disciplines of policy, economics and management in an effort to bridge knowledge gaps.

Derived from this popularity, literature has identified that there is an increasing number of collaborative forms. Collaborative arrangements have been developed both in cross-organisational and cross-sectoral arrangements. This includes between government bodies and the for-profit sector (Fischbacher-Smith, 2015), within the for-profit sector (Co and Barro, 2009; Tantalo and Priem, 2014), between for-profit and non-profit (Smith and Wohlstetter, 2006), and between non-profit organisations (Hands, 2010). Accordingly, there are differences in literature as to the number and types of collaborative forms. Kanter (1994) proposed that there are three principal collaborative arrangements, namely; mutual service

criteria, value chain partnerships and joint ventures. Comparatively, Barringer and Harrison (2000) suggested there are six collaborative dimensions which are dependent on the degree of which bodies are inter-linked. These are joint ventures, networks, consortia, alliances, trade associations and interlocking directorates.

As the many forms of collaboration have come to light, coupled with their relative complexity, literatures points towards the need for formal and informal structures to produce the environment necessary by which to constitute its development. Blanchard (2012) suggested collaboration should comprise 'form' and 'essence' in organisational management. Essence can be characterised as the central values of collaboration, while form is the framework as to how it is undertaken. Alternatively, Thomson and Perry (2006) identified six antecedent attributes which determine the type of collaboration. These were the level of interdependence, the need for resources and risk sharing, resource availability, collaborative experience, complexity, and partner's access to resources. Adding to these findings, Diaz-Kope et al. (2015) furthered this contribution by including institutional structures. Despite these nuances, it has become apparent that ultimately to engender collaboration, literature alludes in many forms to the symbiotic dyad of formal and informal structures.

Notwithstanding the richness of collaborative literature, Gazley (2017) was critical of collaborative research across three pillars. She concluded as part of her critical review that collaborative literature has primarily focused on qualitative studies and failed to offer generalisable outputs. Also, much of the research has been undertaken unilaterally and therein failed to consider the research of others within related fields. In line with this, Kozuch and Sienkiewicz-Malyjurek (2016) similarly highlighted the need for greater quantitative studies which determine the factors contributing to inter-organisational collaboration. Thirdly, Gazley (2017) suggested there has been a sparsity of elongated studies which consider collaboration dynamics over time. Nevertheless, in spite of these shortcomings, collaborations ubiquitous arrival into multiple disciplines and its prevalence throughout organisational arrangements indicates its proclivity for superior project performance.

5.3. Defining Collaboration

Having transcended multiple fields including commercial, social, economic, institutional and political, a plethora of worldviews have all been instrumental in framing collaboration. Victim of this popularity, many interpretations of what defines collaboration are proffered throughout literature and while some have presented definitions stemming from strategic

advantages, knowledge creation and outcomes, others have been more concerned with the systems, actions and processes in which to foster collaboration (Barringer and Harrison, 2000; Hardy et al., 2003).

Nevertheless, despite these disparate submissions, there are consistent normative themes apparent throughout these bodies. These themes centre on collectiveness, working together to achieve something which could not be obtained otherwise, a shared purpose or objective, resource sharing, and communication and information sharing (see Gray, 1989; Kanter, 1994; Keyton et al., 2008; Bouchlaghem and Shelbourn, 2012). Combining these findings, collaboration can be defined as organisations working together and cooperating to achieve a mutual objective, combining interests, and varied skills, resources and experience in a co-ordinated effort to deliver an outcome that could not be achieved otherwise by a solitary organisation (Gray 1985; Kanter, 1994; Tsasis et al., 2015).

5.4. Motivations to Collaborate

Borrowed heavily from Waddock (1989), Savage et al. (2011) opined collaboration has been extolled for its capacity in bringing together organisations to solve what can be described as social or macro-environmental problems. These are problems which cannot be solved by any one organisation, but rather require a joint effort. Being inter-dependent, the objective of a collaborative alliance is collectiveness (Wilson et al., 2010). Still, while there is merit in terming these problems on a macro level, others have felt they fail to encapsulate collaborations aptitude in addressing what have been dubbed 'wicked' problems. Emanating out of social policy, the coining of wicked problems can be attributed to the idea that a scientific-rationale cannot be applied within social confines. Wicked problems are those that cannot be or are difficult to solve because they are neither defined, nor easily understood (Rittel and Webber, 1973). Different from simple and complex problems, wicked problems are distinguishable, in that there is no consensus on the true nature of the problem, nor is there any agreement of how to resolve it (Denning, 2009). These problems typically involve many organisations, and thus there are many perspectives, and equally many different potential approaches to collaboration and their resolution (Roberts, 2000). Wicked problems include preventing a pandemic, delivering quality high school education, battling poverty, improving health care problems, combating global warming, and preventing terrorist attacks (Denning, 2009). To overcome wicked problems, Roberts (2000) suggested three coping mechanisms; authoritative, competitive and collaborative strategies. Within an organisational context, though it is difficult to determine a definitive outcome to wicked

problems, collaboration allows organisations to collectively achieve something that would otherwise be difficult or impossible to obtain by a single organisation (Savage et al., 2011). Hence, collaboration offers an interesting solution to wicked problems, in that essentially, at its core, it provides a 'win-win' approach to problem solving, with each partner benefiting from the arrangement (Mitchell et al., 1997).

A fundamental reward from collaboration, is what many refer to as achieving 'collaborative advantage'. In short, this is described as being in a better position than would be if done individually (Huxham and Macdonald, 1992; Huxham and Vangen, 2004). This ability to offer superior rewards has led to large cross-sectoral organisations engaging in collaborative relationships. Tsisis et al. (2015) explored collaboration in HIV/AIDs prevention, while Hands (2010) found collaboration is effective in bringing together schools to improve education. Collaboration has also been used in developing business links (Uztel and Martin, 1998), enhancing nature-based tourism (Plummer et al., 2006), tackling mental health problems (Jones et al. 2004), battling poverty (Brown and Ashman, 1996), and in promoting multi-agency working in social policy (Asthana et al., 2002).

Others have displayed enthusiasm to collaborate predicated on its aptitude in forging cross-sector links, providing access to other technologies, products and markets (Wilson et al., 2010). Doz and Hamel (1998) promoted collaboration for its capacity to facilitate access to foreign markets, as well as allowing organisations to combine and pool resources that are not available internally (Lewis et al., 2010). Hardy et al. (2003) deemed collaboration is an effective vehicle for knowledge exchange and the creation of new knowledge, while others have displayed eagerness premised on its propensity to improve an organisations competitive position through complimentary skill-sets (Savage et al., 2011). Erridge and Greer (2002) commended collaboration for its ability to handle complex situations, whereas Savage et al. (2010) opined it encouraged long-term innovation and learning by sharing information. Aldrich (1976) found collaboration is an effective tool for resolving conflict and navigating through environmental turbulence. Likewise, Hardy et al. (2003) reckoned collaboration can enhance an organisation's position relative to other competing organisations. Other motives may include diversification, overcoming legal barriers or market seeking (Todeva and Knoke, 2005). Specific to construction research and infrastructure development, Cannings (2014) suggested built environment collaboration can lead to:

- Meeting stated objectives on time leading to greater predictability of time, cost and quality;
- A long-term relationship through mutual trust;
- Removes restrictions on solutions design and thinking through stronger relationships;
- Reduces waste (surplus, duplication and generated);
- Reconciliation of uncertainty;
- Allows organisations to gain competitive advantage;
- Offers better design management through whole life understanding;
- Can engender a rewarding environment for individuals;
- Adds values through risk allocation and management, and economies of scale; and
- Exploits knowledge for value creation.

From this, it is apparent there are many benefits to collaboration which underpin its importance in PPP. Notwithstanding the plethora of research promoting collaboration and its popularity, it should be noted that there are caveats and not all experiences have been positive. Barringer and Harrison (2000) articulated several barriers to collaborative relationships. Reiterating sentiments displayed by Culpan, (1993), Doz and Hamel (1998), Hatfield and Pearce (1994), and Niederkofler (1991), they suggested the benefits of collaboration may fall short of those expected. Also, collaborative partnerships can be difficult to manage as a consequence of misaligned cultures between separate entities. Huxham and Vangen (2004) caveated the magnitude of undertaking a collaboration. Moreover, DeSchepper et al. (2014) warned for collaboration to be effective, it is critical there is acceptance and awareness from stakeholders of the resource intense nature of undertaking the development of these relationships. Others pointed out that rather than encouraging inter-organisational collectiveness, there is a risk that smaller silo networks often form within the collaboration to achieve their own goals which are misaligned from the mission statement (Erridge and Greer, 2002). Equally, DeSchepper et al. (2014) and Patel and Robinson (2010) cautioned that improper structures and systems involved in the development of the relationship can cause delays.

At this juncture, the research has examined collaboration theory. It has identified that collaboration is a complexity of formal and informal attributes. It has also established there are different forms of collaboration which is contingent on the organisations involved and the purpose of the partnership. The research has also reviewed the motivations to

collaborate. Having done so, the thesis will now turn its attention to PPP stakeholder collaboration.

5.5. Public-Private Partnerships Stakeholder Collaboration

Grounded in a cross-sectoral partnership, throughout literature and industry, the importance of collaboration there has been accumulating and there subsequently is now greater awareness over the centrality this concept must play in steering long-term project success. Suggested by its very name, Public-Private *Partnerships*, the collaborative ethos is an inherent ideal in these arrangements. It is therefore no surprise that many definitions presented in PPP literature adhere to this cooperative philosophy. Burke and Demirag (2017) characterised PPP as a durable cooperation between the public and private-sectors where stakeholders develop mutual facilities and/or services whereby risks, rewards and benefits are shared. Waring et al. (2013) likewise described PPP as a formalised collaboration between the public and private-sectors to meet public goals, premised on the ideology that collaboration combines resources and risk sharing skills to co-deliver a public service.

In this sense, these descriptions promote shared objectives, the sharing of risks and resources and integrated business processes. However, this is not always the case. Historically, PPP via PFI has been utilised as an outsourcing arrangement for alternative motivations. This interpretation is evidenced through several definitions of PPP such as that of HM Treasury (2003) which branded PFI as an arrangement whereby the public-sector purchases capital services from the private-sector. Similarly, Hardcastle and Boothroyd (2003) defined PFI as a long-term contractual arrangement in which the private-sectors resources are utilised to provide an infrastructure and deliver a public service. Comparatively, Zhang (2006) termed PFI as an agreement between the government and the private-sector whereby a private firm delivers an asset or service in exchange for a payment which is predicated on the provision quality or an output delivery.

Subsequently, a divide has emerged in literature which differentiates between a collaborative partnership and contractual outsourcing arrangements. Such examples of this include Smith and Wohlstetter (2006) who distinguished between formal and informational partnerships; Teisman and Klijn (2003) asserted there were cooperative and contractual partnering governance structures in PPP; Zheng et al. (2008) determined contractual versus relational governance in PPP; Leiringer (2003) differentiated between contractual and cooperative PPP; and, Waring et al. (2013) who classified PPP as either 'tight' and 'loose' arrangements.

Accordingly, the need to reconcile this disparate between the previous contracted 'PFI-esque' interpretation to more modern collaborative PPP interpretations has emerged. Indeed, the importance of collaboration in partnering is not a new phenomenon. As far back as the 1990s it was noted that there was a need for a behavioural shift towards the collaborative philosophy to overcome the adversarial and fragmented nature of the built environment in the UK. Latham (1994), as part of the 'Constructing the Team' report, is often cited for his pivotal contribution which encouraged collaboration and the use of collaborative partnering in PFI to bring together large networks of diverse disciplines who have not worked together before. This landmark report called for behavioural change in the construction industry in addition to also highlighting the salience of the client in driving this ideological revolution. Yet, PFI was still in its infancy with limited mobilisation, which meant that there was inadequate understanding of this mechanism, the means to engender collaboration, and the importance of collaboration in ensuring long-term success.

Since then many have contributed efforts to progress this body of knowledge. Nine years after, in 2003, the Strategic Forums (2003) 'Accelerating Change' report underpinned and reinforced the importance of collaboration; though on this occasion, greater emphasis was ascribed not just to the client in fostering collaboration but also highlighted the need for inclusion of the wider stakeholder network and the systems for stakeholder integration. This document promoted delivering on a shared-vision and teamworking centric procurement to enhance innovation and deliver continuous improvement.

Moving forward, the identification of collaboration as a facilitator in a network of organisations continued to gather momentum and later that year the Strategic Forum (2003) published a toolkit categorising the constituent components of collaboration. This emergent toolkit identified the attributes of collaboration as: committed leadership; culture and values; and processes, tools and commercial arrangements.

More recently, Constructing Excellence (2011) has furthered the built environments understanding of collaboration by distilling collaboration into six CSF: early involvement; selection by value; aligned commercial arrangements; common processes and tools; performance measurement; and long-term relationships. Moreover, the introduction of British Standard 11000 has been a watershed for collaborative business relationships (BSI Group, 2013). However, despite observable progress, the prevalence of this concept in literature indicates there is still a prevailing knowledge gap.

In conjunction with industry, several academics have undertaken investigations to add to the PPP collaboration stock of knowledge. McErlane et al. (2016) identified the need for collaboration in PPP to improve project performance through greater understanding of stakeholders. Equally, as HM Treasury (2012) points towards the changes in PF2 as a strategy to improve collaboration in PPP, McErlane et al. (2017) invited UK PPP organisations to evaluate these policy reforms. In the main, respondents were uncertain of these changes.

Also, Clifton and Duffield (2006) investigated performance improvements in Australian PPP projects through the incorporation of Alliancing principles into the concession agreement. Their study aimed to offer improved governance pertaining to the contract structure, risk management and features of the concession agreement which influence the service performance. However, over a decade ago, in tandem with the monumental changes in the UK PPP market, this research is arguably dated and no longer relevant to current PPP mechanisms.

Smyth and Edkins (2007) explored the partnership through the lens of relational contracting and relationship management (RM). Determined by the parameters of trust and confidence, they measured thirty relational dynamics adapted from Gummesson (2001) in the partnership. Their article highlighted poor and weak relationships widespread throughout the PPP environment, though notably it was most prevalent at the public-private interface. Although insightful, Smyth and Edkins (2007) captured input from a single SPV and failed to gather views from the public-sector.

Zou et al. (2013) also sought to identify the CSF of RM in PPP. The authors deemed the top four CSF were commitment, defining objectives, integration and multidisciplinary skills. However, these CSF pertain to in Build-Operate-Transfer (BOT) projects. Jefferies et al. (2014) identified sixteen CSF of alliancing contracts in Australia using a case-study approach. Liu et al. (2014) investigated CSF in both economic and social infrastructure PPP projects. The authors were of the opinion traditional CSF failed to encapsulate the complexity of PPP and thus they argued attributes are dependent upon the project phases. While there is merit in this approach, elements of their study appear complex, for example, during the partnership phase, factors such as effective contract management are vague and undefined. Hence, to simply amalgamate these phases which equate to 25+ years, it is argued that these findings fail to effectively account for the changing dynamics across the construction and operational periods.

Even so, the built environment has often been criticised as being slow to adapt and keep pace with other industries. In spite of the prominence of collaborative partnering in PPP, it is argued the built environment has yet to reconcile this information void between the confrontational culture of infrastructure development and the collaborative philosophy necessary for PPP. These assertions are underpinned by the plethora of studies which continue to identify the partnership as a primary source of poor project performance (Zou et al., 2013; Jefferies et al., 2014; Jefferies and Rowlinson, 2016; Burke and Demirag, 2017; O’Nolan and Reeves, 2017). The next of this research is therefore to consolidate literature to identify the attributes for PPP stakeholder collaboration.

5.6. Public-Private Partnerships Stakeholder Collaboration Attributes

Predicated on the findings of the foregoing, together with the research’s understanding of PPP, this investigation defines PPP stakeholder collaboration as a long-term partnership between the public-sector Authority and the private-sector Project Company (ProjCo) and its constituent members whereby equal partners share risks, rewards and resources to deliver infrastructure in a cooperative and joint working manner. Fundamentally, it is this sharing of roles, risks and responsibilities on equal platforms whereby all partners participate that distinguishes collaborative PPP from contractual outsourcing arrangements whereby, all risks and responsibilities of the service provision are transferred to the private-sector in exchange for a charge which is underpinned by an incomplete contract when conflict arises.

Having defined PPP stakeholder collaboration, the research now identifies the attributes of PPP stakeholder collaboration. To do so, it combines the findings of chapter four, together with collaboration theory, and PPP literature.

5.6.1. Accountability

In section 4.5, this research already identified multiple issues with accountability deriving out of the blurred boundaries associated with PPP. These accountability gaps are prevalent on both the public and private-sector sides. Indeed, Shaoul et al. (2013) described accountability as a multi-faceted concept which comprises account giving, holding organisations to account, analysis of accountability and applying sanctions, and being responsive to the public. Accountability is important for collaboration in that it represents a commitment to the project and therein can foster trust. Also, accountability holds organisations responsible for their actions and is instrumental in decision-making. Comprising multiple layers across the partnership, it is essential that accountability spans all

levels, and for this reason, it is often coupled with the skilled leadership (Archer and Cameron, 2013).

5.6.2. Agreement of Project Brief

Messy problems are those which cannot be tackled alone, thus, collaboration is unique in that it is a juxtaposition between self-interested goals and a shared vision. Nevertheless, by collectively defining a problem and agreeing the approach to address this problem, this creates a sense of 'we' as opposed to autonomous behaviour (Denning, 2009). It is important that all Social Infrastructure Stakeholders (SIS) agree to the purpose of the project and sign-off on the mission statement. This encourages early buy-in and also promotes active participation. Furthermore, this can enhance the integrated solution development. With shared understanding of the task at hand, all SIS can work together to develop an innovative service that would not have been available otherwise. It is hence important that all SIS agree to the project brief early in the project, determine and agree on the success criteria and identify the Key Performance Indicators (KPIs) to measure the productivity of the collaboration (Roehrich and Caldwell, 2012; Chinyere, 2013; Tang and Shen, 2013; Zou et al., 2013; Wong et al., 2015; Leviäkangas et al., 2016).

5.6.3. Appropriate Risk Sharing

According to Archer and Cameron (2013), it is inevitable a collaboration will encounter risks. Nevertheless, Walker et al. (2017) found that collaboration in infrastructure projects can lead to reduced project risks and can also unlock better risk coping strategies. Collaboration theory suggests that the level of risk sharing is reflective of an organisations willingness to collaborate (Alter and Hage, 1993). In the same vein, risk sharing has been an important influencer on PPP SIS partnerships (English and Baxter, 2010).

It is fundamental that risk is shared and retained by the SIS best able to manage it rather than be used as a mechanism to facilitate 'off-balance sheet' accounting. This is in contrast with previous undertakings where the partnership has been contractual in nature whereby the private-sector has typically adsorbed all risks in exchange for a premium. Already, this research has shown risk transfer and risk sharing has been a source of poor PPP collaboration. Adding credence to this, the on-going prevalence of risk in PPP literature suggests it continues to be a prominent concern (Loosemore and Cheung, 2015; Xiong et al., 2017). Indeed, Burke and Demirag (2017) considered the nexus between risk allocation and stakeholder relationships. In doing so, they found that a collaborative project is more likely

to be more tolerable of risks and that risks which are addressed in a cooperative manner are less reliant on the contract.

5.6.4. Authority Experience

For collaborative success, it is fundamental that the public-sector can contribute as an equal partner. To do so, the Authority must possess in-house skills and not be so reliant on external advisors and consultants. That said, the critical examination of the PPP collaboration gaps found that the heterogenous nature of PPP and the scale of these ventures has meant that there is limited scope for repeatability. This has curtailed the development of best-practice experience which has detracted from the development of collaboration (Pretorious et al., 2008). The Infrastructure and Projects Authority (IPA) is the expertise center in the United Kingdom (UK) designed to support the successful delivery of social and economic infrastructure and major projects through the development of the overall project delivery system (HM Treasury, 2017). It is critical for collaboration that the IPA is instrumental in shepherding and overseeing the development of the partnership particularly in the earlier phases. Moreover, structures should be implemented to share and develop Authority experience as the project progresses to mitigate against the impact of staff turnover.

5.6.5. Authority In-house Resources and Skills

In line with Authority Experience, prevailing skills and resources shortages confronting the Authority has directly transpired in a power imbalance between the Authority and ProjCo. This has detracted from the Authority's negotiating position and it has also been an obstacle to stakeholder collaboration. Successful collaborations manufacture win-win scenarios. By upskilling, Authorities are empowered to effectively input into arrangements and lead the collaborative ideology. Moreover, equal platforms can provide stakeholders with the capacity and confidence to by-pass bureaucracy and can culture an informal arrangement which is less dependent on the contract. For this reason, Authority in-house skills and resources are deemed to be a necessary PPP collaborative attribute (Roehrich and Caldwell, 2012; Reynaers, 2013; Zou et al., 2013).

5.6.6. Balance of Stakeholder Needs and Expectations

An attribute of PPP stakeholder collaboration discerned from literature is the need to balance stakeholder needs and expectations. Comprising a matrix of diverse organisations, it is significant that all SIS derive benefits from the collaboration. If gaining from the arrangement, this will safeguard the sustainability of the partnership (Smyth and Pryke,

2008). In this context, it is important that an assessment is undertaken early in the project to identify the advantages of collaboration and the disadvantages of not collaborating. This incentivises collaboration. In addition to this, any profits or rewards emanating from the project should benefit all SIS. This will reduce autonomous behaviour (Archer and Cameron, 2013; Tang and Shen, 2013).

5.6.7. Clarifying Roles and Responsibilities

From literature, the research identified the PPP stakeholder collaborative attribute of clarifying roles and responsibilities. Premised on the complexity of organisations, it is important there is clarity of roles and responsibilities of SIS. This is significant for the identification of gaps in the project as well as to determine overlaps and ultimately design a plan to address these gaps (Kanter, 1994; Huxham, 2003; Vangen and Huxham, 2003). Shaoul et al. (2013) maintained that clarification of roles and responsibilities can improve accountability. Likewise, Tang and Shen (2013), Aerts et al. (2014) and Wong et al. (2015) all identify this collaborative attribute as an important critical success factor (CSF).

5.6.8. Clear Governance Structures

Liu and Wilkinson (2014) deemed that effective governance structures and a collaborative consortium were instrumental in driving PPP project success. Equally, Akintoye and Kumaraswamy (2016) advocated for collaboration to underpin the governance structures. Still, research signifies that the nature of PPP has been contractual as opposed to collaborative. Demirel et al. (2017) suggested that historically SIS have relied upon the contract to determine the control framework for the project. Yet, it is impossible to predict all unforeseen eventualities in PPP. Over-reliance on contractual governance has culminated in the breakdown of the partnership as SIS have turned to the incomplete contract to resolve disputes. It is therefore important that the governance structures in PPP are collaborative and thereby negate the need to depend on the incomplete contract to determine the outcome of unforeseen conflicts (Zheng et al. 2008).

5.6.9. Collective Stakeholder Planning and Decision-Making

Prevalent in collaborative theory is the attribute of collective stakeholder planning and decision-making (Gray, 1985; Gray, 1989; Butterfield et al., 2004). Equally, in PPP literature this attribute has been well recognised (Chinyere, 2013; Henjewe et al., 2013; Tang and Shen, 2013). Collective stakeholder planning and decision-making is an important attribute of PPP stakeholder collaboration. Failures to ensure collective stakeholder planning and

decision-making has been well documented in literature. Demirag et al. (2015) found that the reluctance of the Debt Funders to participate in the decision-making had hindered collaboration and eroded project trust. Moreover, resistance on the part of Authorities to participate in the decision-making has in the past transpired in a contractual outsourcing arrangement (Barlow and Köberle-Gaiser, 2008). Furthermore, Soomro and Zhang, (2014) highlighted how the failure to include the Service Provider (FMCo) had engendered contractual relationships as opposed to a partnership.

5.6.10. Conflict Resolution Structures

According to Archer and Cameron (2013), conflict is inevitable in collaborative arrangements. With this in mind, leaders have an important role in managing conflict. Moreover, project managers play an integral part in early identification of conflict. Akintoye and Kumaraswamy (2016) asserted that conflict resolution structures should focus on delivering a cooperative solution as opposed to apportioning blame. Likewise, Demirel et al. (2017) put forward the notion of incorporating a change procedure into the contract to deal with unforeseen events during the contractual period. They purported that it was fundamental that project managers understand the complexity of the PPP environment and have contingencies in place to cope with unforeseen eventualities.

5.6.11. Contract Flexibility

With a life-cycle of 25+ years, and a complexity of contracts among organisations, it is impossible to predict all outcomes or manifestations across a PPP venture. PPP contracts are thus considered incomplete on the basis they cannot stipulate for every unforeseen eventuality. Shaoul et al. (2013) suggested that the main sources of project change were brought about by project stakeholders. They asserted that it is inevitable that services or physical facilities will be altered to reflect the transformative needs of the service. Hence, there is a need for formalised collaborative contracting protocols together with suitable safeguards and transparency (Akintoye and Kumaraswamy, 2016) to ensure the contract is flexible to these changes. Through greater collaboration, as unforeseen circumstances arise, SIS are less reliant upon the contract to determine the outcome but instead conflict can be resolved in an equitable manner. Notably, one of the prominent provisions implemented through Private Finance 2 (PF2) has been the removal of the soft-services from the contract to facilitate greater flexibility (HM Treasury, 2012).

5.6.12. Early Establishment of Collaboration

It is well documented in collaborative research that collaboration should be fostered early in the project (Huxham, 2003; Vangen and Huxham, 2004). Soomro and Zhang (2014) found that it is important to establish collaboration early in a PPP project. This can prevent the manifestation of other latent sources of poor performance. Patel and Robinson (2010) suggested that early establishment of collaboration establishes a collaborative base and sets the trajectory of the partnership onto a sustainable path. This is critical premised on the duration of the operations phase, the manifestation of unforeseen events and the incompleteness of the contract. Early collaboration encourages early stakeholder buy-in. Also, research suggests that it is more difficult to develop collaboration downstream. However, it was determined that due to the competitive nature of the procurement process, historically, collaboration has been absent from this process.

5.6.13. Early, Defined and Collective Stakeholder Involvement and Consultation

Early, defined and collective involvement and consultation encourages inclusiveness and creates an environment which stakeholder's buy into (Tang and Shen, 2013; Wang et al., 2013; Demirag et al., 2015). Yet, it has been reported, stemming from the failure to include all SIS early in the arrangement, there has, on some occasions, been curtailed long-term synergy between organisations which has eventually transpiring in the collapse of the partnership (Roehrich and Caldwell, 2012). Early involvement allows stakeholders to develop a shared vision of the project. Also, collective decision-making can prevent autonomous SIS behaviour, provides a superior integrated solution and also can reduce conflict. These engagement processes should be clearly defined and structured.

5.6.14. Effective Communication

To some in collaborative literature, communication is tantamount to this concept (Lewis, 2006). To others, it is a mechanism to further understanding. Communication and its various forms are common practice for bringing organisations together (Henjeweel et al., 2013; Tang and Shen, 2013; Wang et al., 2013; Aerts et al., 2014). Through information exchange, dialogue, idea sharing, brain-storming, bargaining and so on, communication is the exchange channels and structures to nurture these alliances. Communication should be transparent, inclusive, and regular (O'Leary and Vij, 2012). Notwithstanding its importance, it has been reported poor communication has been a concern in PPP. Failure to communicate early in the project has led to long-term issues emerging in the operations. Communication must be

effective, collective and on-going throughout the project among all SIS. All SIS should be involved early in communication channels to maximise the integrated solution provision. Already some have considered how the use of Information Technology (IT) and Building Information Modelling (BIM) can improve communication among SIS. Love et al. (2015) promoted BIM to measure long-term performance and Wang et al. (2013) proposed a framework for earlier FMCo involvement in the design phase also with BIM.

5.6.15. Financial and Technical Exchange and Support / Stipend

Some have considered the nature of the PPP procurement phase as a barrier to early collaboration. The failure to cultivate early collaboration has detracted from the long-term performance as short-term objectives have been prioritised over an integrated innovative process. To overcome this barrier, by providing support; both technical and financial or a stipend, SIS are encouraged to commit earlier to the project. This display of resource exchange indicates appetite for a collaborative partnership. Also, by exchanging resources this can lead to greater innovation as well as improve the overall performance of the project (Ho and Hsu, 2014; Wong et al., 2015).

5.6.16. Identifying Individual and Shared Objectives

One of the primary reasons to collaborate is to acquire skills not available internally. Upshot from this, organisations will possess different values, norms, and objectives, culminating in disparate stakeholder objectives. This misalignment of interests has heavily encouraged the autonomous behaviour of stakeholders. To minimise the impact of these differences, SIS should identify shared commonalities and recognise the need to work together (Denning, 2009). By identifying commonalities, a shared aim for the project can be agreed. Furthermore, heterogeneous objectives should be shared to improve understanding. Through shared understanding of the standpoint of each organisation this enables informed collective decision-making and togetherness. Ultimately, this can foster an atmosphere that is win-win for everyone (Eden and Huxham, 2001; Hardy et al., 2003; Huxham and Vangen, 2004; Chinyere, 2013; Zou et al., 2013; Tsisis et al., 2015; Zhang et al., 2015; Davis, 2016; Leviäkangas et al., 2016; Burke and Demirag, 2017).

5.6.17. Information Sharing and Transparency

Information sharing and transparency, has been put forward as an attribute of PPP stakeholder collaboration (Eden and Huxham, 2001; Hardy et al., 2003; Huxham and Vangen, 2004; Chinyere, 2013; Zou et al., 2013; Tsisis et al., 2015; Zhang et al., 2015; Leviäkangas et

al., 2016; Burke and Demirag, 2017). Through collaborative information sharing and transparency, the performance of the partnership can be measured to ascertain the performance of the project, calculate the efficacy of risk transfer and ultimately determine Value for Money (VfM). Additionally, transparency and information sharing enable more accurate forecasting, and therein promotes informed decision-making and greater accountability which is often convoluted as a result of the complexity of PPP. Mukhopadhyay (2016) investigated the concept of a nested framework for transparency and information sharing in PPP. The authors suggested this attribute should be a two-way flow of information among SIS and it is fundamental early in the project to capitalise on efficient decision-making.

5.6.18. Information Technology

IT supports information sharing, communication and the construction of trust through active stakeholder involvement. Social software such as email, conferencing, blogs, wiki's and discussion boards are now universal and encourage the formation of a community like environment. IT, advantageously, can circumnavigate geographical and logistical barriers. Furthermore, IT can be utilised for other processes including modelling, planning, programming and forecasting. In line with this, BIM is now being actively encouraged as a concept for promoting long-term success in PPP arrangements. BIM can complement other collaborative attributes such as collective decision-making and communication (Wang et al., 2013; Love et al., 2015) and can aid stakeholders to develop and maintain the facility. Moreover, BIM and IT can be used to retain knowledge and measure the performance of the collaborative partnership (MGI, 2017).

5.6.19. Innovation

An attribute of collaboration which is often overlooked is innovation (Roumboutsos and Saussier, 2014). For a collaboration to be sustainable, all SIS must benefit. Thus, innovation is an important attribute of collaboration on the grounds it can enhance long-term value creation. According to McKinsey Global Institute (MGI, 2017) innovation in collaboration can improve the service provision through the application of new technologies and systems thinking. By doing so, the service provision can be refined and recalibrated. Moreover, as the partnership evolves, through continuous innovation, performance can be improved (MGI, 2017).

5.6.20. Knowledge Retention

Knowledge retention has been identified as an attribute of PPP stakeholder collaboration (Aerts et al., 2014; Burke and Demirag, 2017). Attributable to the seismic undertaking in PPP projects, Authorities are typically involved in a small number of schemes. Thus, systems and structures should be installed to retain best-practice knowledge which can be exchanged across organisations. Additionally, transcending multiple phases and decades, Akintoye and Kumaraswamy (2016) indicated there is a need to develop a strategy by which to retain experience and knowledge capital captured to bolster the sustainability of the partnership. Roehrich et al. (2014) agreed, remarking a failure to centralise and retain intellectual capital has meant lessons learnt from previous stakeholder collaborations have not been shared within and across projects and organisations.

5.6.21. Power Sharing

Many have asserted that control and power sharing is central to PPP collaboration (Chen et al., 2013; Tang and Shen, 2013; Zou et al., 2013; Aerts et al. 2014; DeSchepper et al., 2014; Henjeweile et al., 2014; Rwelamila et al., 2014; Burke and Demirag, 2017). Archer and Cameron (2013) maintained that without power sharing, the interdependent philosophy of collaboration is undermined which would culminate in no one succeeding. It is critical all project leaders understand the importance of equal power sharing and project control. Furthermore, power sharing is pivotal in these arrangements as a combined effort permits not only heterogeneous problem solving, but also it encourages others to influence problems. Chapter four has shown how power sharing is intrinsically linked to the possession of skills, experiences, and resources. However, shortcomings particularly on the side of Authorities has detracted from the performance of the partnership. To ensure power sharing, all SIS should have access to the required skills and resources to participate on an equal platform.

5.6.22. Processual Change

Collaboration is an on-going, dynamic and evolving process. Moreover, identified in section 4.4 the boundary specification of PPP is permeable, thus, nascent SIS may enter the project, while others may also exit. In this respect, the ability to continually learn and evolve, in tandem with the dissolving of old, and building of new alliances is critical. Bringing together organisations with different project objectives, as stakeholder involvement and priorities shift over time, collaborative arrangements must be capable of correspondingly maturing.

Despite the pertinence for evolving arrangements, literature indicates PPP partnerships have failed to evolve and develop as projects progress. To combat this, it is important that the performance of the partnership is continually monitored, measured and managed to determine efficacy against the predefined performance targets. Through processual change, the partnership can adapt reflective of feedback for improved productivity (Cruz and Marques, 2013; Wong et al., 2015; Demirel et al., 2017).

5.6.23. Skilled Leadership

According to Vangen and Huxham (2003), leadership is the person who is charged with the responsibility of 'making things happen' and can facilitate decision-making, support conflict resolution as well as reinforce the collaborative agenda. Geddes (2012) described collaborative leadership as the joint management structures which glue the disparate aspects of the partnership together. In the context of PPP, this is particularly important because of the permeable boundary. Metcalfe (1993) identified leadership as salient for strengthening the interface among organisations. Likewise, Shaoul et al. (2013) suggested leadership is required to oversee and manage the project systems such as communication and involvement. Premised on the myriad of relationships, organisations and misaligned project objectives, skilled leadership is critical in steering the project in a direction that is agreeable to all SIS to circumnavigate autonomous behaviour (Akintoye and Kumaraswamy, 2016). Indeed, ULI (2016) reiterated the importance of leadership as a core principle of successful PPP initiatives in developing a shared vision among project stakeholders. For the public-sector to participate as an equal partner, the project leader, according to World Bank et al. (2016), should have diverse expertise in technical, environmental, economic, financial and legal aspects of the project, can manage the decision-making process and can coordinate external advisors together with the Authority. A failure to meet these requirements has been a common source of project failure.

5.6.24. Social Capital / Inter-personal Relationships

Although considered distinct from inter-organisational collaboration, many have asserted an important attribute for collaboration is the development of inter-personal collaboration. Inter-personal social capital exists between the individuals responsible for the day to day undertaking and execution of the arrangement. However, consequent of the longevity and bundled approach of PPP, high staff turnover is associated with these arrangements. It has been recorded social capital can facilitate the development of shared norms, rules, and expectations of interactions as well as complimenting equality. Likewise,

social capital enables collaboration at an organisational level to shift allegiances from individuality to a mutual shared obligation and expectations. Efforts such as workshops and social events are important in fostering social capital (Roehrich and Caldwell, 2012; Tsisis et al., 2015)

5.6.25. Project Company Experience

World Bank et al. (2016) were of the view, strong technical capacity and experience is a key component of project success. Similarly, Li et al. (2005a) identified that a strong consortium with a positive reputation was important for project success. In their research, they suggested that SIS with similar objectives could further the performance in that it reduced the likelihood of conflict and autonomous behaviour. World Bank et al. (2016) suggested that, premised on the scale of infrastructure investment and PPP, consortium experience was an important factor in managing the complexities and challenges of these ventures. Through experience, others have argued that a strong consortium can implement best-practice systems, apply new technologies and therein improve the performance of the partnership and the reliability of the service (Roehrich and Caldwell, 2012; Tang and Shen, 2013; Zou et al., 2013; Aerts et al., 2014). According to the World Bank et al. (2016), the Authority should ensure the winning bidder is qualified with construction experience, operation and maintenance experience and PPP management.

5.6.26. Stakeholder Commitment

Several authors; both in PPP and collaborative literature, maintain commitment is critical for collaboration (Huxham, 1993; Eden and Huxham, 2001; Zou et al., 2013; Chinyere, 2013; Tang and Shen, 2013; Aerts et al., 2014; Wong et al., 2015). Commitment must be exhibited by all SIS and be a top-down approach, starting at senior level management. A failure to engender collaborative commitment at the highest level brings about a superficial arrangement (Kanter, 1994). Commitment can be demonstrated through sharing of resources, information or personnel exchanges. Equally, it can be encouraged through active inclusion and participation. Some have considered the nature of PPP procurement as a barrier to early collaboration. Wong et al. (2015) suggested to overcome this barrier, by providing support either in the form of resources or a stipend, SIS are encouraged to commit earlier to collaboration. Nonetheless, it has been identified that a lack of commitment exhibited by the Authority frustrated ProjCo, particularly in the design and construction phase. Likewise, commitment problems have surfaced within micro partnering dynamics pertaining to Debt Funders. Remaining distant, some have queried the commitment of these

SIS as a result of viewing the infrastructure only from a financial perspective. This has generated distrust in the project (Demirag et al., 2015).

5.6.27. Trust and Respect

Trust is one of the foremost attributes commonly correlated to collaborative success (Vangen and Huxham, 2003; Smyth and Edkins, 2007; Harrison et al., 2010; Tang and Shen, 2013; Zou et al., 2013; Tantalo and Priem, 2014; Wong et al., 2015; Burke and Demirag, 2017). Trust has been explored in many fields including psychology, economics, sociology and organisational science. Blanchard et al. (2013) in their book, presented four normative components of trust, encapsulated within the acronym “ABCD”:

- A. Able – confidence in the capacity and wherewithal of an organisation to complete tasks;
- B. Believable - refers to integrity and confidence that what is being stated is the truth;
- C. Connected – identifies the significance of social capital and inter-personal relationships in creating trust; and
- D. Dependability – discusses the importance of being able to rely on someone or an organisation in delivering on commitments.

Given the significance of trust, in the context it has perhaps been the collaborative attribute to have received most attention. In earlier research conducted by Smyth and Edkins (2007), they considered relationship management through the lens of trust. In doing so, they were able to map thirty dimensions of relationship management in an SPV for collaborative working and identified the salience of proactive management of relationships. Henjewele et al. (2013) found that trust in PPP was best built through dialogue and an integrative strategy. Likewise, Tantalo and Priem (2014) asserted that trust is an effective means of overcoming barriers and enables the sharing of multi-attribute utility functions. This develops a better understanding and can unlock greater value creation and improve strategic advantage. Like communication, trust is considered by many as a catalyst and utility attribute for other aspects of collaboration. As a result, it is often coupled with leadership (Tantalo and Priem, 2014). In an effort to cultivate trust, Mineo (2014) recognised the importance of a leader in acting as a champion to drive forward the philosophies of trust.

Allied with trust, all organisations should be considered equal and thus deserve to be respected and heard. It is important that trust and respect are established early in the project. Even so, many have articulated how there has been a failure to build and establish

trust and respect in PPP projects. It has been identified that the competitive nature of the procurement phase has hindered the early fostering of trust which in turn has long-term implications for the dynamics of the partnership (Zheng et al., 2008). To negate this, other attributes such as resource exchange and communication are important factors in the development of trust.

Table 5.1 is a summary of the 27 PPP stakeholder attributes identified from literature along with the corresponding authors. These attributes will now be used in the empirical investigation for the development of the PPP stakeholder collaboration framework. This will be the next stage of this study.

Table 5.1: PPP SIS Collaborative Attributes

Attribute	Author(s)
Accountability	Vangen and Huxham (2003); Patel and Robinson (2010); O'Leary and Vij (2012); Archer and Cameron (2013); Shaoul et al. (2013); Grossi and Thomasson (2015); Tsasis et al. (2015); Akintoye and Kumaraswamy (2016); Wu et al. (2016)
Agreement of Project Brief	Gray (1985); Gray (1989); Roehrich and Caldwell (2012); Chinyere (2013); Tang and Shen (2013); Zou et al. (2013); Wong et al. (2015); Davis (2016); Leviäkangas et al. (2016)
Appropriate Risk Sharing	Archer and Cameron (2013); Chang (2013); Cheung et al. (2013); Aerts et al. (2014); Loosemore and Cheung (2015); Burke and Demirag (2017); Xiong et al. (2017)
Authority Experience	Tang and Shen (2013)
Authority In-house Resources / Skills	Roehrich and Caldwell (2012); Reynaers (2013); Zou et al. (2013)
Balance of Stakeholder Needs and Expectations	Archer and Cameron (2013); Tang and Shen (2013)
Clarifying of Roles and Responsibilities	Kanter (1994); Huxham (2003); Huxham and Vangen (2004); Shaoul et al. (2013); Tang and Shen (2013); Aerts et al. (2014); Wong et al. (2015)
Clear Governance Structures	Hall et al. (1977); Gray (1985); Huxham (2003); Huxham and Vangen (2004); Thomson and Perry (2006); Archer and Cameron (2013); Shaoul et al. (2013); Akintoye and Kumaraswamy (2016); Demirel et al. (2017)
Collective Stakeholder Planning and Decision-Making	Gray (1989); Gray (1985); Applegate, 2004; Butterfield et al. (2004); Barlow and Köberle-Gaiser (2008); Roehrich and Caldwell (2012); Chinyere (2013); Henjeweile et al. (2013); Tang and Shen (2013); Soomro and Zhang (2014); Demirag et al. (2015)
Conflict Resolutions Structures	Archer and Cameron (2013); Akintoye and Kumaraswamy (2016); Demirel et al. (2017)
Contract Flexibility	Javed et al. (2014); Lam and Javed (2014); Wong et al. (2015); Akintoye and Kumaraswamy (2016); Burke and Demirag (2017); Demirel et al. (2017)
Early Establishment of Collaboration	Little et al. (1995); Kelly et al. (2002); Soomro and Zhang (2014)
Early, defined and collective Stakeholder Involvement and Consultation	Carley and Christie (1992); El-Gohary et al. (2006); Roehrich and Caldwell (2012); Tang and Shen (2013); Wang et al. (2013); Demirag et al. (2015)
Effective Communication	Lewis (2006); O'Leary and Vij (2012); Henjeweile et al. (2013); Wang et al. (2013); Aerts et al. (2014); Tang and Shen (2013); Zou et al. (2013); Love et al. (2015)
Financial and Technical Exchange and Support / Stipend	Ho and Hsu (2014); Wong et al. (2015)
Identifying Individual and Shared Objectives	Eden and Huxham (2001); Hardy et al. (2003); Huxham and Vangen (2004); Denning (2009); Chinyere (2013); Zou et al. (2013); Tsasis et al. (2015); Zhang et al. (2015); Davis (2016); Leviäkangas et al. (2016); Burke and Demirag (2017)
Information Sharing and Transparency	Kanter (1994); Bouchlaghem (2012); Zou et al. (2013); DeSchepper et al. (2014); Wong et al. (2015); Mukhopadhyay (2016)
Information Technology	Wang et al. (2013); Love et al. (2015); MGI (2017)
Innovation	Roumboutsos and Saussier (2014); MGI (2017)
Knowledge Retention	Aerts et al. (2014); Roehrich et al. (2014); Akintoye and Kumaraswamy (2016); Burke and Demirag (2017)

Power Sharing	Gray (1989); Applegate, 2004; Huxham and Vangen (2004); O'Leary and Vij (2012); Chen et al. (2013); Tang and Shen (2013); Zou et al. (2013); Aerts et al. (2014); DeSchepper et al. (2014); Henjewe et al. (2014); Rwelamila et al. (2014); Burke and Demirag (2017)
Processual Change	Doz (1996); Huxham (2003); Huxham and Vangen (2004); Wong et al. (2015); Demirel et al. (2017)
Skilled Leadership	Foster-Fishman et al. (2001); Huxham (2003); Archer and Cameron (2013); Shaoul et al. (2013); Tang and Shen (2013); Akintoye and Kumaraswamy (2016)
Social Capital / Inter-personal Relationships	Agranoff and McGuire (2003); Waugh and Streib (2006); Roehrich and Caldwell (2012); Tsasis et al. (2015)
ProjCo Experience	Roehrich and Caldwell (2012); Tang and Shen (2013); Zou et al. (2013); Aerts et al. (2014); World Bank et al. (2016)
Stakeholder Commitment	Huxham (1993); Eden and Huxham (2001); Zou et al. (2013); Chinyere (2013); Tang and Shen (2013); Aerts et al. (2014); Demirag et al. (2015); Wong et al. (2015)
Trust and Respect	Zaheer et al. (1998); Clegg and McNulty (2002); Vangen and Huxham (2003); Smyth and Edkins (2007); Harrison et al. (2010); Tang and Shen (2013); Zou et al. (2013); Tantalo and Priem (2014); Wong et al. (2015); Burke and Demirag (2017)

5.7. Summary

The remit of this chapter was to consider the collaboration concept and to identify the attributes of PPP stakeholder collaboration which will form the basis of the empirical investigation. Determined in chapter three, already, efforts have been undertaken to address collaboration in the built environment and PPP. Notwithstanding these investigations, there remains a prevailing knowledge gap.

To bridge this void, there were pertinent grounds to look beyond the confines of the built environment and into collaboration theory to extract the attributes of collaboration. Accordingly, the research conducted an in-depth exploration of collaboration theory. It defined collaboration, considered the motivations to collaborate and ultimately it identified 27 PPP stakeholder collaboration attributes which will be used to develop the PPP stakeholder collaboration framework. The methodological design to be implemented for this framework development is delineated in the next chapter, chapter six.

CHAPTER SIX

RESEARCH METHODOLOGY

6. Research Methodology

6.1. Introduction

In the critical literature review, it was determined in chapter two that social infrastructure provision in the United Kingdom (UK) must be addressed bi-laterally: through the identification of more alternative sources of finance and by improving the performance of existing provision frameworks by addressing inherent inefficiencies.

A provision framework which has been extolled for as a vehicle for 'more and better' infrastructure is Public-Private Partnerships (PPP). Internationally, the UK is considered a pioneer of these cross-sectoral partnerships. Yet, since the onset of the Global Financial Crisis (GFC), the UK PPP marketplace has exhibited tapered levels of activity. Stemming from acute transformations in the financing markets as well as forthcoming concerns over the true extent of Value for Money (VfM) for the taxpayer as a result of inherent deficiencies, confidence in PPP frameworks has been undermined. Nevertheless, PPP has been identified as a mechanism which will continue to be used where offering better VfM. To address the inherent inefficiencies of these partnering frameworks and to stimulate wider capital sources, the UK government has undertaken steps to strategically reform UK PPP arrangements. Despite this overhaul, there remains noteworthy uncertainty regarding the future of UK PPP with legitimate concerns as to whether these modifications have indeed addressed the inherent inefficiencies of the previous models.

There is now the acknowledgement that there is a need for greater collaboration to underpin and safeguard the performance and sustainability of these partnerships as well as to encourage increased participation from nascent financial social infrastructure stakeholders (SIS). Notwithstanding the need for collaboration, literature indicates that the nature of PPP ventures has been contractual as opposed to collaborative. It is hence argued there is a forthcoming knowledge gap as to how to best foster PPP stakeholder collaboration. To address this knowledge gap, the research conducted an analysis of stakeholder collaboration in PPP. Ultimately, derived from this detailed critical literature review, the research identified a list of 27 PPP stakeholder collaborative attributes for empirical investigation.

This chapter serves to determine the research structure by which to empirically develop the PPP stakeholder collaboration framework. In addition to this framework development, premised on the findings of chapter three, the research also undertakes a PPP social infrastructure market analysis. The remit of this contemporary analysis is to provide an

insights into market activity to add contemporary credibility to the research. Holding a positivist epistemological and objectivist ontological stance, this chapter explains the bi-quantitative research design. This consists of a PPP social infrastructure market analysis using secondary datasets as well as the deductive quantitative survey questionnaires which are to be used for the development of the PPP stakeholder collaboration framework .

This chapter is organised as follows:

- Research paradigm;
- Research strategy;
- Research methods;
- Research design;
- Survey design;
- Statistical analysis; and
- Framework development.

6.2. The Research Paradigm

Creswell (2009) suggests a research design is a cross-section comprised of three components:

- a. Research philosophy;
- b. Strategies of inquiry; and
- c. Research methods.

When planning a study, it is critical a researcher considers how their study fits into the theoretical perspective of research, the strategy that correlates to this theory and the procedures by which to carry out the practice. The research will therefore, according to this structure, investigate these three components before deciding on a research design for this study.

6.2.1. Research Philosophy

Guba (1990) and Knight and Ruddock (2008) similarly described philosophy as the rationale which underlies a research methodology. Within literature there are several names for this; Creswell (2009) dubbed research philosophy as *worldviews* whereas Mertens (1998) referred to this as research *paradigms*. Consequently, within literature there are inconsistencies pertaining to this theoretical underpinning. Notwithstanding this disparity, Creswell (2009) identified four worldviews, equally, Teddlie and Tashakkori (2009) recognised five; however,

more broadly this philosophical theory seems to be subsumed into epistemological and ontological considerations (Dainty, 2008; Bryman and Bell, 2015).

Understanding competing theoretical viewpoints is fundamental to understanding how research contributes to knowledge. Just like any theory, research philosophy is subject to interpretation. Different stances will create different approaches to knowledge contribution and thus will be deterministic of the type of data collected, the methods by which to do so and the steps to analyse said data. Nevertheless, by linking the research methods and strategy to the larger theory, Creswell (2009) is of the opinion that this adds to research value in that it explicates and justifies the researchers design. This investigation will therefore now explore into epistemology and ontology to determine the perspective appropriate to this research.

6.2.1.1. Epistemological Consideration

James Frederick Ferrier, a Scottish philosopher coined the term *epistemology* in 1856. Originating from the Greek word *epistēmē* meaning 'knowledge' and 'logos', epistemology can be defined as the theory of knowledge especially that pertaining to validity, methods and scope (Knight and Turnbull, 2008). Epistemology discerns what acceptable knowledge is, and if the social world is accountable to the same principles of that in natural sciences (Bryman and Bell, 2015). In other words, epistemology is concerned with how a researcher may discover knowledge. Inherent to epistemology, there are two standpoints: positivism and interpretivism.

Positivism, intelligible from its very name, advocates natural science methods in social reality studies. According to Creswell (2009) positivists hold a deterministic philosophy which explains why this viewpoint is often referred to as the *scientific method* or *science research*. Bryman and Bell (2015) presented five principles that positivism adheres to:

- i. Knowledge confirmed by the senses can genuinely be warranted as knowledge;
- ii. Theory serves the purpose of constructing hypotheses fit for testing and assessment;
- iii. Knowledge is founded on findings from data gathered;
- iv. Science must be objective and carried out in a means which is value free; and
- v. Scientific and normative statements are discernible, and scientific statements are the true domain of the scientist.

Alternatively, epistemology can be viewed as *interpretivist*. While positivism is centred on the application of a scientific model to study the social world, others have been critical,

arguing the subject matter, i.e. that people and their institutions differ fundamentally from that of natural sciences (Bryman and Bell, 2015). Interpretivism is hence grounded in the notion that people are inherently different from natural sciences and thus it requires a decoupled approach for this type of study. Simply put, knowledge is socially subjectively created as opposed to being objectively apparent (Carson et al., 2001).

6.2.1.2. Ontological Consideration

While epistemology is the theory of knowledge, Knight and Turnbull (2008) refer to ontology broadly as conceptions of reality. Bryman and Bell (2015) offer the question, should social entities be considered objective entities that have a reality external to social actors or is a social entity created by social actor's perceptions and actions. Essentially, ontology concerns assumptions pertaining to how the world is constructed and the nature of things in it. Bryman and Bell (2015) suggested it can be approached from an objectivist or constructivist position. Objectivists hold the view that social phenomena, actions and meanings are autonomous of social actions, while constructivists believe social phenomena are created through social interactions and to that end, cannot be constant therefore necessitating continued revision (Bryman and Bell, 2015).

6.2.1.3. Methodological Reasoning

While research can be observed from an epistemological or ontological stance, Bryman and Bell (2015) further argue there is a third facet to the relationships of theory, research and reasoning, i.e. *methodology*. Methodological reasoning encapsulates inductive, deductive or abductive theory.

Deductive theory can be described as the process of hypothesising deduced from existing knowledge in a theory which is subsequently scrutinised through empirical investigation (Bryman and Bell, 2015). For this reason, deductive reasoning is commonly referred to as a top-down approach in that it commences at a universal or abstract level filtering to a concrete or actual level whereby inferences or conclusions are surmised, indicative of a general level. In this regard, the theory travels from the general to the specific, thus that which is true at the abstract level should theoretically apply to a contextual scenario. Bryman and Bell (2015) maintain, within a deductive approach, the hypothesis is determinant of the methodological design, and the data collecting process. This approach is prevalent in *positivist quantitative* research.

Oppositely, *inductive* reasoning is often referred to as a bottom-up approach. This approach draws inferences or conclusions from a specific phenomenon which lead to the theory on a universal level. Inductive theory is particularly recognisable in grounded theory which analyses data for the production of a theory. Much the same way deductive research is dominant in quantitative research, inductive research is typically prominent in *interpretivist qualitative* investigations (Bryman and Bell, 2015). Though these theories are perceptibly distinct, often there are elements of each approach interwoven within each other. This iterative process of reflection often involves the variable shifting back and forth between data and theory. As such, Bryman and Bell (2015) suggest these approaches ought not to be thought of as distinct but rather considered as tendencies.

Notwithstanding the deductive/inductive dichotomy, there is also a middle ground. Just as deductive and inductive reasoning benefit from conclusions and inferences to construct theories, so too can *abductive* reasoning. Abductive reasoning compensates for inherent weaknesses and limitations in the deductive and inductive approaches. Unlike other reasoning, abductive logic selects the ‘best explanation’ to explain a puzzle which existing theory cannot account for (Bryman and Bell, 2015).

6.2.2. Research Strategy

Having examined research philosophy and described how this connects to research strategies, this investigation will now examine these research strategies to inform the research of a suitable strategy by which to undertake the empirical study.

6.2.2.1. Quantitative Research

Creswell (2009) asserts that quantitative research permits the objective testing of theories through examining measurable relationships between variables. It supports structured and statistical analysis characterised by a population typically deployed through a standardised means permitting direct comparison and generalisation (Creswell, 2009). Quantitative research is advantageous on the grounds it allows the study to cover a large number of cases within a limited timeframe, which is representative of a larger population. However, Flick (2011) warned relevance and context of some of the data can on occasion be potentially meaningless. Notwithstanding this criticism, typically quantitative research has been carried out via surveys or experiments (Creswell, 2009). Echoing Yin (2014), Barnham (2015) reasons quantitative research characteristically seeks to determine ‘what?’ questions, e.g. what number of, or what percentage of people prefer ‘A’ to ‘B’. Similarly, Flick (2011) considered

quantitative research to be an effective means to assess relations between variables, or a basis for events.

6.2.2.2. Qualitative Research

Just as a quantitative approach may be an effective strategy to formulate conclusions, it is restricted in the sense that it typically applies a statistical approach and is therefore representative of what might occur rather than what indeed did (Silverman, 2001). Others have considered further approaches beyond strictly quantitative research. Qualitative research explores into insights and observations of a problem which involves the researcher developing themes derived from data (Creswell, 2009). It is characterised by relationships, motivations, behaviours and opinions for the discovery of underlying meaning and theory development. Different to quantitative, qualitative research attempts to answer ‘why?’ questions searching for causality and motivations on a ‘deeper’ level (Barnham, 2015). These inductive approaches offer the advantage of flexibility in that the researcher has much more freedom to explore themes and relevance in its context. Nonetheless, there are drawbacks to this method; due to the nature of these approaches, this can be time consuming. Equally others have suggested it can be difficult to generalise to a wider population (Creswell, 2009). Within qualitative research, Creswell (2009) refers to many strategies such as ethnography and grounded theory. Alternatively, Dainty (2008) suggested interviews and case-studies have been common approaches in the built environment. Hitherto, two themes within research philosophy are forthcoming.

Table 6.1: Fundamentals of Research Design (Bryman and Bell, 2015)

	Quantitative	Qualitative
Principal theoretical orientation in research	Deductive; testing of theory	Inductive; generation of theory
Epistemological orientation	Natural science model, particularly positivism	Interpretivism
Ontological orientation	Objectivism	Constructivism

Table 6.1, created by Bryman and Bell (2011) depicts how research philosophy and research methods are interspersed.

6.2.2.3. Mixed-Methods Research

While there are arguments for and against each, Creswell (2009) points out that research may also undertake a combination of research strategies stemming from abductive theory. Mixed-methods are an extension of the previous two strategies permitting multiple

applications and approaches to an investigation as opposed to unilateral techniques. Mixed-methods are complimentary and structured in sequential, concurrent or transformative strategies compensating for limitations and weaknesses in each singular approach (Creswell, 2009).

6.2.3. Research Methods

Of the three elements considered by Creswell (2009), research methods are the means to collect, analyse and study data. Accordingly, selecting the appropriate methods must be reflective of the researcher's intentions. Collecting data can be undertaken via several methods, for example, instruments can be used to elicit numerical data through experiments whereas interviews can deploy closed or open-ended questions to ascertain opinions and beliefs. Within quantitative data collection, experiments and surveys are commonly identified (Creswell, 2009); however, when it comes to qualitative research, methods are somewhat more disparate. Tesch (1990) listed 28 qualitative methods, equally Wolcott (2001) identified 21. Nevertheless, a review of literature indicates the following methods are the most commonly suggested of all research instruments (Denscombe, 2007; Knight and Ruddock, 2008; Creswell, 2009; Saunders et al., 2015);

- Surveys - Creswell (2009) defines surveys as a numbered account of trends, perspectives or opinions of a selected population which are representative of a wider population. Denzin and Lincoln (2005) assert surveys are an effective mechanism to confirm hypotheses and map out aspects of the social world (Denscombe, 2007). Equally, Fowler (2009) deems surveys as an efficient approach to gather opinions, behaviours and social situations. Within surveys there are several types: listed postal questionnaires, internet surveys, face-to-face interviews, telephone interviews, and observations (Denscombe, 2007).
- Experiments - Experiments test for cause-and-effect relationships between independent and dependent variables (Sekaran and Bougie, 2010). This approach is rare in construction management research because of the difficulties surrounding organisational variables; however, when applicable, they are often commended due to their robustness and trustworthiness (Bryman and Bell, 2011).
- Case Study - Stake (1995) defines a case-study as a single or collection of cases to be investigated and analysed. Denscombe (2007) claims a case-study approach is an effective approach to exploring at depth an event, relationships, experiences or processes. Similarly, Yin (2003) described case-studies as a holistic approach which

affords the researcher the opportunity to investigate meaningful complex social phenomena in a real-life context. Within this approach there are four types (Yin, 2014): holistic single case-study, embedded single case-study, holistic multiple case-studies, embedded multiple case-studies.

- Ethnography - Ethnography can be described as the study of cultures and people. That is to say, the research observes societal phenomena from the perspective of the research (Denscombe, 2007). Stemming from anthropology, ethnography has been assimilated into social science research and is typically implemented to holistically interpret cultural issues (Heider, 2009).
- Grounded Theory - Hunter and Kelly (2008) describe grounded theory as the process of constructing theory derived from data. This methodology was introduced by Glaser and Strauss in 1967, and since then has been deployed in a two-fold fashion: Glaser used grounded theory to derive theory from data, whereas Strauss and Corbin encouraged an approach motivated by research questions (Hunter and Kelly, 2008). Data is typically collected in three ways; field data, interviews or by any other literary source.
- Phenomenology - Farina (2014) made the claim, to define phenomenology is dangerous and potentially paradoxically, in that it is not a philosophical school but should be regarded closer to a school of thought as it is a method to overcome the traditional rationalism and empiricism argument. It is premised upon reality being constructed from objects and events, i.e. *phenomena* perceived by human consciousness, and not anything beyond. In essence, phenomenology objectively studies a topic that is typically subjectively analysed (Sanyal, 2014).
- Action Research - Coined by Kurt Lewin in 1944, action research was introduced in his 1946 paper 'Action Research and Minority Problems'. Action research is the process of strategically addressing a problem and producing a best practice framework or guidelines (Denscombe, 2007). According to Denscombe (2010) there are two themes: participatory and practical action research. Reason and Bradbury (2001) considered action research to be an on-going and repetitive interactive process to determine underlying social causality through data analysis and interpretation.

6.2.4. Built Environment Research Designs

Considered to be a new discipline relative to others, Knight and Ruddock (2008) explain there are consequently no pre-defined approaches to research methodologies intrinsic to the built

environment. Embracing contributions from social and human sciences as well as a diversity of domains including art, law, economics, sociology, statistics and philosophy, positivist studies have been popular although advocates of interpretivism have argued over the importance of understanding social phenomena vis-à-vis explaining it. Upshot from this, the built environment has displayed increased interest in qualitative research and more recently, mixed-methods approaches (Knight and Ruddock, 2008).

An analysis of 30 peer-reviewed journals constituting either PPP or stakeholding over the last decade indicates there has been much enthusiasm primarily for qualitative research. Of 30 papers; 23% were quantitative, 47% qualitative, 13% mixed-methods and the remainder undertook no empirical methodology (17%). Earlier publishing's reveal, primarily studies have either been fundamentally qualitative or quantitative, for example, Li et al. (2005a) conducted questionnaire surveys, Grubnic and Hodges (2003) utilised case studies, while El-Gohary et al. (2006) performed semantic interviews as part of their investigation. Nevertheless, trending is changing. While qualitative approaches remain popular, many researchers are surpassing conventional approaches and are now actively embracing mixed-methods strategies. Notably, all mixed-methods research has been carried out post 2012; Zou et al. (2013) performed a triangulated mixed-methods strategy consisting of interviews and empirical survey questionnaires. Similarly, Ng et al. (2013) executed case studies with interviews, focus groups and a two-round Delphi survey whereas DeSchepper et al. (2014) employed a multiple case-study / focus group approach. Within these mixed-methods studies, a sequential structure has typically been undertaken. This transition from strictly quantitative / qualitative studies to mixed-methods seems to have paralleled the roll-out of several other data collection methods. For some time, survey questionnaires (20%), interviews (30%) and case-studies (37%)¹⁹ have dominated almost all approaches; however, several contemporary papers have welcomed others. Focus groups (7%), Delphi surveys (7%) and face-to-face surveys (7%) have burgeoningly grown in popularity. Furthermore, it is worth noting, focus groups and Delphi surveys have been used in conjunction with other data collection methods typically to test or validate findings. A case in point is DeSchepper et al. (2014) who confirmed case-study data with five stakeholders in a focus group. Likewise, Ng et al. (2013) validated and enhanced results with a focus group and a Delphi survey. Zou et al. (2013) were of the opinion deploying a mixed-methods approach is advantageous in

¹⁹ On occasion, percentages do not add up to 100% as some studies incorporated more than one approach while others had no empirical methodology.

that it allows an initial qualitative element to further develop and validate findings prior to quantitatively evaluating them.

Notwithstanding the shifting research trends, fundamentally, a research design is contingent upon the research objectives and must therefore be reflective of the research's intent. This research identified two areas the research design must be conducive to. These are:

- I. To offer contemporary insights into the current state of the UK PPP social infrastructure market following the reformation of these partnering frameworks; and
- II. To develop a PPP stakeholder collaboration framework for 'more and better' UK social infrastructure provision.

This investigation will now consider the component parts of this research design by which to meet these research outputs.

6.3. Contemporary United Kingdom Public-Private Partnerships Social Infrastructure Market Analysis

Regarded as a pioneer of PPP, the UK historically has been a global leader for partnering infrastructure provision. However, identified in chapter three, the UK PPP social infrastructure market has undergone acute policy reformations as these frameworks have been tarnished for being inefficient and ultimately delivering poor VfM to the UK taxpayer. In spite of this overhaul and commitment to PPP, literature suggests that there continues to be concerns encircling the viability of this procurement mechanism; one of the foremost being the presence of poor stakeholder collaboration. Low levels of mobilisation since the modification of these frameworks in tandem with low levels of confidence in the wherewithal of PPP to deliver VfM has severed to engender uncertainty in the marketplace pertaining to the future of UK PPP. Hence, the purpose of this component of the research design is to offer contemporary context of the UK PPP social infrastructure market. In doing so, this will have several important implications for the research:

- Adds contemporary credibility to the research;
- Underpins the salience of this research on the grounds that despite prominent steps already undertaken to improve the PPP mechanism, curtailed market activity suggests these nuances have failed to address the inherent inefficiencies; and

- Offers transaction clarity of the UK PPP social infrastructure market for vested and interested parties both in industry and academia which is currently unavailable elsewhere in the public domain.

To gather these quantitative insights, datasets were sourced from *Infrastructure Journal (IJ)* Online Database. *IJ* depicts global infrastructure investment and PPP market activity from 2005 to present day and supplies details on capital value, financial structures, Special Purpose Vehicle (SPV) details and key actors. Access to these datasets requires an annual subscription. For the purpose of the UK PPP social infrastructure market analysis, datasets were downloaded on 31/06/2017 and was interrogated using Microsoft Excel. Having identified in chapter three that the devolved governments of the UK have developed their own nuanced models of PPP, this research will scrutinise these datasets to capture findings relating to the capital value of PPP ventures, deal number per year, social infrastructure sectoral activity, respective regional market activity in the UK and the financial structure of PPP transactions set against the growing appetite for greater institutional investor participation.

Others have already utilised *IJ* in academic and industry research related to PPP and infrastructure investment. Haran et al. (2013) exploited *IJ* datasets to interrogate the financial structure of PPP projects globally post the GFC. *IJ* has also been instrumental in a 2013 Royal Institute of Chartered Surveyors (RICS) report which considered PPP as a mechanism by which to channel private investment into infrastructure internationally (RICS, 2013). McErlane et al. (2017) similarly utilised *IJ* to perform a contemporary analysis of the UK PPP social infrastructure paradigm in terms of capital value and deal number to compliment research on the roll-out of Private Finance 2 (PF2). With this in mind, *IJ* is deemed to be a credible and reliable data source.

6.4. Development of Public-Private Partnerships Stakeholder Collaboration Survey

This investigation will also produce a framework of PPP stakeholder collaboration. It was identified in the literature review that collaboration has been approached unilaterally which has transpired in a knowledge gap of the attributes necessary for PPP stakeholder collaboration. Hence, seeking to measure variables, premised on research philosophy theory allied with the outcome of the literature review, this research will accordingly adopt an epistemologically positivist and ontologically objectivist stance to be carried out quantitatively. A quantitative methodology enables the research to gather large amounts of data regarding multiple variables which can be easily generalised and quickly formulated

(Bryman and Bell, 2015). In studies like this which have modelled saliency or importance, quantitative approaches have been the predominant research design. Chou and Pramudawardhani (2015) employed quantitative survey questionnaires to assess critical success factors (CSF) in PPP projects. Tang and Shen (2013) utilised survey questionnaires to evaluate effectiveness and efficiency factors for analysing stakeholder needs at the briefing stage of PPP projects and Zou et al. (2013) evaluated the attributes of relationship management (RM) in Build-Operate-Transfer (BOT) projects.

Two quantitative methods have been identified from literature: experiments and surveys. Creswell (2009) regarded surveys as a numbered account of trends, perspectives or opinions of a selected sample which is representative of a wider population, whereas experiments test an outcome against controlled variables. On this basis, experiments can be discounted leaving surveys as the cogent choice. There are several types of surveys (Denscombe, 2010);

- Listed postal questionnaires;
- Electronic questionnaires;
- Face-to-face interviews;
- Telephone interviews; and
- Observations.

At this juncture of chapter six, several of these instruments can be eliminated. Observations can be disregarded subject to the longevity of a PPP project. Equally, financial and logistical barriers create problems for face-to-face and telephone interviews. What's more, Denscombe (2009) is of the opinion quantitative telephone interviews can on occasion be unreliable and exposed to human error. Predicated on their popularity, the research also considered Delphi surveys; however, this method was not opted for premised on the high drop-out rates in other studies, particularly in PPP related research (see Kumaraswamy and Anvuur, 2008; Ng et al., 2013). Furthermore, the time demands for a Delphi survey would be challenging set against the nature of the research topic. To this end, surveys will be carried out via questionnaires. In related studies, there has been much enthusiasm for this instrument. Zou et al. (2013) elicited responses via questionnaires. Chou and Pramudawardhani (2015) obtained stakeholder perceptions of the CSF across several jurisdictions and Raisbeck and Tang (2013) conducted surveys to identify design development factors in Australian PPP. Accounting for their popularity in other studies, this research will therefore also deploy a survey questionnaire strategy by which to develop the PPP stakeholder collaboration framework.

6.4.1. Survey Questionnaire

Knight and Ruddock (2008) define questionnaires as an instrument of measurement to gather attitudes. Hague (1993) termed questionnaires as a tool by which to interview people. Furthermore, a third definition by Gillham (2008) described questionnaires as a means of obtaining people's opinions. Questionnaires facilitate a standardised, systematic, simple and quick approach to generating large datasets suitable for statistical analysis which are comprehensive and representative of the identified PPP SIS population. Gillian (2007) was of the opinion questionnaires practically provide more flexibility over other methods in that it affords the participants the freedom to participate as and when they choose.

When developing the research questionnaire methodology, the following factors were considered:

- i. Stakeholder Identification;
 - a. Population
 - b. Sample
- ii. Bias;
- iii. Determining experts;
- iv. Questionnaire design and format;
- v. Pilot survey;
- vi. Questionnaire administration; and
- vii. Questionnaire response rate.

6.4.2. Stakeholder Identification

Figure 6.1 is an outline of the stakeholder identification process which was conducted to determine a sample for the survey questionnaires. The research will now discuss this determination process.

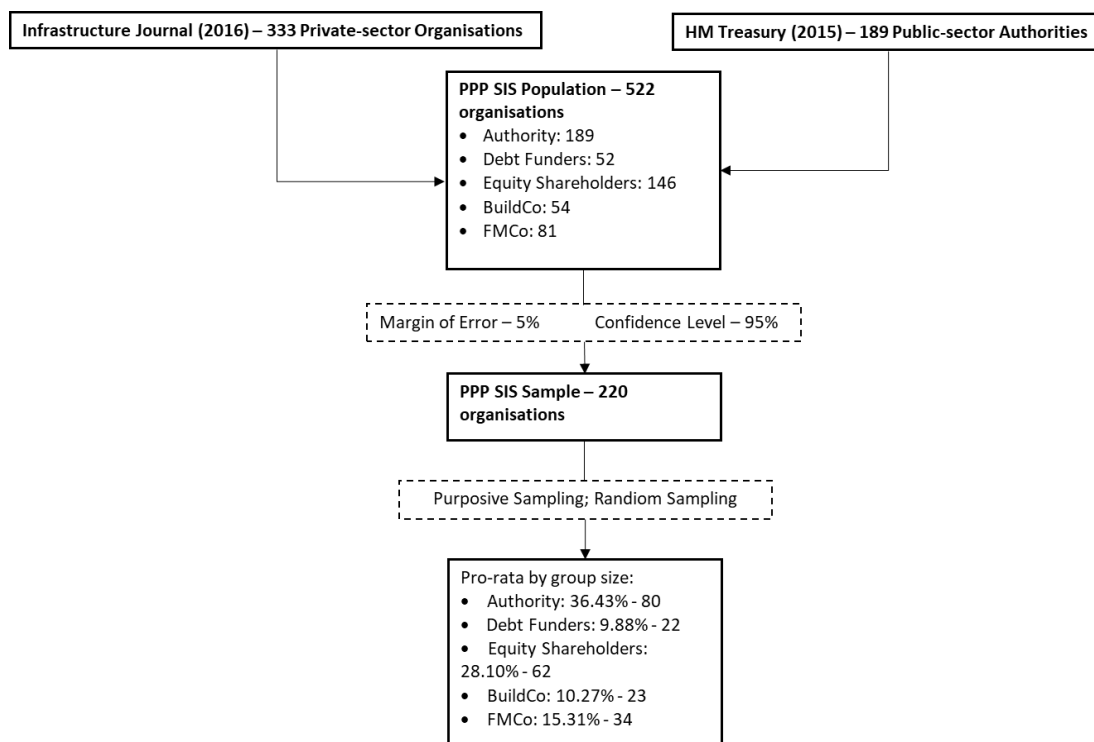


Figure 6.1: Population and Sample Selection Flow Chart from 2005 to 2016

6.4.2.1. Population

A population is the total collection of a group to be analysed, whereas a sample is a smaller selection of participants which are representative of the wider population. Sampling can be described as specified precision at minimal cost, meaning that through a strategic approach, a selected sample at lowest cost and time can be adequately precise for the research (Cochran, 1977). When determining a sample, Nardi (2006) recommends that the researcher should clearly define its unit of analysis. Through the application of *stakeholder theory*, chapter four identified five PPP SIS groups. These were the public-sector Authority, and the private-sector Project Company (ProjCo) constituent members, i.e. Debt Funders, Equity Shareholders, Construction Contractors (BuildCo), and the Service Provider (FMCo). These stakeholder organisations were the unit of analysis and a sample was selected according to this SIS classification framework.

Still, before a sample can be derived, the research must firstly determine a population. It has been noted by previous researchers that access to comprehensive and standardised UK PPP stakeholder datasets has been problematic. Set against this gap, in an effort to identify a population, the research considered information that was available through public sources, namely, the HM Treasury (2015) PFI summary data. This is a spreadsheet which is updated annually and holds key PFI projects details for both economic and social infrastructure

projects across the UK. These datasets encapsulate public-sector departments, procuring Authorities, sector, project status, date of financial close, details of unitary charge payments, equity holders and SPV details. While these datasets do beneficially identify the Authority, they do not supply a comprehensive list of all private-sector organisations involved in each project as per the SIS boundary specification defined in chapter four. Moreover, there were gaps in SPV details, equally, the datasets do not specify when investments have been refinanced or sold on in the secondary market. These difficulties were compounded by the permeable nature of PPP projects with many SIS organisations entering and exiting the projects at different stages of the project. Accordingly, there were concerns over the completeness of this information. To address these shortcomings, the research had to undertake further interrogation of these datasets before it could be satisfied with its reliability.

In order to validate this information, the research extracted all social infrastructure projects from the HM Treasury summary data and sought to confirm SIS involvement where identified in the datasets, but also to reconcile any data gaps. Using a combination of primary and secondary sources, this validation process comprised an extensive cross-examination of the datasheets set against evidence acquired from sources including but not limited to official government documentation, company websites, freedom of information requests, direct validation from SIS organisations, project documentation and other secondary sources. Still, predicated on the laborious and resource intensive nature of this process, it was apparent this task could not be comprehensively completed within the confines of a three-year PhD. On this basis, it was accepted that it is virtually impossible to identify the entire UK PPP social infrastructure population. Instead, the research set about identifying as many SIS as would be considerable viable to produce rigorous and robust academic findings.

Accordingly, the research turned to literature to consider how others have filled this vacuum. Several academics have deployed innovative strategies, for example, Li et al. (2005a) determined a population by employing datasets produced by PwC and Glasgow Caledonian University. Zou et al. (2013) utilised a snowballing approach which initially targeted individuals who attended an international PPP conference, whereas, Smyth and Edkins (2007) captured input from a single ProjCo for their questionnaire.

In light of this, the research likewise considered employing datasets sourced from an additional secondary source to compliment the shortcomings of the HM Treasury (2015) datasets. A number of potential suppliers were considered such as Preqin and Standard and

Poor's (S&P); however, these platforms were rejected on the grounds they tended to be orientated towards financial outputs. Ultimately, *Infrastructure Journal (IJ)* Online Database was opted for set in the context of the success both Haran et al. (2013) and RICS (2013) achieved using this source. Equally, *IJ* is deemed by industry practitioners to be a credible source having worked with over 80% of the global leading project financing lenders, 90% of leading law firms and 85% of the world's leading financial advisors. Hence, *IJ* datasets are mobilised on a daily basis to inform transactions around the world with key customers including BTMU, EDF International, Macquarie, Norton Rose and PGGM (*IJ*, 2017).

However, akin to the HM Treasury (2015) datasets, there were limitations to the data. *IJ* is representative from 2005 onwards. Also, *IJ* data does not distinguish between divisions within organisations despite some organisations having several projects remits. Furthermore, *IJ* does not provide contact details or identify the individual involved. Information is provided as an Excel spreadsheet information download which then requires extensive additional interrogation and profiling to derive meaningful outputs. As well as these caveats, there were likewise gaps in terms of the spreadsheet itself and *IJ* too does not specify the Authority. Thus, like the HM Treasury (2015) datasets, *IJ* also underwent an extensive interrogation process using primary and secondary information. This was in an effort to arrive at a point whereby the research was confident it had taken all reasonable steps to identify as many SIS as possible and safeguard the credibility of the study. This again included a refinement process:

- To verify that these private-sector organisations had indeed participated as per *IJ*;
- To verify these organisations were still operational;
- To identify the division of the company which participated and to confirm their project remit; and
- To ascertain the contact details of the individual involved.

In essence, the research sourced a population of SIS organisations from two sources:

- I. HM Treasury (2015) PPP summary data - Annually, HM Treasury produces an up-to-date spreadsheet comprising project details of Private Finance Initiative (PFI) and now, Private Finance 2 (PF2) transactions. However, stakeholder identification from this source comes with a caveat. The data pertains explicitly to PFI and PF2 arrangements and does not constitute other nuanced PPP models. Likewise, though the data was adequate to identify Authorities, these datasets fail to include private-

sector organisations. The incompleteness and inadequacy of this information meant this data had to be supplemented with an additional secondary source.

- II. *IJ* Online Database - Similar to Li et al. (2005a), datasets were obtained from an external source, namely; *IJ*. For the population identification, datasets were downloaded on 31/05/2016 and provided a list of 333 private-sector organisations. To negate time-lime differences, HM Treasury (2015) and *IJ* (2016) datasets were paralleled in terms of the timeframe: 2005 to 2015.

In total, a population of 522 PPP SIS organisations was identified. This population was comprised of: 189 Authorities; 52 Debt Funders; 146 Equity Shareholders; 54 BuildCo; and 81 FMCo.

6.4.2.2. Sample

While a population is the total group to be analysed, a sample is a smaller selection deemed to be representative of the overall group. A sample can circumnavigate accessibility problems as well as time and cost constraints while still being representative of the population. It is critical, the selection process of a sample is carried out in a strategised approach to ensure the research is both robust and defensible. To determine a sample from the known population, the following should be considered (Saunders et al., 2015):

- (i) Population Size;
- (ii) The margin of error; and
- (iii) Significance level.

At this juncture the research identified a population of 522 SIS organisations which was constituted from five SIS groups. To calculate a sample from the population, the next step was to establish acceptable parameters for margin of error and significance level. Roscoe (1975) believed academic research should apply a 10% margin of error. Contrarily, Wersberg and Bowen (1977) argued the margin of error should be closer to three or four percentile points for greater precision.

Within literature, a confidence level of 95% and a margin for error of five percent (5%) seemingly are the most prevalent values for academic research (Bryman and Bell, 2015; Saunders et al., 2015). This research will therefore adopt these metrics. According to Cochran (1977) the sample size is determined using the following formula:

$$\underline{n}_o = \frac{(t)^2 * (s)^2}{(d)^2}$$

Where α is the selected alpha level, where σ is the standard deviation of the population, and where d is the margin of error.

Computing this formula, from a population of 522, a sample of 220 was calculated. This sample size concurred with Krejcie and Mordgan (1970) who opined for a population of 500, a sample size of 217 was adequate. Furthermore, Bartlett et al. (2001) calculated a sample size of 218 respondents was sufficient at 5% margin of error and 95% confidence value for a population of 500.

To select the sample from the population, Nardi (2006) suggested this can be carried out by either probability or non-probability approaches. Probability sampling encompasses simple, stratified, systematic and cluster. Alternatively, non-probability sampling comprises convenience, purposeful, quota and snowball. The main difference between probability and non-probability strategies pertains to the likelihood of selection. In probability sampling, everyone has an equal opportunity to be selected. This approach facilitates easier generalisation from results, equally, there is greater reliability of population representation when the data is extrapolated. Alternatively, Nardi (2006) asserted, non-probability sampling cannot rely on the rationale of probability theory and thus it is not random. From non-probability sampling, it is more difficult to generalise. Conventionally in research, investigators have opted for probability sampling due to its greater rigour and accuracy; however, contingent on the difficulties of conclusively determining the population there is an element of uncertainty that the identified organisations are conclusively representative of the entire PPP population. The research will accordingly employ a purposive sampling strategy. With purposive sampling, to ensure the sample was characteristic of the population, the sample was deconstructed by SIS type and the size of each group was calculated pro-rata in proportion to the overall population. Organisations to be invited to participate were selected then through random sampling. Saunders et al. (2015) suggested that there is little difference between random and systematic sampling selection.

Table 6.2: Identified SIS Sample

	Population	Pro-rata SIS Population (%)	Sample Size
Authority	189	36.4	80
BuildCo	52	9.9	23
Debt Funders	146	28.1	22
Equity Shareholders	54	10.3	62
FMCo	81	15.3	34
Total	522	100.0	220

Table 6.2 displays the five SIS groups constituting the sample.

6.4.3. Bias

Bias can be characterised as the cognitive bases which sway responses from the accurate affecting validity and accuracy (Furnham, 1986). Within questionnaires, this may pertain to the wording of questions or the desire of the participant to answer as they view socially desirable (Kalton and Schuman, 1982). To mitigate response bias questions have been worded objectively and avoids leading questions. Moreover, the questionnaire underwent a pilot study to identify any potential problems or erroneous questions. In addition to this, participants have been selected through a justified and robust strategy.

6.4.4. Determining Social Infrastructure Stakeholder Participants

A review of research literature reveals there is no definitive format by which to define an expert participant contextual to PPP or collaborative research. To this end, to characterise experts, this research adopted approaches deployed in similar studies. Zou et al. (2013) defined their interview experts as senior managers or academics with rich experience in PPP, positioned within governmental departments, private companies, PPP consulting firms or universities. Their professional standings were senior official, senior lawyer, assistant professor, director, senior consultant, professor and managing director. Similarly, in their questionnaires, experts were those who needed to have a good knowledge of PPP, either with practical experience or in research. They must be positioned in a senior position and have hands-on experience with conducting PPP projects. Experts were also sourced from other groups internationally and professional groups in the PPP industry. Li et al. (2005a; 2005b) targeted directors or managers whereas Ng et al. (2012) targeted experts with at least five years' experience. Kumaraswamy and Anvuur (2008) followed Delbecq et al. (1975) and Okoli and Pawlowski (2004) to identify and solicit experts for a nominal group and Delphi processes. Ultimately, Kumaraswamy and Anvuur (2008) identified experts from a list of internationally regarded PPP experts which was contingent on their knowledge and experience in PPP involved in a 2005 conference in Hong Kong. Eventually, out of 21 invitations, 11 participated. Seven were academics, one in government and three in private organisations. Smyth and Edkins (2007) sourced experts from within a PFI project. Experts were executives and senior managers with key decision-making powers. Kwawu et al. (2010) distributed questionnaires to directors, bid managers, partners, associates and procurement managers.

From a review of these studies, this research defined experts as those who are stationed in a management or senior position and hold at least five years' experience positions within:

- Public-sector councils;
- National Health Service (NHS) trusts;
- Housing associations;
- Other public-sector departments;
- Construction organisations;
- Infrastructure developers;
- Service Providers; and
- Financing institutions.

By targeting individuals which meet these criteria, it is deemed these participants possess both practical experience in the management of projects but also the knowledge of organisational relationships to effectively contribute to the study. Ethical approval for the research design to target these individuals was granted by Ulster university on 26/08/2016.

6.4.5. Questionnaire Design and Format

Questions can be administered in two formats: closed and open questions (Saunders et al. 2015):

- An open question asks participants a question which they are free to answer as they see fit. Open questions are beneficial in that respondents are offered the flexibility to answer as they wish. Likewise, responses beyond the obvious can be elicited, and thus can be useful in ascertaining new information. In addition to this, open questions are not suggestive of an answer and hence can tap into the participant's level of understanding and interpretation. Nevertheless, there are pitfalls to this format; they are time consuming to analyse and code. Moreover, open questions can be more time and effort demanding on the participant (Nardi, 2006; Bryman and Bell, 2015).
- On the other hand, closed questions furnish the respondent with predefined options from which they select the most appropriate option. Closed questions are favourable on the grounds they are straightforward. Equally, the structured answers allow for easy comparison between variables and respondents. They also remove researcher interpretation and ambiguity. By offering predefined choices, the possibility of participant misinterpretation is minimised as well as being easy to complete. Notably

however, closed questions have been criticised because they are exclusive of alternatives not identified. Also, participants may feel the options are not indicative of their viewpoint or there may be overlapping of choices (Nardi, 2006; Bryman and Bell, 2015).

The purpose of the questionnaire was to evaluate variables, i.e. collaborative attributes. For this reason, the questionnaire was carried out in a closed question format. Though open questions are beneficial insofar as they permit potential further conceptualisation of alternative SIS collaborative attributes, by undertaking a thorough and extensive critical literature, this exploratory necessity was negated.

Closed questions typically are carried out through attitude scales such as semantic differential scales, Likert scales, ordinal or interval data or multiple-item scales; though Hoxley (2008) acknowledge semantic differential scales and Likert scales are the two most common. These scales were therefore further considered:

- a. The Likert scale - this design conventionally employs a symmetric five or seven-point scale by which respondents select their level of agreement or disagreement, and thus captures their range of attitudes. A Likert scale for example will offer 'strongly agree', 'agree', 'neutral', 'disagree', and 'strongly disagree' as options (Hoxley, 2008).
- b. The semantic differential scale - this scale was created by Osgood et al. (1957) and measures semantics. Using a bi-polar scale typically offering five or seven categories the participant is requested to select the option best representative of their position (Hoxley, 2008).

Using a pre-coded scale is advantageous in that it facilitates a simple data analysis task (Bryman and Bell, 2011). Both Dawes (2008) and Colman et al. (1997) deemed there to be little difference between a seven and five-point scale. A five-point scale was thus adopted for the closed questions again premised on its popularity (Tang and Shen, 2013; Chou and Pramudawardhani, 2015).

6.4.6. Questionnaire Administration

The survey questionnaire instrument can be administered in hard or soft formats. An electronic format was chosen for the research design predicated on the apparent advantages it offers over the traditional postal questionnaire design. Both Nardi (2006) and Bryman and Bell (2011) deemed electronic questionnaires to be more effective in eliciting improved

response rate. Furthermore, it has been argued electronic data can be aggregated quicker at a reduced cost as well as also lessen distribution time and minimise human error when transferring responses from hard to electronic format for analysis (Creswell, 2009; Saunders et al., 2015). In accordance with Peterson (2000) the questionnaire was clearly presented and suitably spacious to encourage participation. Moreover, corresponding questions were designed to be unbiased and objective, specific and grouped together with clear instructions as to how to respond.

As suggested by Salant and Dillman (1994) and Bryman and Bell (2011), a four-step procedure was employed to encourage maximum participation. Central to this strategy was the introduction of personality to enhance response rates. Bryman and Bell (2011) advocated for the use of a cover letter to personalise and explain the reasons for the research. Accordingly, the following approach was deployed:

1. Participants were contacted one week prior to the questionnaire in the form of a short information document. The document contained information pertaining to the researcher, the research, what is the purpose of the questionnaire and what was expected from the participant;
2. The second step was the distribution of the questionnaire. This dissemination process was carried out and managed using SurveyMonkey;
3. A follow-up email reminding participant of the questionnaire was sent two weeks after the questionnaires initial circulation. This email reasserted the importance of the research and its potential impact; and
4. Finally, to maximise participation, as well as building on the previous personal relationship development, invitees were contacted directly by telephone one week after the reminder was sent.

6.4.7. Pilot

Though questionnaires are an effective instrument, there are also risks which the research must mitigate against. These pitfalls can generally be categorised as low response rate, poor quality and misinterpretation of questions (Gillham, 2007; Fowler, 2009). Creswell (2003) argues to circumnavigate these issues, safeguards can be set in place through a pilot scheme. Hoxley (2008) agreed and was of the opinion, a pilot is fundamental to the success of questionnaires. According to Creswell (2006) a pilot scheme should be carried out in two phases: pilot pre-test and pilot scheme. The purpose of this is to test the research

instrument, the recruitment of respondents and to determine the feasibility of the study (Leon et al., 2011).

When determining a pilot size, literature varies. Connelly (2008) suggested a pilot study size should represent 10% of the parent study. Comparatively, Baker (1994) deemed 10 to 20% to be more adequate, whereas Isaac and Michael (1995) suggested 10 – 30 participants. Van Belle (2002) suggested 12 participants are suffice and Hill (1998) was of the opinion a pilot required 10 to 30 participants. Ng et al. (2012) piloted with 6 experts. Similarly, Li et al. (2005a; 2005b) piloted with experts from a single organisation.

For this research, the pilot study geographically was endemic to Northern Ireland (NI) and carried out in two phases: pilot pre-test and pilot scheme as suggested by Bryman and Bell (2011). In total, 15 participants contributed in the pilot study. This was a combination of academic colleagues and PPP experts. Seven contributed to the pre-test and eight to the pilot scheme.

6.4.7.1. Pre-Test

The pilot pre-test invited research supervisors, research colleagues and an industry advisory panel consisting of two PPP experts to participate in the study. This purpose of this was to test the research instrument. A link to the survey together with the project information document was distributed. Participants were asked to consider:

- I. Project information documentation comprehensibility;
- II. Consistency of questions and answer terminology;
- III. Clarity and structure of the questionnaire;
- IV. Spelling and grammatical errors; and
- V. Functionality of the survey.

Participants were additionally asked to verbalise their thought processes as they completed the questionnaire via semi-structured interviews. In doing so, participants provided insights into their interpretation of each question and any ambiguity was recorded. On average, the activity lasted around 20 minutes. Key Feedback suggested minor corrections; spelling mistakes and phrasing of questions. All changes were then applied to the questionnaire before proceeding to the pilot scheme.

6.4.7.2. Pilot Scheme

Having satisfied the pre-test, the survey was piloted with PPP social infrastructure stakeholders. The pilot scheme, in essence, was a mock survey paralleling the procedures and strategies to be deployed in the parent study. The purpose of the pilot scheme was to test the recruitment of respondents, to determine the feasibility of the scheme and ultimately safeguard the quality of surveys. From the sample, eight organisations involved in the NI PPP market were invited. Of this eight, six organisations agreed to participate; two rejected invitations. All SIS groups were represented. Semi-structured interviews again were utilised contingent on their perceived flexibility to probe and explore. Feedback was provided over the telephone to facilitate geographical and logistical flexibility. Akin to the pre-test, participants were asked to complete the questionnaire while simultaneously verbalising their thoughts and interpretations of each question to uncover any ambiguities or concerns. The pilot scheme also provided insights into the likely effectiveness of the deployed strategic system by which to maximise participation and respondent recruitment.

From the pilot scheme, it was established the survey completion time was circa 15 minutes. Moreover, a combined strategy of email, complimented by telephone contact was advantageous in encouraging participation. On average, the highest participation derived from a combination of a prior emailed invitation followed up by a telephone call. In terms of the questions, some experts opined that due to the limited use of Private Finance 2 (PF2), they were unable to effectively answer questions pertaining to this framework, and these questions should be optional. Also, it was suggested that the labels used as part of the Likert scale should be simplified and more consistent. All feedback was considered, and the appropriate changes were implemented.

The survey questionnaire which was utilised is enclosed in appendix B.

6.5. Statistical Data Analysis

Having determined the research design, the final section of this chapter identifies the proposed data analysis to be conducted on the survey responses. In addition to this, this section details the framework for the framework development based on the PPP stakeholder collaboration attributes. Hoxley (2008) suggests that the Statistical Package for Social Sciences (SPSS) is the most common and versatile analytical software for Windows based environments. Thus, for interrogation, data can be downloaded from SurveyMonkey in

Microsoft Excel format. From there, responses can be imported into SPSS from Microsoft Excel for analysis.

It is proposed data analysis will be carried out through a combination of descriptive and inferential techniques. Descriptive is applied to describe the data through tables, charts and graphs, whereas inferential is used to extract meaningful inferences concerning phenomena from a sample to a population (Burns and Burns, 2008).

6.5.1. Relative Importance Index

To discern the ranking salience of the PPP collaborative attributes, a relative importance index (RII) will be conducted. This will provide insight into the importance of each variable relative to the others through the Weighted Average (WA). Moreover, it will allow for comparison between and among SIS groups. The RII is a regression-based form of relative importance analysis. This approach is particularly insightful in the context of organisational related studies whereby research investigates a list of variables to understand their importance in driving a prediction. According to Tonidandel and LeBreton (2011), an RII is advantageous in that it offers a more holistic understanding of the explained variance per variable. This approach has been popular in similar research investigations (see Chan and Kumaraswamy, 1997; Sambasivan and Soon, 2007; Eadie and Miller, 2013; Eadie et al., 2013; McCord et al., 2015).

The RII is calculated using the following equation:

$$RII = \frac{\sum w}{(A \times N)}$$

Where w is the weight ascribed to each factor by SIS ranging from one to five, A is the highest weight (5) and N is the total number of SIS respondents.

6.5.2. Kruskal-Wallis H Test

Before investigating the statistical significance of the cohort holistically in preparation for the framework development, building on the findings of the RII, the research will consider the statistical significance of findings across SIS groups. To do this, the research will conduct an Analysis of Variance (ANOVA). An ANOVA is a data analysis technique used to examine statistical significance among groups in a multi-factor model (Bryman and Bell, 2015). However, before conducting the ANOVA, there are a number of assumptions the research must meet in order to qualify for the parametric or nonparametric ANOVA. Typically, this is predicated on the normality of the datasets and can be discerned either visually by

interpreting a normality curve or alternatively by computing the this will be confirmed by the Shapiro-Wilk test -Wilk W test of normality (Field, 2013). The null hypothesis for the Shapiro-Wilk W test is that data is normally distributed, and this can be determined through the P value. A P value less than 0.05 suggests that datasets are not normally distributed, and the null hypothesis should be rejected ($H_0 = P > 0.05$).

Stemming from the disparate norms, values and beliefs of the SIS categories, it is likely the data will not be normally distributed and there will accordingly be different opinions. Based on this assumption, the research will conduct the Kruskal-Wallis H test²⁰. Kruskal-Wallis is a non-parametric test used to determine stochastic dominance. In essence, it computes whether samples derive from the same distribution. Unlike other ANOVA tests, advantageously, Kruskal-Wallis accounts for unequal means and is not bound by normality distributions (Corder and Dale, 2009).

There are four assumptions for the Kruskal-Wallis H test. The first is that the dependent variable must be either ordinal or continuous. The second is that groups are independent. Thirdly, the data must be independent of observations meaning there are no participant overlaps across or within groups. Finally, the fourth assumption is that groups should have the same shape (Kruskal and Wallis, 1952). By adopting this test, the research will explore for significantly different perceptions among SIS categories of the salience of the collaborative attributes.

Literature indicates the Kruskal-Wallis H test is computed as per (Conover, 1999):

$$H = \frac{12}{n(n+1)} \sum_{i=1}^k \frac{R_i^2}{n_i} - 3(n+1)$$

Where k is the number of comparison groups, n is the total sample size, n_i is the sample size in the i th group, and R_i is the sum of the ranks in the i th group.

The null hypothesis for the Kruskal-Wallis H test is that all samples derive from the same population (Kruskal and Wallis, 1952). To determine the null hypothesis, this is indicated through the alpha level ($P > 0.05$). A P value below 0.05 indicates the null hypothesis can be rejected. Accordingly, in this instance, it is unlikely that the difference between groups stems from random sampling, but rather the groups have different distributions (Corder and Dale, 2009).

²⁰ This will be confirmed by the Shapiro-Wilk test before proceeding to the Kruskal-Wallis H test.

6.5.2.1. Dunn's Test

To compliment the findings of the Kruskal-Wallis H test, the research adopted Dunn's Multiple Comparison test. Dunn's test is a post-hoc pairwise test that often follows the rejection of the Kruskal-Wallis test and reports on stochastic dominance. It interprets average rankings of each group score computed as part of the Kruskal-Wallis test and therein identifies differences (Dunn, 1961). The null hypothesis for Dunn's Test is that there is no difference between groups, and the alternate hypothesis is there is a difference between groups. By conducting this test, this will enable the research to establish where SIS groups have significantly different perceptions of the importance of the stakeholder collaborative attributes.

Dunn's test is calculated according to the formula (Dinno, 2015):

$$z_i = \frac{y_i}{\sigma_i}$$

Where i is one of the 1 to m multiple comparisons, $y_i = WA - WB$, and σ_i is the standard deviation of y_i calculated from:

$$\sigma_i = \sqrt{\left\{ \frac{N(N+1)}{12} - \frac{\sum_{s=1}^r T_s^3 - T_s}{12(N-1)} \right\} \left(\frac{1}{n_A} + \frac{1}{n_B} \right)}$$

Where N is the total number of observations across all groups, r is the number of tied ranks, T_s is the number of observations tied at the s th specific tied value.

The results of the RII, Kruskal-Wallis H and Kendall's W are detailed in chapter eight.

6.5.3. Kendall's Coefficient of Concordance

While the RII is beneficial in that it provides insight into the relative importance of variables, and the Kruskal-Wallis H test is insightful for comparing between SIS groups, they do not however meet the statistical requirements necessary for the framework development. To satisfy this requirement, the research conducted Kendall's Coefficient of Concordance.

Kendall's Coefficient of Concordance measures levels of agreement on a scale ranging from zero to one. According to Kendall and Babington-Smith (1938), Kendall's W should be opted for when datasets derive from different groups or 'judges' and concern more than two variables. In similar built environment research, McCord et al. (2015) opted for Kendall's W to measure agreement among four stakeholder groupings which measured many variables using a Likert scale.

Kendall's W test is the statistical approach used to determine degrees of concordance. It is an estimate of the variance of the row of sums of ranks, divided by the maximum number of possible sum of ranks. The maximum number occurs when there is perfect agreement among respondents. Hence, the W value is determined on a scale between one and zero. One indicates perfect accordance whereas zero represents perfect disagreement among participants and responses were random. The null hypothesis for Kendall's W is:

- H_0 = There is no significant degree of agreement among participants, and responses are independent of each other ($H_0 = 0$).
- H_1 = There is a statistically significant degree of agreement among participants ($H_1 \neq 0$).

Literature suggests there are two approaches by which to compute Kendall's W statistic and carrying out of either route will produce the same results (Legendre, 2010):

$$S = \sum_{i=1}^n (R_i - \bar{R})^2$$

Or

$$S_i = \sum_{i=1}^n R_i^2 = SSR$$

S is the sum-of-squares over the row of sum of ranks R_i , and \bar{R} is the mean of R_i values. Derived from these equations, the following equations can be opted for (Legendre, 2010):

$$W = \frac{12S}{m^2(n^3 - n) - mT}$$

Or

$$W = \frac{12S_i - 3m^2n(n + 1)^2}{m^2(n^3 - n) - mT}$$

Where n is the number of objects and m is the number of variables, and T is a correction factor for the tied ranks:

$$T = \sum_{k=1}^g (t_k^3 - t_k)$$

Where t_k is the number of tied ranks in each (k) of g group of ties. The sum is computed over all groups of ties found in all m variables of the data table. $T = 0$ when there are no tied values (Legendre, 2010).

Just as Kendall's W is beneficial in that it offers insight into the degree of agreement or accordance, the P value is interpreted to indicate agreement significance (Legendre, 2010). The null hypothesis (H_0) states there is no significant degree of agreement among participants and responses are independent of each other. Conversely, the alternative hypothesis H_1 states there is significant agreement among participants. This is portrayed through the P value. Where the P value is less than 0.05 ($P < 0.05$), the null hypothesis (H_0) should be rejected and the alternative hypothesis (H_1) is accepted. Oppositely, if the P value is greater than 0.05 ($P > 0.05$), the null hypothesis of H_0 is accepted premised on there being inadequate information by which to support the alternative hypothesis of H_1 (Legendre, 2005).

6.6. Public-Private Partnerships Stakeholder Collaboration Framework Development

While the RII advantageously can offer insight into the salience of constructs, it does not offer meaningful outcomes by which to understand the relationship among attributes. For this reason, to develop a framework, two methods were considered: Factor Analysis (FA) or Principal Components Analysis (PCA). Hoxley (2008) described both these methods as effective data reduction methods capable of condensing a large group of multivariate variables, down to a smaller group of more meaningful dimensions. The purpose of PCA and FA is to summarise the maximum findings of the data and the variance within the data through relatively fewer components.

Both methods are considered as effective data reduction methods; however, seemingly many in literature often mistakenly conflate the two techniques. Instead, there are subtle nuances between PCA and FA.

Field (2013) explains, FA determines the nature of and the number of latent or underlying variables that account for measured variance and covariation between and among sets of observed indicators. In other words, FA measures hidden linkages or covariance influencing the variables which cannot be measured directly. For this reason, FA is commonly applied when there has been an antecedent assumption of relationships among variables.

Conversely, PCA assumes there are no latent relationships and instead is the process of reducing a larger set of observed variables into smaller components that summarise the variance. Indicators do not have to be correlated and the solution is generally a means to an end (Suhr, 2008). The finite amount of variance is equal to the number of observed (measured) variables, hence the number of components extracted will be equal to the

observed variance (Field, 2013). Though both approaches would be equally beneficial, this research has opted to conduct PCA on the basis it did not identify underlying connections between collaborative attributes.

The purpose of this method was to reduce the larger list of 27 PPP collaborative attributes to more meaningful findings reflected through several constructs. Hoxley (2008) deemed a list of more than 20 variables was a suitable number to undergo PCA.

Using SPSS version 17, PCA is computed by the equation:

$$R_{mm} = \frac{ZT_{mn} \times Z_{mn}}{N}$$

Norusis (2006) delineated the procedure of PCA into four distinguishable steps:

1. Production of a correlation matrix comprising all variables $R = \{R[R_{mm}]\}$ into standardised scores.
2. Interpretation of the principal components to determine the component loadings. The first component contains the largest amount of variance, the second component encapsulates the second largest amount of variance and so on.
3. Rotation of the variables to ensure each component has non-zero loadings for some of the variables.
4. After the computation of the rotation, the data matrix $X = (X_{[mn]})$ is transformed to a matrix of standardised scores (Z) determined through the mean and standard deviation for each row m of the data matrix where m represents the number of variables and n is the number of observations.

6.6.1. Application of Principal Components Analysis

To determine the number of principal components to be retained, the research applied an a-priori selection framework. This was constituted from the following:

- Sample size;
- Eigenvalue;
- Scree test;
- Component variance;
- Component retention; and
- Component scores.

6.6.2. Sample Size

In literature, there is discord regarding sufficient sample size for PCA. While some have displayed foremost preference for the overall sample size (n), others have predicated the quality of their PCA on sample size case ratios.

In terms of sample size, Osborne and Costello (2004) argued larger samples are advantageous in minimising errors as well as maximising generalisability. Comfrey and Lee (1992) attempted to codify the quality of sample sizes: 50 was very poor; 100 was poor; 200 was fair; 300 was good; 500 was very good; and more than 1000 was excelled. Differently, Doloi (2009) utilised PCA on a much smaller sample size of 67 premised on the extensive knowledge of the participating industry experts. Similarly, McCord et al. (2015) conducted PCA on a sample size of 49 participants.

Alternatively, case ratio has been adopted as a measure of sample quality. Bandalos and Boehm-Kaufman (2009) claimed the number of subjects should be around five to 10 times the number of variables. Gorsuch (1983) suggested a minimum subject ratio of 5:1 though higher ratios were preferable. Similarly, Nunnally (1978) encouraged the subject to item ratio of 10:1.

Notwithstanding this discussion, perhaps the most widely accepted and popular means by which to ensure accuracy and reliability of the PCA is through the application of the Kaiser-Meyer-Olkin (KMO) (1970) measure of sampling adequacy. According to Field (2013), the KMO identifies the ratio of the squared correlation between variables and is measured between one and zero where zero signifies the sum of partial correlations is large relative to the sum of correlations. Oppositely, a value proximal to one represents that correlation patterns are relatively compact and should therefore produce reliable components. Kaiser (1974) himself recommended that values greater than 0.5 are marginally acceptable. Moreover, Hutcheson and Sofroniou (1999) suggested the following guidelines: values of 0.90 and over were marvellous; values of 0.80 and above were meritorious; while values between 0.50 to 0.70 were poor to middling.

As well as the KMO, Bartlett's test of sphericity has also commonly been conducted to compare correlations between variables. Bartlett's test of sphericity compares the observed correlation matrix against an identity matrix to discern if variables significantly differed (Field, 2013). Bartlett (1954) advised a significance value of $P < 0.05$.

Predicated on the ubiquitous adoption of the KMO and Bartlett's tests throughout academic research, this investigation applied these two sampling measures to the development of the PCA framework.

6.6.3. Eigenvalue

In PCA, the eigenvalue is computed and used as an indicator of the substantive importance of a component. Kaiser (1960) suggested components with an eigenvalue greater than one should be considered as representing a substantive amount of variance. However, some in literature have contended this figure. Jolliffe (1972) argued an eigenvalue of one was too strict and instead something closer to 0.7 is optimal. Still, despite these disagreements, several studies continue to utilise Kaiser's eigenvalue value of one (see Li et al., 2005a; Field, 2013; McCord et al., 2015). This research will therefore also implement this value.

6.6.4. Scree Test

A scree plot is a graphical depiction of the total variance of the variables. This comprises the plotting of each eigenvalue (y-axis) against the value with which it is most associated (x-axis) (Cattell, 1966). Though it is possible for the number of components to equal the number of variables, by visually illustrating the variables through a graph, the salience or importance of each component becomes more apparent. Components range from those with the highest eigenvalues which typically have relatively few variables to the lowest which commonly comprise many variables giving the scree plot its very distinctive shape (Field, 2013). Cattell (1966) explains, the point of inflexion is apparent where this is an acute redirection and should be considered as the cut-off point. The scree plot will visually assist the statistical framework development.

6.6.5. Component Variance

As part of the PCA, a component matrix is produced which displays the cumulative variance of components. Field (2013) suggests components with eigenvalues above one should account for a minimum of 70 – 80% of the variance. Similarly, Suhr (2005) stipulated components should cumulatively comprise 70 - 80% of variance.

6.6.6. Component Rotation

Bryant and Yarnold (1995) described rotation as the process of rotating factors to achieve a simple structure. Yaremko et al. (1986) defined component rotation as the means to extract simple and interpretable components from a list of variables. Component rotation maximises

the loading of variables onto a component to which they relate the most whilst also minimising all other components. Within PCA, there are three orthogonal rotation (varimax, quartimax and equamax) and two oblique rotation (direct oblimin and promax) methods available in SPSS. These methods differ in terms of how they rotate the variables and therefore the output from SPSS will be dependent on the approach selected. Orthogonal rotation is conducted when components are considered independent, whereas oblique rotation is opted for when components are correlated. Field (2013) claimed orthogonal varimax is perhaps the most viable option in that it offers easily interpretable outputs in a simplified manner.

Variables were considered to be independent, hence this research also adopted the orthogonal varimax method.

6.6.7. Component Scores

The purpose of PCA is to identify fewer linear combinations of the original variables than can be adopted to summarise the data. In part, this comprises the measure of the substantive importance of variables ascribed to each component through statistical significance. Stevens (2002) proposed, component significance with a value greater than 0.4 are adequate for interpretive purposes. Similarly, Suhr (2008) recommended a weighting of 0.4 or more is substantially weighted. Alternatively, Kaiser (1974) advised using a value of 0.45. This value was applied by McClements (2013) in a relatable thesis in the built environment. The research will therefore also adopt a component weighted value of 0.45.

The outcomes of the PCA are contained in chapter nine of the thesis.

6.6.8. Reliability of Principal Components

The most common method to test the reliability and validity of PCA results is through the application of Cronbach's alpha ($C\alpha$) function. Cronbach's alpha ($C\alpha$) is a function of the variance within a component, and the covariance between components (Cronbach, 1951). In doing so, this indicates the consistency of a set of related items as a group. Cronbach's alpha was coined by Lee Cronbach in 1951 and is derived from classical test theory. Conceptually, it relates to the Spearman-Brown prediction formula and has subsequently been used in a number of domains including social sciences, business, health and medicine (Field, 2013).

$C\alpha$ is calculated using the following formula (Cronbach, 1951):

$$\alpha = \frac{k \times \bar{c}}{\bar{v} + (k - 1)\bar{c}}$$

Where k refers to the number of scale items, \bar{c} is the average of all covariances between items, and \bar{v} is the average variance of each item.

The theoretical value of $C\alpha$ ranges from zero to one on the basis that it is a ratio of two variances, and the variance in the denominator is always at least as large as the variance of the numerator. In terms of desirable values, Doloj (2008) codified ranges within these parameters as:

- A $C\alpha$ value greater than 0.90 is considered as excellent;
- Between 0.80 and 0.90 is good;
- 0.70 and over is acceptable;
- 0.50 to 0.70 is questionable;
- 0.60 to 0.50 is poor; and
- 0.50 and below is unacceptable.

6.7. Summary

This chapter has explored into research philosophy to determine an epistemological positivist and ontological objectivist stance to be carried out through a bi-quantitative research design. The research will conduct a market analysis of the UK PPP social infrastructure market which will be informed using datasets from // Online Database. The purpose of the market analysis is to add contemporary credibility to the investigation as well as to offer contemporary insights into the UK marketplace following the overhaul of these partnering frameworks. This market analysis is contained in chapter seven.

This market analysis is complimented with an electronic online survey questionnaire which will be utilised to gather attitudes towards PPP stakeholder collaboration. The survey will be disseminated using the survey host; SurveyMonkey and is employed to have SIS organisations evaluate the salience of the 27 PPP collaborative attributes determined from literature. Questions will be asked in a closed-ended format to enable simplified and consistent comparison and responses will be evaluated by means of a five-point Likert scale.

In addition to the design of the research methodology, this chapter has delineated the data analysis framework and the framework development strategy to be conducted in chapters eight and nine respectively. Data gathered from the surveys will be analysed to discern salience through a RII. The RII will be complimented with the Kruskal-Wallis H test to explore

for statistical differences among SIS groups. Kendall's Coefficient of Concordance has equally been adopted as the statistical test to determine levels of agreement of the SIS collectively. Following this, the research has elected to carry out PCA as the data reduction method. This methodological framework provides the framework development strategy for chapters eight and nine to meet objectives four and five of the research which concern the identification of the salient attributes of PPP stakeholder collaboration and the development of the PPP stakeholder collaboration framework.

CHAPTER SEVEN

**UNITED KINGDOM PUBLIC-PRIVATE
PARTNERSHIPS SOCIAL INFRASTRUCTURE
MARKET ANALYSIS**

7. United Kingdom Public-Private Partnerships Social Infrastructure Market Analysis

7.1. Introduction

In chapters two and three, it was determined that internationally Public-Private Partnerships (PPP) are being extolled as a mechanism to provide 'more and better' infrastructure. Although PPP has gained traction globally, in the United Kingdom (UK), despite being an instrumental mechanism for social infrastructure provision, the PPP social infrastructure paradigm has shifted downwards in terms of activity as this mechanism has been discredited for delivering poor Value for Money (VfM) to the taxpayer. However, in times of poor economic prosperity, even with its tarnished reputation, the UK government has declared its commitment to partnering arrangements and has subsequently stated that PPP will continue to be a viable provision model for 'more and better' social infrastructure.

Considered as one of the pioneers of PPP, the UK is often regarded as one of the most mature and transparent markets. Nonetheless, now with several nuanced models of PPP, in the vacuum of a centralised or comprehensive PPP database, there is ambiguity surrounding the future of UK PPP and uncertainty as to whether these reformations have addressed many of the inherent inefficiencies of previous frameworks. Using secondary datasets, the purpose of this chapter is to undertake primary analysis and provide contemporary quantitative findings in regard to the UK PPP social infrastructure paradigm in terms of capital value, deal number, sectoral breakdown, UK jurisdictional markets and financial structure. To do so, as per chapter six, to inform these quantitative insights into current activity, datasets have been sourced from *Infrastructure Journal (IJ)* Online Database and downloaded into Microsoft Excel on 31/06/2017. These datasets were subsequently extensively interrogated and profiled to extract meaningful findings and produce the tables and graphs contained in this chapter.

This chapter is accordingly structured as follows:

- A twelve-year overview of UK PPP social infrastructure investment;
- Consideration of PPP social infrastructure sectoral investment trends;
- Analysis of UK jurisdictional investment;
- Financial structure of UK PPP social infrastructure transactions; and
- A reflection on key findings of UK PPP social infrastructure market analysis.

Together with the literature reviewed in chapter three, the findings from this chapter will have an important contemporary input into this research. Furthermore, the findings from

this chapter will enable the research to credibly meet objective two which concerns evaluating the role of PPP models as a vehicle for ‘more and better’ social infrastructure provision in the UK.

7.2. Twelve-Year Overview of United Kingdom Public-Private Partnerships Social Infrastructure Investment

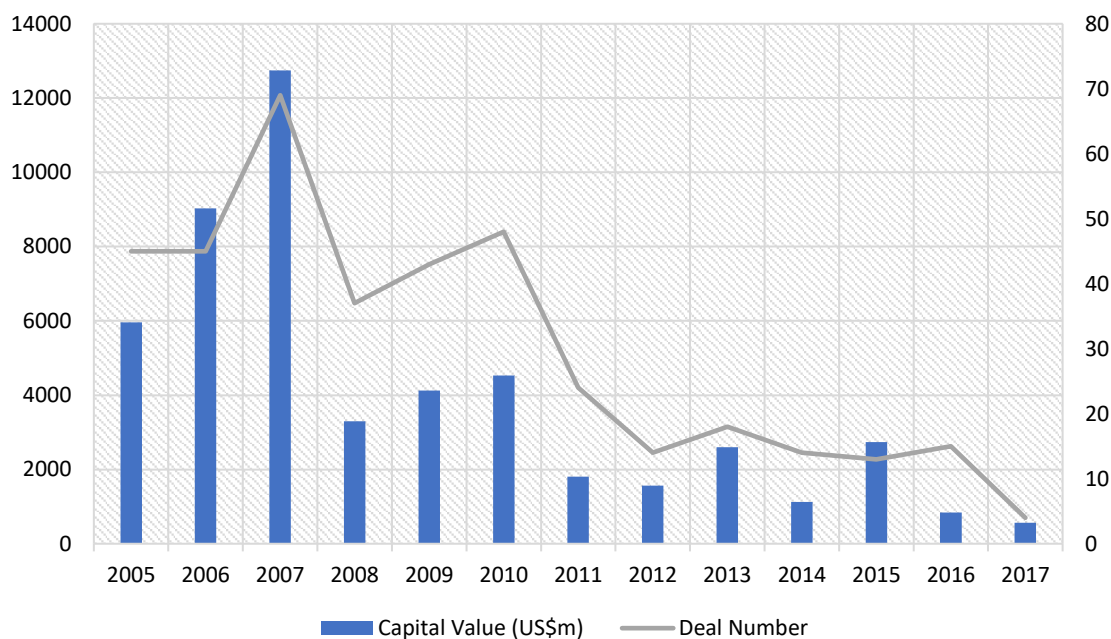


Figure 7.1: UK PPP Social Infrastructure Market Activity by Capital Value and Deal Number from 2005 to 2017 (IJ, 2017)

Figure 7.1 demonstrates UK PPP social infrastructure market activity from 2005 to 2017. In total, since 2005, the UK PPP social infrastructure market has accumulated a total of US\$50.93billion (bn) of private finance, channelled into 389 projects (IJ, 2017). Demonstrably evident, the UK PPP social infrastructure investment paradigm has acutely declined since 2007. As identified in chapter three, in the years preceding the Global Financial Crisis (GFC), social infrastructure PPP ventures were systematically growing both in terms of transaction numbers and capital value. In 2005 and 2006, according to IJ, capital value totalled US\$5.80bn and US\$9.03bn respectively (IJ, 2017)²¹. However, just like other financial markets, the 2008/09 GFC was a watershed in the UK PPP marketplace. The mass exodus of banks from the marketplace allied with tightened capital regulatory requirements of those who remain served to curtail the availability of private capital for infrastructure lending.

²¹ The US dollar is the international currency of infrastructure investment implemented by IJ. This facilitates greater comparison across multi-jurisdictional markets.

Accordingly, this transpired in a gap between investment needs and capital supply. *IJ* (2017) figures show that in the short-term period after the GFC, the UK PPP social infrastructure market contracted and in capital value terms, activity eroded from US\$12.74bn in 2007 to US\$3.30bn in a single year (2008) representing a downturn of US\$9.44bn. Accordingly, while the GFC had an acute impact on UK PPP, it is appropriate to note that the limited PPP investment in spite of economic improvements following 2007 indicate there are other inefficiencies within PPP.

In spite of the immediate downturn in 2008, the capital value of ventures significantly grew in 2009 and 2010 underpinning the salience of PPP in the UK as an infrastructure provision framework by which to bolster and stabilise socio-economic prosperity. PPP was instrumental in the UK government's stimulus package premised on its wherewithal to generate short-term job creation as well for medium to long-term socio-economic development (Haran et al., 2013). The Private Finance Initiative (PFI) specifically was used as a strategic mechanism by which to insulate industries such as the construction sector from the chronic effects of the GFC (Asenova and Beck, 2015). Accordingly, PPP deal flow expanded after 2008, and by 2010, investment capital had increased to US\$4.53bn in 48 ventures (*IJ*, 2017).

Nonetheless, in the following period, subsequent to the removal of PFI grants and the cancellation of the Build Schools for the Future (BSF), PPP activity started to decline. Set against the background of increasing politicisation, PPP lost traction. Mounting concerns of VfM allied with the reduced availability of private capital culminated in a fall in both capital value and project numbers terms. By 2011, *IJ* (2017) figures show PPP social infrastructure provision bottomed since pre-GFC levels at US\$1.80bn and as the Conservative-Liberal Democrat Coalition government replaced Labour, UK PPP activity in effect came to a halt. The moratorium in market activity as the UK transitioned from PFI to nascent reformed frameworks explain the low levels of market activity in subsequent years to 2010.

Against the backdrop of VfM concerns, chapter four identified that the devolved governments of the UK have rolled-out nuanced modalities of PPP to rectify the inherent inefficiencies of PFI as well as to stimulate alternative sources of capital. Notwithstanding these reformations, figures from *IJ* (2017) reveal UK PPP market activity continues to be muted and has failed to recover despite the introduction of newer partnering models.

Demonstrated in figure 7.1, regardless of these changes in PPP, activity continues to be relatively sedate with fluctuating signs of growth. Since 2011, 2015 was the highest in terms

of capital value, constituting US\$2.74bn levered into 13 projects, whereas 2013 was the highest by project number comprising 18 projects valued at US\$2.60bn of private investment. In this year, investment capital increased by US\$1.04bn from the previous year; 2012. Similarly, in 2015, the capital value of transactions achieving financial close increased from US\$1.13bn in 2014 to US\$2.74bn.

Still, lowest market figures have transpired in 2016 equating to US\$0.84bn of outlay encapsulated in 15 projects. These figures represent a pronounced difference between the peak in 2007 and the valley in 2016 of US\$11.90bn and 54 projects. Worryingly, 2016 has been the lowest by deal number and 2017, as of 31/06/2017 also has continued to exhibit a similar pattern. Identified in chapter three, one of the prominent concerns is the absence of a defined investment pipeline or social infrastructure investment programme. This information void has meant it remains unclear what are the intentions of the UK government for PPP which is particularly pertinent set against the fundamental changes inherent to the mechanism. Furthermore, as of June 2017, the government has announced it no longer intends to develop a pipeline but rather PPP will be utilised reactively.

7.3. United Kingdom Public-Private Partnerships Social Infrastructure Sectors

Figure 7.2 denotes the sectoral breakdown of social infrastructure supplied through the PPP mechanism over the twelve-year period from 2005 to 2017. Within this twelve-year period, education has been the largest social sector accounting for US\$22.72bn of investment into 176 contracts. This was followed by health which has accumulated US\$19.94bn of private investment into 132 projects.

Ostensibly, through capital provision schemes such as the BSF and LIFT, investment into these two sectors has meant investment surpassed that of all other sectors. Together, education and health account for 83.7% of market capital and in terms of contract value, education projects have been smaller in scale compared to health. The average deal size of education contracts was valued at US\$0.13bn, while health was circa US\$0.16. Notably, though education and health have been the two most foremost sectors, they have both undergone acute constriction. At the peak of market activity in 2007, education, in a single year accounted for US\$5.23bn invested in 25 agreements. In comparison, in 2016, at the lowest level of market activity, nine education contracts achieved financial close, valued at US\$0.58bn. This represents a difference of US\$4.65bn by capital value and 16 projects. Similarly, health constituted a larger portion of the market equating to a capital value of US\$6.15bn in 32 contracts. The use of PPP to provide health facilities and services also

declined from the highest levels of activity in 2007 at US\$6.15bn in 32 ventures to US\$0.25 in six projects.

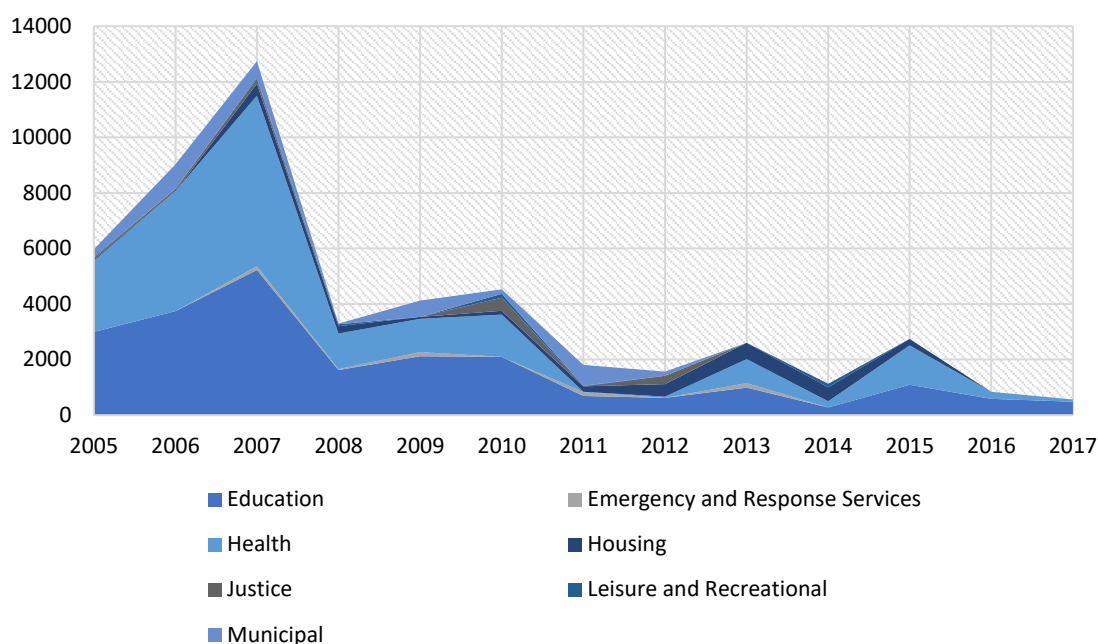


Figure 7.2: UK PPP Social Infrastructure Market by Capital Value (US\$m) 2005 – 2017 (IJ, 2017)

In comparison, as per figure 7.3, all other social sectors occupied significantly lesser presence in the UK PPP market. By capital value, municipal accounts for 6.7% of the market share, housing constitutes 5.7%, justice represents 2.1%, emergency and response encapsulates 1.2%, and leisure and recreational captures 0.7% of the PPP social infrastructure market.

Notably, in more recent years, except for health and education, PPP provision in all other sectors has all but ceased. Two leisure and recreational ventures achieved financial close in 2014, constituting US\$0.12bn. Since then, there have been no further deals in this social sector. The last municipal project signed was in 2012 equating to a transaction value of US\$0.14. Similarly, the latest justice ventures agreed were in 2012 which were the Avon and Somerset Police Authority redevelopment and West Yorkshire Police PPP deals which together comprise US\$0.30bn of investment.

Two emergency and response services agreements achieved financial close in 2013, constituting US\$0.15bn of private capital. Since then, there has been no further activity in this sector. In contrast, housing has exhibited nascent signs of growth post GFC. In the context of a chronic housing shortage, from 2012 to 2014, average housing investment increased to US\$0.5bn year-on-year exceeding figures pre-2007; though the last housing

venture to achieve financial close was in 2015, constituting a reduced capital value of US\$0.23bn. With a massive shortfall in housing supply, the housing sector may be a credible area for future PPP provision growth.

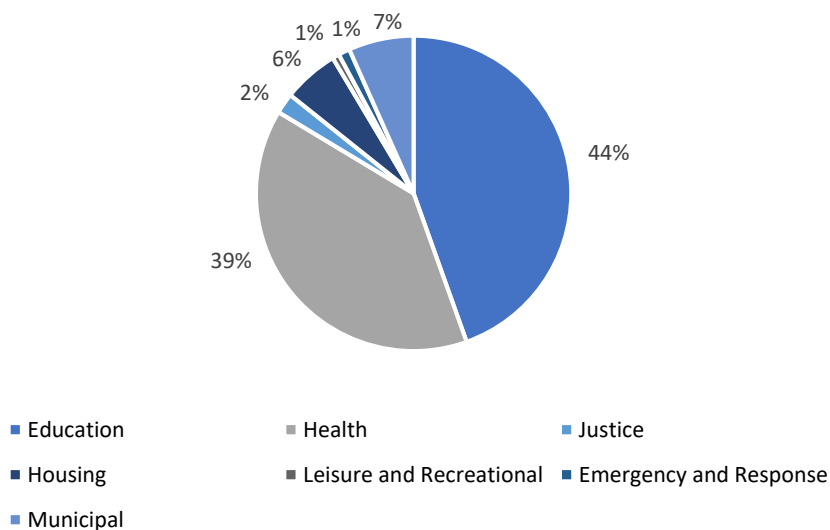


Figure 7.3: UK PPP Social Infrastructure Sectoral Distribution by Capital Value (%) (11, 2017)

7.4. United Kingdom Public-Private Partnerships Jurisdictional Markets

Figure 7.4 displays an accumulated breakdown of the four regional PPP markets in the UK, namely: England, Northern Ireland (NI), Scotland and Wales. Evidenced in this figure, all markets have in the main contracted compared to pre-GFC levels though there have been fluctuating and periodical signs of growth. It was determined as part of chapter three that all UK jurisdictions have developed their own PPP models to replace PFI. Even so, evidenced above market activity remains relatively sedate; though there have been some fluctuations.

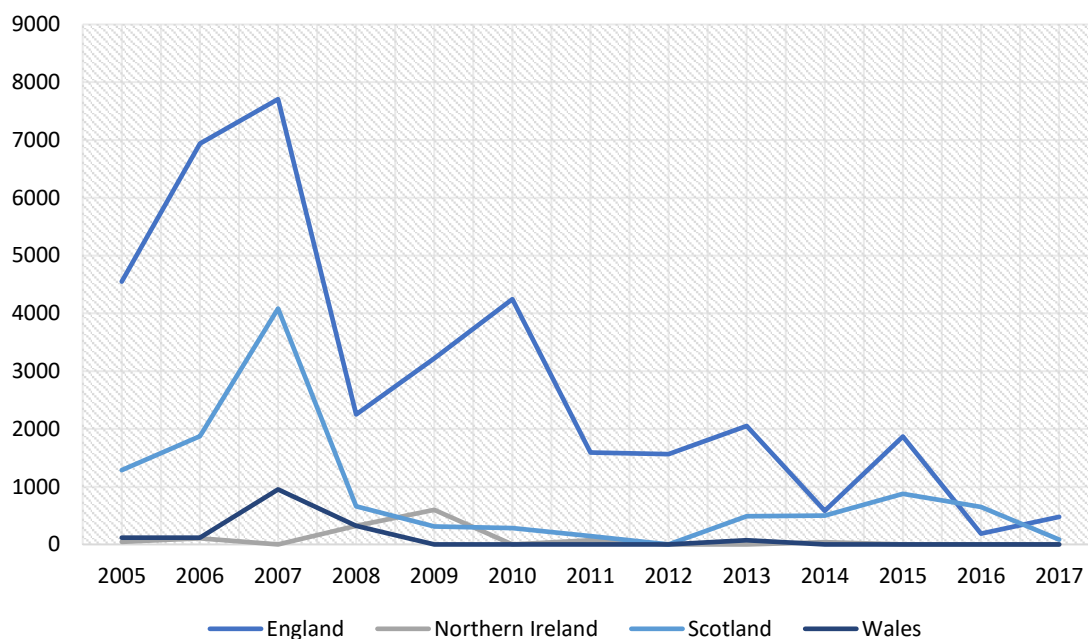


Figure 7.4: Regional UK PPP Social Infrastructure Market Activity by Capital Value (US\$m) 2005 – 2017 (IJ, 2017)

To add further insight into these investment trends, in addition to an overview, table 7.1 exhibits the breakdown of regional PPP markets by social infrastructure sector. The research will now analyse these markets individually in the following.

Table 7.1: Sector Breakdown of Regional UK PPP Social Infrastructure Market Activity (US\$m) 2005-2017 (IJ, 2017)

	Education	Emergency & Response	Health	Housing	Justice	Leisure & Recreational	Municipal	Total
England	14.59	0.60	14.67	2.92	0.91	0.32	3.23	37.23
Northern Ireland	0.67	0.00	0.43	0.00	0.00	0.04	0.04	1.18
Scotland	7.04	0.00	3.89	0.00	0.16	0.00	0.14	11.23
Wales	0.34	0.00	0.95	0.00	0.00	0.00	0.00	1.29
Total	22.64	0.60	19.94	2.92	1.07	0.36	3.41	50.93

7.4.1. England

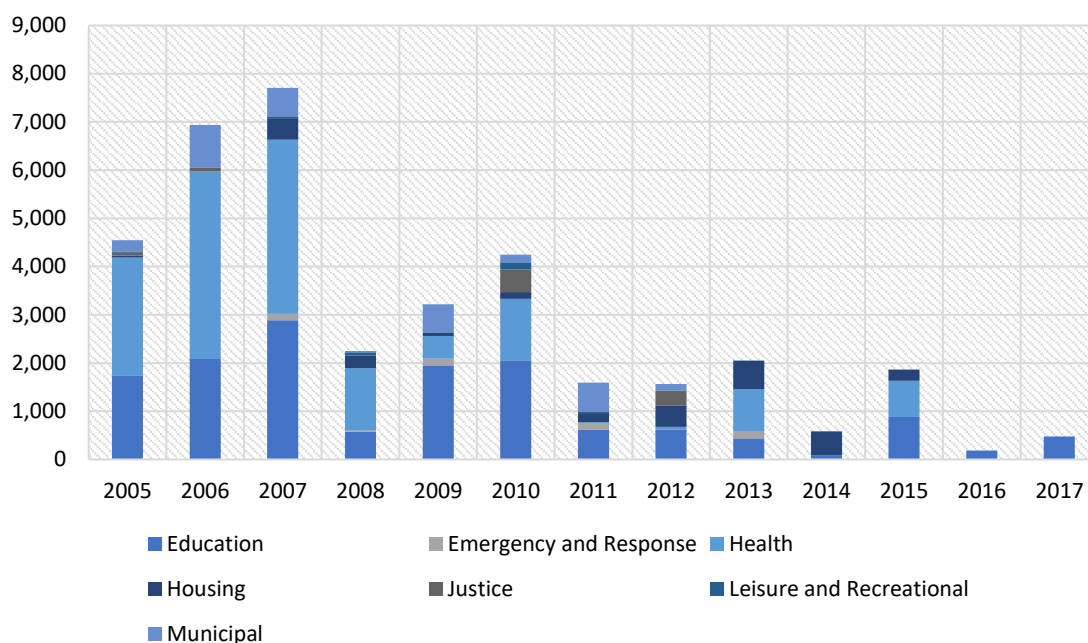


Figure 7.5: English PPP Social Infrastructure Market Activity by Capital Value (US\$m) 2005 – 2017 (IJ, 2017)

Figure 7.5 denotes IJ (2017) data in regard to the English PPP social infrastructure market by project value in the timeframe from 2005 until 2017. The English PPP market has been the largest of all UK regions and vastly exceeds that of other jurisdictions. Of the UK markets, since 2005, the English PPP market has constituted US\$37.23bn of investment, equating to a 73.1% share of the total market value (IJ, 2017). Like the UK market generally, English PPP ventures were expanding in the years leading up to the GFC, valued at US\$4.55bn in 2005 and US\$6.94bn in 2006 before cresting in 2007 at US\$7.71bn. Private investment plunged to US\$2.25bn in 2008, representing a difference of US\$5.46bn from 2007 to 2008. In the short-term period thereafter, investment systematically increased from 2008 to 2010 as was earlier explained. Since this second peak in 2010, the English market has failed to re-establish itself to previous levels. Ultimately, a constrained lending environment allied with concerns pertaining to the PFI has culminated in 2013 to the Coalition government launching Private Finance 2 (PF2).

One of the fundamental differences between PF2 and PFI has been the introduction of the public-sector as an equity co-investor. By directly investing into the project, it is anticipated this will cultivate greater stakeholder collaboration reflected through an improved partnership between contractual stakeholders (Read, 2013). Indeed, the salient emphasis

attached to collaboration in this framework adds credibility to the value of this work. Still, despite the reformed PF2 framework, the English market continues to exhibit tapered market activity and instead of growing, it has bottomed in 2016, comprising US\$0.19bn of private capital. There are several sticking points preventing the augmentation of the English market. Literature points towards the equity funding competition as a barrier to market growth. Also, the introduction of the public-sector equity co-investment has created scepticism; however, most pertinently, the politicisation of the PPP mechanism as well as the absence of a defined pipeline has perhaps engendered the greatest concerns.

Shown in table 7.1, education and health have and continue to dominate English PPP outlay. In capital value terms, health has accumulated the greatest transactions capital, valued at US\$14.67bn. Education ranked second encapsulating a capital value of US\$14.59bn from 2005 to 2017. Comparatively, all other social infrastructure sectors have displayed muted provision. Municipal ranked third largest, constituting US\$3.23bn which reveals a seismic gap from second and third of US\$11.37bn. It is also noteworthy; the English market has exhibited burgeoning traction for housing PPP arrangements identified earlier in this chapter.

Being the largest market, the UK government has been fundamental in driving growth; however, PPP, now heavily tarnished has meant there has been little political will for these frameworks despite the curtailed availability of public capital in the current economic landscape. Instead, economic infrastructure continues to take precedence and large-scale projects such as High Speed 2 (HS2) amongst others continues to be prioritised by the English government.

7.4.2. Northern Ireland

The NI PPP market is the smallest of the jurisdictions in terms of capital value, equating to US\$1.18bn or 2.3% of overall UK market value. *IJ* (2017) data indicates market activity has all but ceased in NI and over the twelve-year period from 2005 to 2017, activity has been intermittent. The last transaction agreed in NI was in 2014 which was the Windsor Park Stadium Redevelopment. This was preceded by a three-year activity moratorium from 2011 which constituted two education ventures, namely; Lagan College PPP and Tor Bank School PPP.

Since 2005, PPP investment has been channelled into education, health, leisure and recreational and municipal transactions. Much like the wider UK market, education and health respectively have been the predominant sectors for PPP utilisation since 2005.

Education constitutes 56.7% (US\$0.67bn) of the market by capital value and health encapsulates 36.1% (US\$0.43bn) equating to 92.8%. There have been no agreements to achieve financial close in justice, housing and emergency and response projects in the twelve-year period from 2005 to 2017. Unlike other UK regions which peaked in 2007, the NI market (US\$0.6bn) exhibited the greatest levels of activity in 2009 in the immediate period post GFC. As the NI Executive sought to reduce public-sector expenditure per head to mirror that of the rest of the UK, PFI was a method by which to bolster private-sector activity in the NI economy (Hellowell et al., 2009). In total, these transactions comprised the agreement of three education contracts and one health arrangement.

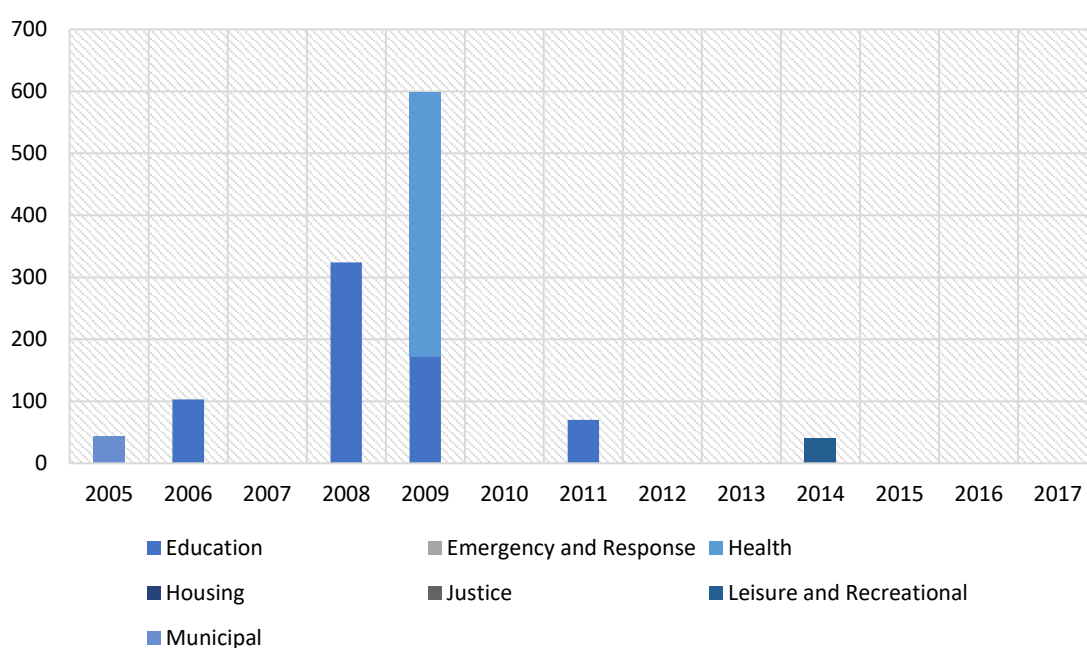


Figure 7.6: Northern Irish PPP Social Infrastructure Market Activity by Project Value (US\$m) 2005 – 2017 (IJ, 2017)

Like the rest of the UK jurisdiction, NI also has developed its own PPP framework to replace PFI. The Third-Party Developer (3PD) was introduced in 2015; however, with no ventures yet to achieve financial close, it is unclear if this reformed framework has addressed the concerns encircling PFI. NI is heavily dependent upon the annual block-grant capital transfer from the UK government and as a result in the main it has preferred to opt for traditionally procured social infrastructure. Because of this, the long-term commitment of PPP has meant that NI has been unwilling to commit to these partnerships. Furthermore, the limited mobilisation of PPP in NI and political uncertainty are major barriers to increased private-sector participation.

7.4.3. Scotland

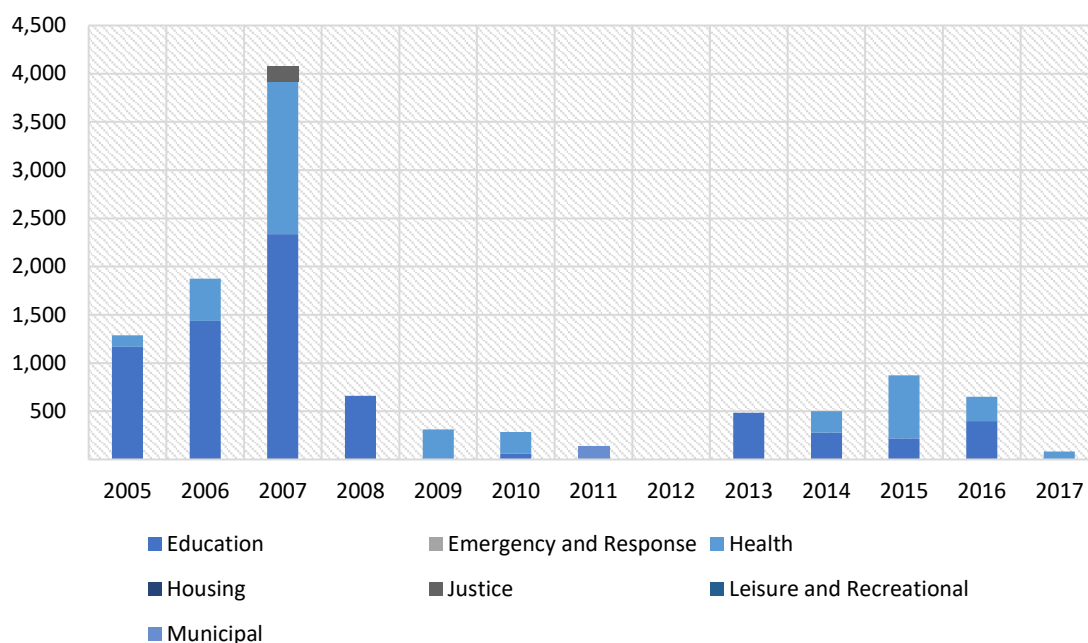


Figure 7.7: Scottish PPP Social Infrastructure Market Activity by Project Value (US\$m) 2005 – 2017 (11, 2017)

The Scottish social infrastructure PPP market was valued at US\$11.23bn equating to 22.0% of UK PPP market capital investment between 2005 and 2017. The Scottish market is ranked second in the UK according to capital value and like all other UK jurisdictions, PPP in Scotland was expanding both in terms of capital value and deal number leading up to the GFC. In 2005, the Scottish PPP social infrastructure market was valued at US\$1.29bn. This increased in 2006 to US\$1.88bn and significantly jumped to US\$4.08bn in 2007. The Scottish market peaked in 2007 encapsulating US\$11.23bn of capital outlay. Post GFC, mirroring wider market activity, Scottish PPP appetite has been remarkably tapered in the short-term period thereafter. The market bottomed in 2012 with no ventures achieving financial close which coincided with the cancellation of the PFI. Since this nadir, evidenced in figure 7.7, Scotland has exhibited a burgeoning revival and in 2016 it surpassed England for the first time in capital value terms, ranking it as the leading market in the UK. In this year, Scotland invested US\$0.65bn whereas England invested US\$0.19bn.

Against the backdrop of new investment frameworks, since 2012, Scottish PPP investment has consistently increased annually and peaked in 2015 at US\$0.87bn. In 2016, though the same capital value was not replicated, as a proportion of the UK market, Scotland's presence has grown; of the 15 PPP projects signed in 2016 across all UK markets, 14 were agreed in

Scotland constituting 93.3% of all UK PPP deals. Projects have emanated from both the hub initiatives and the NPD model. Despite these positive signs, it is noteworthy that the market continues to underperform in comparison to levels recorded pre-GFC.

Primarily, Scottish PPP investment has been encapsulated within education and health projects as well as minor portions appropriated to justice and municipal. More recently, the Scottish government has focused on PPP to provide explicitly either health or education with little appetite for other social infrastructure sectors with the last exception being municipal PPP ventures in 2011. Since 2005, education has accounted for a share of the Scottish market of 62.7% (US\$7.04bn). Health has accrued 34.6% of capital outlay (US\$3.89bn), whereas justice represents 1.45% of the Scottish market at US\$0.16bn and municipal 1.26% at US\$0.14bn. In contrast to the other UK markets, fundamentally, the appointment of the SFT as well as a clear declaration of commitment to PPP has meant there is relative confidence in the Scottish PPP market. This may explain its growth over the previous seven years. Moreover, the Scottish government has announced PPP will continue to be a credible model for health and education provision.

7.4.4. Wales

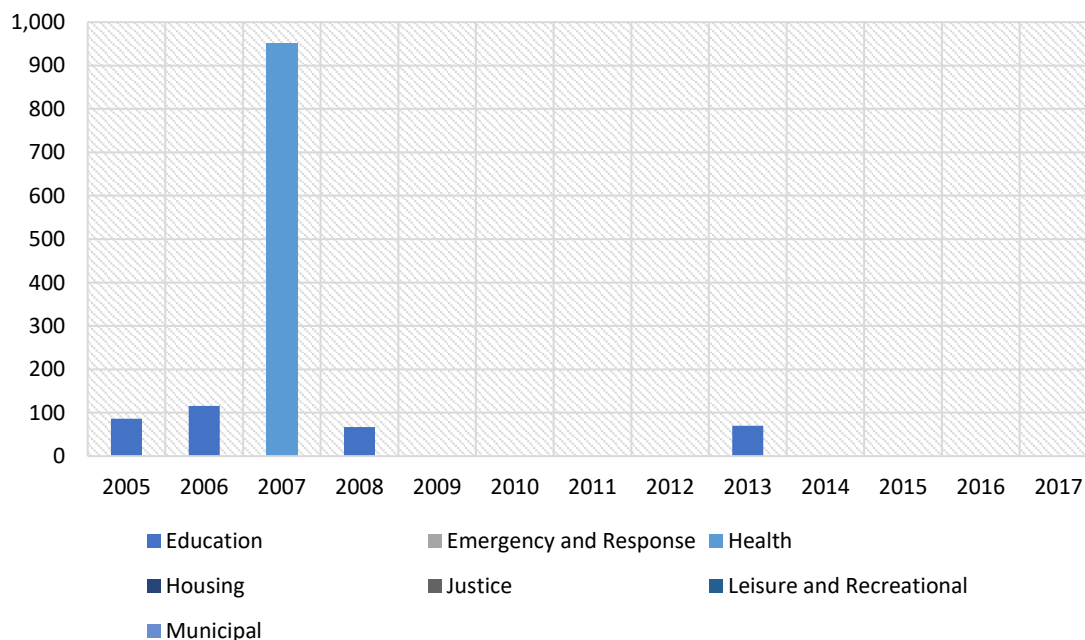


Figure 7.8: Welsh PPP Social Infrastructure Market Activity by Project Value (US\$m) 2005 – 2017 (IJ, 2017)

Finally, the last of the four regional markets is Wales. Figure 7.8 shows Welsh PPP market activity from 2005 to 2017. Since 2005, all Welsh PPP ventures have comprised of either

education or health contracts. Education accounts for a capital value of US\$0.34bn, equating to 26.2% and health constitutes 73.8% at US\$0.95bn.

Akin to the rest of the UK market, though relatively smaller compared to England and Scotland, Wales likewise was expanding in the period preceding the GFC. Capital value increased almost tenfold in the two-year period from 2005 to 2007 equating to a growth from US\$0.09bn to US\$0.95bn of private investment. Of all Welsh social infrastructure PPP activity over the last twelve-years, 73.6% of it was recorded in 2007 which equalled US\$0.95bn of the US\$1.29bn total. Having also developed its own Mutual Investment Model (MIM) in 2017, the Welsh Assembly has displayed renewed interest in cross-sectoral partnering; however, like NI, still in its infancy, it remains unclear if this reformed mechanism has addressed many of the inherent criticisms of PFI.

7.5. Financial Structure of United Kingdom United Public-Private Partnerships Social Infrastructure Transactions

Identified in chapters two and three, the financial landscape of infrastructure investment has undergone profound transformations over the previous decade. It is accordingly worthwhile to consider how this has affected the financial structure of PPP arrangements. Premised on *IJ* (2017) data, total debt financing from 2005 to 2017 has accumulated US\$45.34bn of private investment and equity capital has totalled US\$5.59bn. These compiled figures reveal the market averaged a debt-equity ratio of 89:11, closely correlating with literature which stated PFI arrangements were typically highly geared circa 90:10 debt-equity.

Table 7.2: UK PPP Social Infrastructure Market Debt-Equity Composition (*IJ*, 2017)

Year	Debt (US\$bn)	Equity (US\$bn)	Debt-Equity Ratio
2005	5.04	0.92	85:15
2006	8.42	0.62	93:7
2007	11.72	1.02	92:8
2008	2.99	0.31	91:9
2009	3.62	0.51	88:12
2010	4.00	0.53	88:12
2011	1.64	0.16	91:9
2012	1.37	0.19	88:12
2013	2.09	0.51	80:20
2014	1.04	0.08	93:7
2015	2.19	0.55	80:20
2016	0.74	0.10	89:11
2017	0.48	0.08	85:15

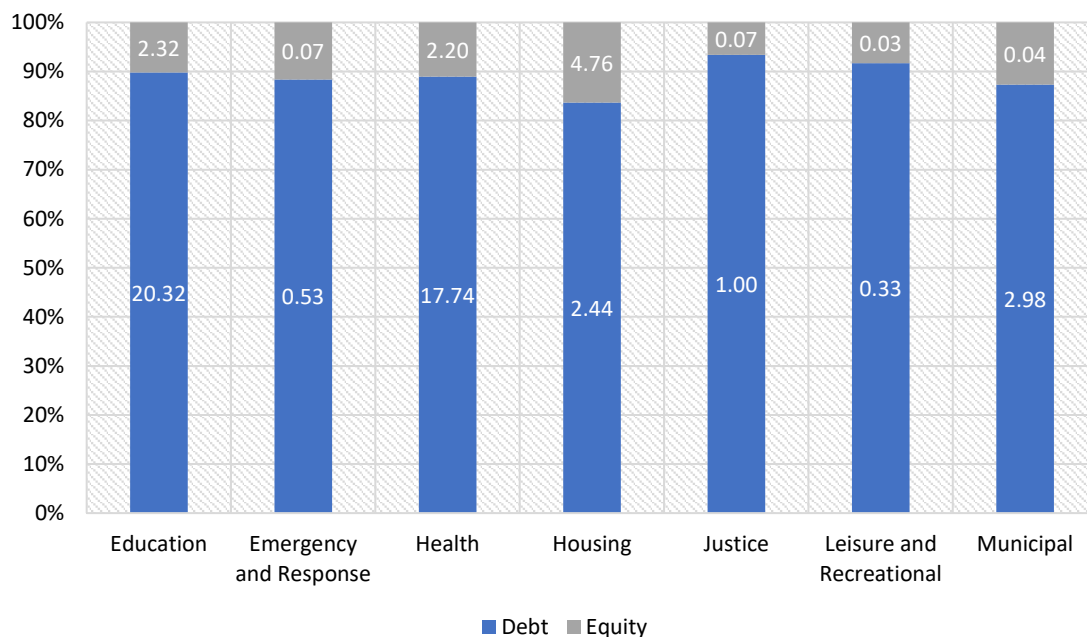


Figure 7.9: UK PPP Social Infrastructure Market Gearing Composition by Sector (US\$bn) 2005 – 2017 (1J, 2017)

Table 7.2 exhibits the deconstruction of the annual financial structuring of UK PPP social ventures in terms of debt-equity capital over the twelve-year period from 2005 to 2017. This is complimented with figure 7.9 which illustrates the financial composition per social infrastructure sector in percentile points together with capital value over the same twelve-year period.

In the two-year period post the GFC, in 2009 and 2010, debt-equity ratios dropped to 88:12. This may be explained by reduced debt contributions resultant of illiquidity in the markets and the need to offset reduced private capital from banks through increased shareholder contributions. Following this, figures returned to relative normality again in 2011 with greater debt filtration into projects, expressed through financial structuring of 91:9 debt-equity. In the following year; 2012, debt lending again lessened before an acute constriction in 2013. In 2013 and 2015, the financial structure of transactions dropped to 80:20 debt-equity, while in 2014, the ratios increased to 93:7.

Principally, these trends can be attributed to the differences between the financial structuring in the English and Scottish markets and the influence of different market activity. With the Scottish markets increasingly holding a greater presence in the PPP private finance sphere, the high leveraging ratios had significant influence on these proportions. Scottish PPP ventures were recorded as being leveraged at 91:9, with debt apportioning US\$10.17bn

and equity accounting for US\$1.07 of private outlay. Alternatively, in England, the composition of arrangements has been less consistent. Fundamentally, English PPP transactions have been highly leveraged circa 88:12 across the twelve years. Debt lending has constituted US\$33.03bn of private outlay and equity investment comprises US\$4.20bn of private finance. Still, more recent *IJ* (2017) data highlights remarkable shifting trends. In 2013, lower levels of market activity stemming out of the transition from PFI to PF2, has culminated in several lower geared contracts. This included the Royal Liverpool University hospital was 54:46 debt-equity, the Woking housing PFI deal which was geared as 47:53 debt-equity, University of Hertfordshire student housing gearing was 77:23 debt-equity and the London Fire Brigade PFI was 74:26. In the following year, i.e. 2014, the leveraging of UK PPP climbed. With reduced activity in 2014 in England (exhibited in figure 7.9), the higher gearing is attributable to several projects in Scotland which were purely debt financed (100%).

In 2015, while the Scottish market continued to expand, so too did the English market, also exhibiting somewhat of a resurgence. Several notable housing and health transactions achieved financial close constituting a capital value growth from US\$0.60bn in 2014 to US\$1.87bn in 2015. Many of these deals averaged much lower leveraging arrangements. The Midland Metropolitan Hospital PPP and New Papworth Hospital PPP in England were both structured as 62:38 debt-equity. Furthermore, the signed Hull extra care housing deal was 40:60 debt-equity which also contributed to the difference in this year. Since then, there have been no English health PPP deals for further comparison.

NI PPP arrangements were also leveraged at an average of 88:12 debt-equity akin to England. Debt lending comprised US\$1.04bn of private capital, while equity was recorded at US\$0.14. However, it remains unclear how developments in the infrastructure financing market will affect the financial structure of future NI PPP transactions.

Similarly, Welsh PPP ventures were determined as debt-equity ratios at 86:14. Debt lending to Welsh PPP projects has encapsulated private investment circa US\$1.1bn and equity US\$0.18bn.

Per social infrastructure sector (table 7.3), justice PPP deals had the highest gearing at 93:7 debt-equity. Debt finance accounted for US\$0.33bn and equity totalled US\$0.03bn. This was followed by leisure and recreational which had a structural composition of 92:8, equating to US\$0.33bn debt and US\$0.03bn equity. Education ventures were arranged as 90:10 debt-equity, consistent with literature. Debt in education deals was valued at US\$20.32bn and

equity amassed US\$2.32bn of private investment. Similarly, health was leveraged as 89:11 debt-equity.

Table 7.3: Sectoral Breakdown of Debt-Equity Financial Structure According to UK PPP Social Infrastructure Regional Market (US\$bn) 2005 – 2017 (IJ, 2017)

Region	England		Northern Ireland		Scotland		Wales	
	Debt	Equity	Debt	Equity	Debt	Equity	Debt	Equity
Education	13.13	1.46	0.58	0.09	6.30	0.74	0.31	0.03
Emergency & Response	0.53	0.70	0.00	0.00	0.00	0.00	0.00	0.00
Health	12.97	1.70	0.38	0.05	3.59	0.30	0.80	0.15
Housing	2.44	0.48	0.00	0.00	0.00	0.00	0.00	0.00
Justice	0.84	0.07	0.00	0.00	0.16	0.00	0.00	0.00
Leisure & Recreational	0.29	0.03	0.04	0.00	0.00	0.00	0.00	0.00
Municipal	2.83	0.40	0.04	0.00	0.11	0.03	0.00	0.00
Total	33.03	4.20	1.04	0.14	10.17	1.07	1.12	0.18

Debt investment was determined as US\$17.74bn and equity was valued at US\$2.20bn. Emergency and response followed health. Debt accounted for US\$0.53bn outlay and equity, US\$0.07bn, expressed through a debt-equity ratio of 88:12. Municipal projects were structured 87:13 with debt encompassing US\$2.98bn and equity US\$0.43bn. The lowest gearing was ascribed to housing ventures. With most of the housing market expansion occurring post GFC in the context of curtailed lending capacity, it is unsurprising equity constituted a larger portion of these agreements. The debt-equity structure averaged 84:16 with debt valuing US\$2.44bn and equity US\$0.48bn.

7.6. Reflection on the Key Findings of the United Kingdom Public-Private Partnerships Social Infrastructure Market Analysis

Having examined the datasets sourced from IJ, the research now reflects on the key insights derived from this contemporary market analysis. The PPP social infrastructure market analysis has identified that health and education have been the major sectors of social infrastructure for PPP provision and continue to be the two sectors preferred for PPP provision. Moreover, the market analysis has determined that the UK market has undergone profound changes over the last decade as was detailed in the literature. In the period leading up to 2008, PPP was growing exponentially. However, it was also determined that the UK PPP market has been remarkably impacted by the GFC. Recognised in chapters two and

three, the appetite of conventional lenders for infrastructure financing has been eroded and therein has left a capital void in the PPP lending space.

To fill this space, there is growing interest for increased investment from institutional investors. With long-term objectives, infrastructure investment is an attractive proposition for institutional investors; however, risk averse, it is yet unclear how to unlock this additional source of finance. The high gearing in Scotland suggests there continues to be an over-reliance on debt to provide most of private capital to PPP ventures which in the main derives from commercial banks. In contrast, in England, the lower ratios indicate that there are noticeable levels of appetite for PF2 on the part of shareholders. Though with the relatively small sample, it is difficult to conclusively determine if this is the case.

As per chapter three, there are many barriers prohibiting market growth. In part this can be attributed to the absence of a defined pipeline which this has cultivated uncertainty particularly within the private-sector community. An obvious example of this is the paradigm shifts between Scotland and England. Through the SFT and the introduction of the NPD and hub initiatives, the Scottish government has outlined its commitment to PPP. As a result, the Scottish market has exhibited signs of a resurgence. Comparatively, the absence of a pipeline in England has been reflected through low levels of market activity, with little signs of expansion. This is also the case for Wales and NI. Thus, one of the key findings from this market quantification is the pertinence for the UK government to provide a transparent deal flow. It was identified in chapter three, by doing so, this can return confidence to the private-sector and reduce transaction costs and increase competition.

In the context of stakeholder collaboration, literature points towards the degeneration of the partnership as a primary source of poor project performance. Unsurprisingly, many of the inherent modifications of these frameworks have been introduced to address these partnering shortcomings. Nonetheless, the low levels of market activity; despite the introduction of nuanced frameworks suggests that these transformations have failed to remedy the criticisms of PFI. A noteworthy concern, is that these reformed frameworks are in fact permutations of PFI and have failed to implement any mechanisms that embrace the ethos of collaboration. Fundamentally grounded in a partnering ethos, collaboration should be a core component of these arrangements. Even so, the disparate ideologies of the public and private-sectors has been and arguably remains a barrier to 'more and better' PPP social infrastructure provision.

7.7. Chapter Summary

The purpose of this chapter, chapter seven, was to offer contemporary insights into the UK PPP social infrastructure paradigm. Having declared its commitment to partnership-based procurement, the UK government has introduced reformed mechanisms to be used for future social infrastructure provision where offering best VfM. Yet, low levels of market activity suggest there remains meaningful doubt over the performance of these frameworks. This consolidates with a recent National Audit Office report which identified a number of inefficiencies continuing to confront the up-take of PPP.

Literature points towards collaboration as a primary source of poor project performance. Moreover, many of the changes introduced as part of these nuanced frameworks have been with the intention of bolstering collaboration. As alternative sources of capital and nascent stakeholders continue to enter the PPP market, there is also a need for greater collaboration.

Having completed the market analysis, the purpose of the next chapter is to analyse the findings of the social infrastructure stakeholder (SIS) survey and therein identify the relative salience and statistical significance of the collaborative attributes in preparation for the framework development.

CHAPTER EIGHT

ANALYSIS OF SURVEY QUESTIONNAIRES

8. Analysis of Survey Questionnaires

8.1. Introduction

In chapter six, the research designed and delineated the research methodology which is to be undertaken to develop the PPP stakeholder collaboration framework. It was determined survey questionnaires would be the research instrument utilised to capture social infrastructure stakeholder (SIS) opinions and views of Public-Private Partnerships (PPP) stakeholder collaboration. The purpose of this chapter therefore is to analyse and interrogate the results of these datasets in preparation for the framework development. The findings from this chapter will provide the data necessary by which to formulate this framework. Moreover, it will be interrogated to determine the ranking salience of these collaborative attributes. Premised on the research methodology delineated in chapter six, survey responses are to be interrogated and analysed through the application of descriptive and inferential statistical techniques conducted through the Statistical Package for the Social Sciences (SPSS) software. This is to ascertain statistical significance as well as ranking salience to achieve objective four.

Chapter eight is structured as follows:

- Stakeholder demographic;
- PPP social infrastructure provision; and
- PPP stakeholder collaboration.

8.2. Response Rate

In total, the research received 109 responses. Of this figure, 36 were incomplete, culminating in 73 completed and useable responses. From a sample of 220, 73 completed surveys equated to a 33% response rate. This was deemed robust, surpassing similar research: Li et al. (2005a) received a 12.2% response rate achieved through 51 usable responses; Dulaimi et al. (2003) received 5.91% responses which equated to 58 usable questionnaires; Salman et al. (2007) recorded a 9.4% rate; Yuan et al. (2009) elicited a response rate of 13.02%; 19 respondents completed Abdul-Aziz's (2012) questionnaire (10.3%); and Yong and Mustaffa (2013) received a 9.83% response rate derived from 48 returned questionnaires. Tang and Shen (2013) acquired 122 responses equating to a response rate of 24.4% and Raisbeck and Tang (2013) recorded a 18.9% response rate ascertained from 36 responses.

8.3. Stakeholder Demographic

Section A of the questionnaire entitled 'Stakeholder Demographic' was designed to discern participant background information and their experience with social infrastructure PPP projects. Of the 73 completed responses, depicted in table 8.1, 18 (24.7%) were received from the public-sector and 55 (75.3%) from the private-sector. This closely reflected Li et al. (2005a) who received 26.2% participation from the public-sector and 73.8% private-sector responses.

In terms of per SIS group, of the 80 Authorities, 18 responded equating to 22.5% of the sample. Sixteen out of 23 Construction Contractors (BuildCo) replied representing 69.6% of the identified sample. Of the Debt Funders sample, 27.3% responded. Sixteen out of a sample of 62 Equity Shareholders answered equating to 25.8%. Finally, half of the Service Providers (FMCo) sample responded equivalent to 50.0%. All participants met the requirements to be considered an expert as stipulated in chapter six, i.e. a minimum of five years' experience in practicing PPP and in a management position or above. Thus, the sample was composed as 24.7% Authorities, 23.3% by FMCo, 21.9% equally by BuildCo and Equity Shareholders, and finally 8.2% by Debt Funders. Predicated on the population composition determined in chapter six, it was deemed that these response rates were representative of the identified PPP SIS population.

Table 8.1: SIS Response Profile

	Pro-rata SIS Population (%)	Sample Size	Number of Responses	Sample Response Percentage (%)	Percentage of Total Responses (%)
Authority	36.4	80	18	22.5	24.7
BuildCo	9.9	23	16	69.6	21.9
Debt Funders	28.1	22	6	27.3	8.2
Equity Shareholders	10.3	62	16	25.8	21.9
FMCo	15.3	34	17	50.0	23.3
Total	100.0	220	73	33.2	100.0

8.3.1. Respondent Experience of Public-Private Partnerships Social Infrastructure Sectors

Section A of the survey requested participants to indicate their experience of PPP in the different social infrastructure sectors. Evidenced in figure 8.1 below, there was a distinct disparity in terms of experience. Mostly, SIS had experience of education and health projects. Of the 73 participants, around two thirds had experience of education ventures (65.7%) and

71.2% had been involved in PPP health provision. In contrast, in the housing, justice, emergency and response services, leisure and recreational, and municipal PPP sectors, there was noticeably less provision experience. Eighteen (24.7%) participants out of the 73 SIS respondents had experience of emergency and response services provision. Likewise, 18 (24.7%) were experienced in housing deals. Sixteen (21.9%) had been involved in leisure and recreational infrastructure PPP deals and 15 (20.6%) in justice. This correlated with literature and the findings of chapter seven which identified health and education as the two largest PPP social infrastructure sectors.

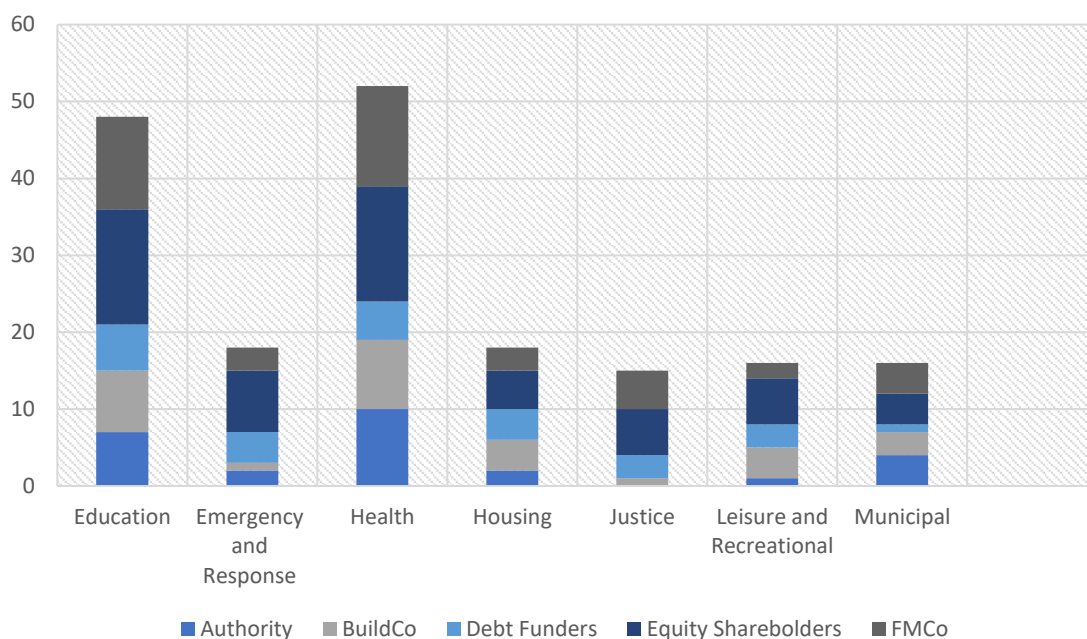


Figure 8.1: SIS experience of PPP in Sectoral Terms

When further unpacked per SIS group, this trend continued. Education and health were the predominant sectors across all SIS groups. The widest experience base was that of Debt Funders. In six of the seven social infrastructure sectors, at least half the Debt Funder sample had experience; with the exception being municipal. It should be caveated that this was the smallest SIS group. All other SIS groups had some levels of experience in all social infrastructure sectors with one exception; no Authority respondents had experience of justice PPP transactions. The respondent sample was therefore considered to be representative.

8.3.2. Respondent Experience of Public-Private Partnerships Modalities

In addition to social infrastructure sectors, SIS were requested to provide information of their experience with specific PPP frameworks, programmes and schemes. Identified in chapter

three, there are four essential PPP modalities in the UK which operate under the Design, Build, Finance and Manage / Operate (DBFM/O) contract: The Private Finance Initiative (PFI), Private Finance 2 (PF2), the Scottish Futures Trust (SFT) hub initiative and the Non-Profit Distribution (NPD) model. Though there is also the Third-Party Development (3PD) model in Northern Ireland (NI) and the Mutual Investment Model (MIM) in Wales, currently no projects have yet to achieve financial close via these frameworks and therefore have not been included in this analysis.

Table 8.2: SIS Experience of UK PPP Modalities

	Not at all experienced (%)	Slightly experienced (%)	Moderately experienced (%)	Very experience (%)	Extremely experienced (%)
Private Finance Initiative	2.7	4.1	9.6	41.1	42.5
Building Schools for the Future	38.4	9.6	8.2	27.4	16.4
Local Improvement Finance Trust and express LIFT	46.6	16.4	13.7	11.0	12.3
Private Finance 2	46.6	17.8	11.0	13.7	11.0
Non-Profit Distribution model	63.0	9.6	15.1	5.5	6.8
Priority School Building Programme	65.8	11.0	11.0	6.8	5.5
Scottish Futures Trust Hub Initiative	72.6	11.0	6.8	2.7	6.8

These frameworks have been nuanced to function as part of capital delivery programmes and schemes. PFI has been instrumental in the Building schools for the Future (BSF) and the National Health Service (NHS) local improvement finance trust (LIFT) and express LIFT (eLIFT) schemes. Similarly, PF2 is instrumental in the Priority School Building Programme (PSBP). Shown in table 8.2, survey participants were requested to indicate their experience with these PPP modalities by means of a five-point Likert scale. The response categories spanned:

- 1-not at all experienced;
- 2-slightly experienced;
- 3-moderately experienced;
- 4-very experienced; and
- 5-extremely experienced.

As would be expected, the frameworks which have had the longest operational roll-out have had the most experience. Conversely, experience of the newer frameworks remains limited.

8.3.2.1. Private Finance Initiative

Being the archetypal PPP modality, predictably almost all SIS had extensive experience of PFI. In total, 97.3% of all SIS had some level of experience of PFI. Further unpacked, 42.5% were extremely experienced and 41.1% were very experienced. Collectively, this accounted for 83.6% suggesting generally SIS groups were extremely familiar with PFI.

8.3.2.2. Building Schools for the Future

Following PFI, the BSF was the second ranking modality by experience. Over sixty percent (61.6%) had experience of the BSF scheme. These findings indicate that across all groups there were moderate levels of experience. Introduced to upgrade, replace and redevelop schools across the UK, the BSF has been instrumental in the provision of education facilities. These findings are expected when coupled with earlier sectoral experience and market mobilisation of educational PPP ventures discussed in chapter three.

8.3.2.3. Local Improvement Finance Trust / Express LIFT

PPP has also been instrumental in the provision of healthcare facilities through the LIFT and eLIFT schemes. Positioning third, a majority of 53.4% were experienced in LIFT and eLIFT schemes. Levels of experience were somewhat more uniform across SIS compared to the BSF programme. Yet, the mean score indicates in general participants were only slightly familiar with LIFT and eLIFT.

8.3.2.4. Private Finance 2

PF2 was introduced to replace PFI. Market figures revealed as part of chapter seven indicate PF2's uptake to date has been muted. Still, despite its limited roll-out, over half the recipients had experience of PF2 (53.4%).

8.3.2.5. Priority School Building Programme

This muted usage of PF2 coincides with the limited operationalisation of the PSBP. The PSBP was developed to replace the cancelled BSF scheme and implements the PF2 framework as the provision mechanism. Still, despite being introduced in 2011, 65.8% of SIS had no experience at all of the PSBP programme. Financial stakeholders (Debt Funders and Equity

Shareholders) had the highest levels of experience, though these were also somewhat curtailed, equivocal to slightly experienced.

8.3.2.6. Non-Profit Distribution

In Scotland, the NPD model was developed to replace PFI. Despite a resurgence of PPP activity endemic to this region, the SIS sample experience was minor; only 27.4% had participated in the NPD model. Debt Funders were the most experienced; 16.7% had no experience at all, 50% were moderately experienced and a further third (33.3%) were very experienced.

8.3.2.7. Scottish-Futures-Trust Hub Initiative

Scotland also utilises the SFT hub initiative. Almost three quarters of SIS had no experience at all (72.6%) of this partnering strategy. Those who did have experience had disparate levels, though the highest response category after not at all experienced was slightly experienced. Still considered to be in infancy, these results coincide with literature and the findings of chapter seven.

8.4. Public-Private Partnerships Social Infrastructure Provision

Having discerned the key SIS variables for the survey, section B of the questionnaire was intended to evaluate PPP as a framework for 'more and better' social infrastructure provision. Throughout literature, the UK is considered one of the pioneers of PPP and it is also regarded as one of the most sophisticated and mature markets globally. Even so, in more recent years, this research has revealed through literature and the UK PPP social infrastructure market analysis that market activity has substantially waned. Against this backdrop, section B of the survey was designed to offer contemporary consideration of PPP for UK social infrastructure. This section was thus structured as follows:

- UK PPP macro-environment;
- SIS perceptions of the PPP concept;
- social infrastructure sectors conducive to PPP provision; and
- future use of PPP.

8.4.1. United Kingdom Public-Private Partnerships Macro-environment

To determine if the macro environment was favourable to PPP social infrastructure provision, SIS were asked if they agreed that the current UK policy and legislative framework, the political landscape and economic climate were conducive to PPP use.

Fundamentally, respondents agreed the UK currently has the necessary policy and legislative framework. Over two-thirds of the sample responded as either agree or strongly agree (75.3%). Likewise, most SIS agreed that the current economic climate was conducive (63.0%) to PPP mobilisation. Contrastingly, SIS were uncertain of the political support. This was expressed through disparate responses. The two most forthcoming response categories were agree and disagree, constituting 34.2% of replies alike. An additional, 24.7% were unsure.

8.4.2. The Public-Private Partnerships Concept

Respondents were asked of their perceptions of PPP as a social infrastructure provision concept. Respondents exhibited remarkable satisfaction across all SIS groups. Ranging on a scale from very bad to very good, 83.6% of the collective sample viewed PPP as either a good or a very good framework. Within this, it is noteworthy, despite PPP models having been heavily criticised for delivering poor Value for Money (VfM) to the taxpayer, Authority respondents generally were enthusiastic about PPP. A majority opined PPP was a good (61.1%) or very good (5.6%) provision mechanism.

8.4.3. Social Infrastructure Sectors Conducive to Public-Private Partnerships Provision

While PPP was considered to be a proficient provision mechanism, the survey was additionally used to harness views on which social infrastructure sectors were most conducive to PPP provision. Responses were captured via a five-point Likert-scale spanning:

1. Strongly disagree;
2. disagree;
3. unsure;
4. agree; and
5. strongly agree.

Scores were ranked according to a Relative Importance Index (RII). The highest-ranking score indicates most conducive. The findings are depicted in table 8.3 below.

Table 8.3: SIS Perceptions of Sectors Conducive to PPP

	Weighted Average (WA)		Authority		BuildCo		Debt Funders		Equity Shareholders		FMCo	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Education	0.803	1	0.678	4	0.688	4	0.900	1	0.913	1	0.906	1
Emergency and Response Services	0.712	5	0.600	6	0.613	7	0.867	3	0.850	3	0.741	6
Health	0.778	2	0.711	3	0.725	2	0.900	1	0.875	2	0.765	4
Housing	0.732	4	0.667	5	0.663	6	0.800	4	0.788	5	0.788	2
Justice	0.704	6	0.589	7	0.688	4	0.800	4	0.813	4	0.706	7
Leisure and Recreational	0.699	7	0.722	1	0.700	3	0.567	7	0.663	7	0.753	5
Municipal	0.751	3	0.722	1	0.738	1	0.700	6	0.788	5	0.776	3

Unsurprisingly, education and health were the two foremost favoured sectors. This mirrors the findings in chapters three and seven in that these have been the sectors to have most widely utilised PPP. That said, there were some nuanced opinions. Despite education and health respectively ranking first and second overall, Authorities and BuildCo respondents considered municipal as the social infrastructure sector most conducive to PPP provision. This is pertinent on the grounds that as part of chapter seven, it was revealed that activity

within this sector has all but ceased; however, these findings suggest this may be a potential future growth area.

8.4.4. Future Use of Public-Private Partnerships

Looking forward, SIS were asked if they intended to participate in future UK PPP social infrastructure projects. All participants in the main exhibited appetite for future utility of PPP except for a minority of 2.7%. Markedly, almost two-thirds were either very interested (30.1%) or extremely interested (31.5%). These findings indicate that despite the negative connotations associated with PPP frameworks suggested in literature, SIS responded with enthusiasm.

From these findings, the research has determined from the survey responses, PPP is an attractive social infrastructure provision mechanism. Moreover, it has identified education and health are the two social infrastructure sectors most conducive to PPP provision. All SIS groups remain interested in future use of PPP for social infrastructure provision. Of the macro-environmental considerations, generally SIS believed the UK possessed a conducive economic climate as well as the necessary policy and legislative framework. However, SIS were uncertain as to whether there was the required political backing critical for future mobilisation of PPP frameworks.

8.5. Public-Private Partnerships Stakeholder Collaboration

This research defines PPP stakeholder collaboration as a long-term partnership between the public-sector Authority and the private-sector Project Company (ProjCo) and its constituent members whereby equal partners share risks, rewards and resources to deliver infrastructure in a cooperative and joint working manner. As its prominence in PPP and the built environment continues to gather momentum, section C of the survey was designed to determine participants' perceptions and opinions of PPP stakeholder collaboration. Moreover, it was developed to garner SIS insights into the salience of attributes by which to engineer collaborative advantage. The findings from this section will supply the empirical data for the framework development and is structured as follows:

- Conduciveness of PPP frameworks to collaboration;
- Salience of PPP stakeholder collaboration; and
- Analysis of PPP stakeholder collaborative attributes.

8.5.1. Conduciveness of Public-Private Partnerships Frameworks to Collaboration

Participants were invited to evaluate the conduciveness of PPP frameworks to the formation of collaborative relationships. Predominantly, SIS opined UK PPP frameworks were conducive to collaboration. A minority of 6.8% opined PPP was not at all conducive. It has been suggested in literature that the nature and complexity of PPP encourages autonomous stakeholder behaviour; however, encouragingly, these findings suggest there is still appropriate capacity within the PPP mechanism to foster collaboration.

Within collaboration theory it has been argued that the disproportionate distribution of resources among stakeholders skews the true nature of partnering as one partner becomes dominant. This has served to undermine the development of a win-win environment. Interestingly, SIS fundamentally disagreed with this. Instead, SIS generally agreed it was possible for PPP stakeholders to nurture a win-win environment whereby all stakeholders collectively benefited. The largest response category was likely, accounting for 54.8% and a further 30.1% agreed that it was extremely likely. Of those who disagreed, this emanated from Authorities and BuildCo; a minority of Authorities regarded it as unlikely (11.1%) whereas 6.3% of BuildCo felt it was extremely unlikely. These findings suggest that the construction phase of a PPP is particularly problematic for collaboration.

8.5.2. Salience of Public-Private Partnerships Stakeholder Collaboration

Survey participants were asked if they agreed or disagreed with the statement that through the adoption and integration of collaborative attributes, partnering could develop collaborative advantage. Principally, all SIS agreed or strongly agreed (97.7%). A minority portion of 2.7% were unsure. This minority was constituted from one Authority and one FMCo. When compared per SIS, the highest frequency response for all groups was the agree response category barring FMCo where a majority of 64.7% strongly agreed. Unsurprisingly, opinions were in the main uniform across social infrastructure sectors.

In line with the foregoing, SIS were asked if they agreed or disagreed that improved stakeholder collaboration would improve PPP social infrastructure provision. Over half of the SIS sample agreed with this statement (58.9%) and an additional 27.4% strongly agreed. This correlated with literature which argued that collaborative advantage can improve the performance of PPP frameworks. A minority of 13.7% were unsure.

SIS were also queried to discern if improved stakeholder collaboration would increase the likelihood of their future involvement in PPP social infrastructure provision. Almost three quarters (74.0%) of the SIS sample believed improved stakeholder collaboration would increase their likelihood of future involvement. Equally, SIS opined that a successful partnership with another organisation would increase the likelihood of a repeat future collaborative working. Comprising 90.4% of sample, SIS responded that it would either likely (43.8%) or be extremely likely (46.6%). These figures were homogenous across sectors and SIS classes. These findings underpin the importance of this investigation.

8.5.3. Analysis of Public-Private Partnerships Stakeholder Collaborative Attributes

Predicated on the salience of stakeholder collaboration, the survey was designed to evaluate a list of 27 collaborative attributes which have been identified for PPP SIS stakeholder collaboration. Participants were requested to evaluate these attributes using a five-point Likert-scale to ascertain their relative salience. The Likert-scale ranged as per:

1. Not at all important;
2. Slightly important;
3. Moderately important;
4. Very important; and
5. Extremely important.

Data was analysed using SPSS. A RII was conducted to determine the relative ranking salience of each attribute. Equally, the Kruskal-Wallis H test was carried out to investigate if there were significant differences between respondent groups. The outcomes of these statistical calculations are detailed below.

8.5.3.1. Ranking Salience of Public-Private Partnerships Stakeholder Collaborative Attributes

Table 8.4 exhibits the findings derived from the RII. Attributes were ranked from highest to lowest, and those ranked highest were of most importance. The attributes were ranked according to the WA of the respondent cohort, as well as per SIS group. This is insightful on the grounds it provides an overall collective ranking of the attributes but equally offers nuanced perceptions between SIS groups.

Table 8.4: Ranking of PPP Stakeholder Collaborative Attributes

	Weighted Average (WA)		Authority		BuildCo		Debt Funders		Equity Shareholders		FMCo	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Trust and Respect	0.923	1	0.944	1	0.913	1	0.767	4	0.950	1	0.941	2
Effective Communication	0.896	2	0.878	2	0.863	3	0.867	1	0.900	2	0.953	1
Skilled Leadership	0.858	3	0.856	4	0.850	5	0.700	12	0.850	4	0.929	3
Agreement of Project Brief	0.849	4	0.867	3	0.825	8	0.800	2	0.838	5	0.882	4
Stakeholder Commitment	0.833	5	0.789	6	0.813	11	0.767	4	0.875	3	0.882	4
Early Establishment of Collaboration	0.830	6	0.789	6	0.875	2	0.733	9	0.813	7	0.882	4
Early, defined and collective Stakeholder Involvement and Consultation	0.819	7	0.778	12	0.863	3	0.767	4	0.775	13	0.882	4
Appropriate Risk Sharing	0.814	8	0.789	6	0.813	11	0.800	2	0.813	7	0.847	11
Collective Stakeholder Planning and Decision-Making	0.811	9	0.767	15	0.825	8	0.700	12	0.825	6	0.871	9

ProjCo Experience	0.742	20	0.742	0.745	0.759	0.770	0.775	0.778	0.789	0.797	0.803	0.803	Information Sharing and Transparency	0.808
	20	19	18	17	17	16	15	14	13	11	11	10		10
	0.744	0.778	0.767	0.744	0.722	0.800	0.722	0.789	0.733	0.789	0.778	0.700		0.700
	17	12	15	17	20	5	20	6	19	6	12	23		23
	0.738	0.775	0.725	0.775	0.788	0.738	0.788	0.813	0.838	0.838	0.838	0.825		0.825
	19	17	22	17	14	19	14	11	6	6	6	8		8
	0.633	0.600	0.700	0.600	0.767	0.700	0.767	0.733	0.733	0.733	0.667	0.667		0.667
	18	20	12	20	4	12	4	9	9	9	16	16		16
	0.775	0.738	0.713	0.738	0.725	0.813	0.763	0.750	0.800	0.800	0.813	0.775		0.775
	13	19	22	19	21	7	16	18	12	7	7	13		13
	0.753	0.729	0.788	0.835	0.847	0.776	0.847	0.824	0.847	0.847	0.871	0.882		0.882
	24	26	19	16	11	20	11	17	11	11	9	4		4

Authority in-house Resources / Skills	0.726	22	0.789	6	0.738	19	0.600	20	0.763	16	0.659	27
Knowledge Retention	0.715	23	0.722	20	0.688	25	0.600	20	0.688	23	0.800	18
Power Sharing	0.685	24	0.689	24	0.700	24	0.600	20	0.600	25	0.776	20
Innovation	0.671	25	0.667	25	0.688	25	0.500	26	0.613	24	0.776	20
Processual Change	0.660	26	0.633	26	0.725	22	0.533	25	0.575	27	0.753	24
Information Technology	0.644	27	0.589	27	0.688	25	0.467	27	0.588	26	0.776	20

The highest-ranking collaborative attribute was ‘trust and respect’ with an RII WA of 0.836. This collaborative attribute ranked highly among all SIS. Authorities ranked ‘trust and respect’ first (RII = 0.944), as did BuildCo (RII = 0.913), Debt Funders positioned it fourth (RII = 0.767), Equity Shareholders rated it as the foremost important attribute of collaboration in first (RII = 0.950), and similarly, FMCo deemed it to be second in terms of salience (RII = 0.941). In literature, the importance of trust as a collaborative attribute has been well documented in both collaboration and PPP literature. Smyth and Edkins (2007) examined trust as part of stakeholder management in PPP. Likewise, Tantalo and Priem (2014) argued the cultivation of trust is critical on the grounds it is a catalyst by which to further unlock other utility functions and helps to reduce uncertainty from the project. Trust is important as it can foster more effective communication and also it can produce an environment where organisations will go above and beyond their contractual obligations. These findings consolidate the prevailing salience of trust already identified in literature (Zou et al., 2013; Wong et al., 2015).

The second ranked attribute was ‘effective communication’ with an RII WA value of 0.896. Authorities ranked ‘effective communication’ as the second most important collaborative

attribute (RII = 0.878), BuildCo positioned it third (RII = 0.863), Debt Funders regarded it as the most prominent attribute, rating it first (RII = 0.867), Equity Shareholders considered it second (RII = 0.900), and FMCo placed it first (RII = 0.953). These findings reaffirm the prominence of communication in both PPP related studies as well as in collaboration theory. Prevalent in collaborative management research, O'Leary and Vij (2012) identified the need for more consistent interpretations of communication. Equally, Lewis (2006) believed communication was tantamount to collaboration. In regard to PPP, it has been reported poor communication early in the project has resulted in many problems arising later in the project in the operations phase. In response, Love et al. (2015) considered Building Information Modelling (BIM) as a long-term communication concept in PPP. Similarly, Wang et al. (2013) sought to determine a framework to encourage earlier FMCo involvement in the design phase. Like 'trust and respect', 'effective communication' is a conduit for other functions.

The third most important attribute for collaboration with an RII WA value of 0.858 was 'skilled leadership'. This attribute was considered extremely important by all SIS except for Debt Funders. Authorities ranked this attribute fourth (RII = 0.856), BuildCo positioned it fifth (RII = 0.850), Equity Shareholders considered it to be the fourth most important attribute (RII = 0.850), and FMCo regarded it third (RII = 0.929). Differently, Debt Funders placed it twelfth (RII = 0.700). The high ranking of this attribute reaffirms the findings from the literature by Huxham and Vangen (2005) who asserted, in collaboration theory, leadership is the responsibility of 'making things happen', as well as ensuring the framework for other attributes such as communication and involvement are installed and effective. In this regard, it has been claimed that 'skilled leadership' is fundamental in PPP (Shaoul et al., 2013). Premised on the myriad of relationships, organisations and misaligned project objectives, 'skilled leadership' is critical in steering the project in a direction that is agreeable to all SIS in order to circumnavigate autonomous behaviour (Akintoye and Kumaraswamy, 2016).

Ranked fourth, determined through an RII WA of 0.849, was the collaborative attribute of 'agreement of project brief'. This attribute was rated highly among all SIS. Authorities considered it third in terms of importance (RII = 0.867), BuildCo regarded it as eighth (RII = 0.825), Debt Funders placed it in second (RII = 0.800), Equity Shareholders ranked it fifth (RII = 0.838) and FMCo positioned it fourth (RII = 0.882). The salience of this attribute in the survey correlate with the importance of an 'agreed project brief' suggested in the literature (Chinyere, 2013; Tang and Shen, 2013). Collaboration is unique insofar as it is a paradox between self-interested goals, and a shared vision. However, by sharing a common definition

of the problem through an agreed project brief, SIS can pool skillsets to tackle messy problems (Wong et al., 2015).

The fifth highest-ranked collaborative attribute with an RII WA value of 0.833, was 'stakeholder commitment'. This attribute was ranked highly among all SIS though notably less by BuildCo. Allocated an RII value of 0.789, Authorities ranked this attribute sixth in terms of importance. Debt Funders placed it fourth (RII = 0.767), Equity Shareholders rated it third (RII = 0.875) and FMCo considered it to be the fourth most prominent attribute of PPP collaboration (RII = 0.882). Differently, BuildCo ranked it eleventh (RII = 0.813). The pertinence of 'stakeholder commitment' in the survey correlates with its prominence in PPP research (Zou et al., 2013; Chinyere, 2013; Tang and Shen, 2013; Wong et al., 2015). Commitment must be a top-down approach. Moreover, it should be engendered as early in the project as reasonably possible to encourage stakeholder buy-in. In regard to PPP, to inspire commitment prior to financial close, the Authority should consider some form of stipend or resource exchange as a display of intent (Wong et al., 2015).

Contrastingly, the collaborative attribute of 'Information Technology (IT)' was ranked the least important attribute for stakeholder collaboration. The SIS sample ascribed an RII WA value of (0.611) ranking this attribute twenty-seventh. Authorities ranked IT of least importance in twenty-seventh with an RII value of (0.589), equally as did Debt Funders (RII = 0.588). BuildCo considered IT to be of relatively low importance attaching an RII value of 0.688, placing it twenty-fifth. Equity Shareholders positioned it twenty-sixth (RII = 0.588) whereas FMCo viewed 'IT' as marginally more important, ranking it twentieth with an RII score of (0.776). These findings are remarkable insofar as, in literature, IT is critical in supporting other attributes of collaboration. Love et al. (2015) and Wang et al. (2013) asserted IT supported information sharing, communication and the building of trust through active stakeholder involvement. Yet, while the attributes of 'trust and respect' and 'effective communication' positioned first and second in terms of importance, IT was the least important. Moreover, as the built environment continues to exhibit appetite for BIM, seemingly its enthusiasm as an attribute to develop collaboration is somewhat muted within the confines of PPP. BIM is a complex concept which is still rapidly developing. Thus, still somewhat unrefined, this may explicate the low prominence of this attribute.

The second lowest ranking collaborative attribute was 'processual change' with an RII WA value of 0.660. This was considered to be of lesser importance consistent across all SIS. Authorities positioned it in twenty-sixth (RII = 0.633), BuildCo regarded it twenty-second (RII

= 0.725), Debt Funders deemed it twenty-fifth (RII = 0.533), Equity Shareholders rated it twenty-seventh (RII = 0.575) and FMCo ranked it twenty-fourth (RII = 0.753). In literature, it was suggested, predicated on the long-term life of a PPP contract and its evolving nature, the dynamics of the partnership must be able to correspondingly transform and mature (Cruz and Marques, 2013). However, while the attribute of 'processual change' is replete in collaboration theory, it remains relatively unexplored in the confines of PPP. The lack of awareness of this collaborative attribute may therefore explain its low ranking.

Ranked twenty-fifth, making it the third lowest attribute was 'innovation'. Allocated an RII WA of 0.671, 'innovation' was considered of relatively low importance for PPP collaboration. This attribute was considered of lower importance consistently across all SIS groups. Authorities positioned it in twenty-fifth (RII = 0.667), as did BuildCo (RII = 0.688). Debt Funders rated it twenty-sixth (RII = 0.500), Equity Shareholders deemed it twenty-fourth (RII = 0.613) and FMCo positioned it notably higher in twentieth (RII = 0.776). The literature review found that 'innovation' in collaboration can expedite and improve existing processes through the application of new technologies and systems thinking (MGI, 2017). However, as a result of problems associated with contract incompleteness and flexibility identified above, these shortcomings associated with the project may explain the low ranking of this attribute.

In terms of per SIS group, the five highest-ranked attributes of collaboration by the Authority in descending order were, 'trust and respect' (RII = 0.944), 'effective communication' (RII = 0.878), 'agreement of project brief' (RII = 0.867), 'skilled leadership' (RII = 0.856) and 'social capital / inter-personal relationships' (RII = 0.800). Alternatively, the five lowest ranked PPP collaborative attributes by the Authority were from the lowest upward, 'IT' (RII = 0.589), 'processual change' (RII = 0.633), 'innovation' (RII = 0.667), 'power sharing' (RII = 0.689), and 'information sharing and transparency' (RII = 0.700). The difference between the foremost attribute and last ranked was an RII value of 0.355 which suggests there was a notable importance difference among the attributes. Interestingly, 'trust and respect' was valued markedly higher than the second rated attribute. These findings indicate that many of the attributes which the Authority considers as important for collaboration pertain to the governance structures. It was noted in the literature review, as well as reaffirmed above that the Authority has heavily relied on the contract to guide and steer the PPP environment because of insufficient resources (Zheng et al., 2008). In light of these findings, it can be suggested collaboration must be incorporated into the contract (Akintoye and Kumaraswamy, 2016) and is complimented with greater access to resources and skills in the

public-sector. Allied with this, despite 'information sharing and transparency' being considered as an important barrier for PPP, it was ranked relatively low for PPP collaboration.

The highest-ranked PPP collaboration attribute by BuildCo was 'trust and respect' with an RII value of 0.913. This was followed by 'early establishment of collaboration' (RII = 0.875), 'effective communication' (RII = 0.863) and 'early, defined and collective stakeholder involvement and consultation' equally, and 'skilled leaderships' (RII = 0.850). Comparatively, the five least important attributes of collaboration were considered to be 'Information Technology' (RII = 0.688), 'innovation' (RII = 0.688), 'knowledge retention' (RII = 0.688), 'power sharing' (RII = 0.700), and tied in twenty-second 'financial and technical exchange and support / stipend' and 'processual change' (RII = 0.725). The RII value disparity between highest and lowest ranked attributes was 0.225. Indicated from these findings, for collaboration to be successful, BuildCo have emphasised the pertinence of 'early and collective decision-making'. Indeed, literature has flagged that on occasion there has been a failure to effectively involve all organisations which has served to detract from project synergy (Roehrich and Caldwell, 2012). With the shortest involvement, expectedly, the majority of high ranking collaborative attributes are orientated to the front-end of the project and promote transparent identification and establishment of project responsibilities.

Debt Funders deemed the five highest-ranked PPP collaborative attributes in descending order as 'effective communication' (RII = 0.867), 'agreement of project brief' (RII = 0.800) and 'appropriate risk sharing' (RII = 0.800), 'stakeholder commitment' (RII = 0.767) and 'trust and respect' (RII = 0.767). Alternatively, the lowest Debt Funders rated attribute was 'IT' (RII = 0.467). This was followed in ascending order by 'innovation' (RII = 0.500), 'processual change' (RII = 0.522), and tied in twentieth; 'power sharing' (RII = 0.600), 'knowledge retention' (RII = 0.600), 'Authority in-house resources and skills' (RII = 0.600) and 'Authority experience' (RII = 0.600). The RII value difference between the foremost and lowest ranked attributes was 0.400 which signifies substantial variance of the attribute importance. Like all other SIS, 'effective communication', 'trust and respect', and 'agreement of the project brief' ranked highly. Still, it is also worth noting, unlike other SIS, Debt Funders regarded 'conflict resolution structures' as extremely important for PPP collaboration. Ranking it fourth, it has already been identified, the incompleteness of the contract has been a source of conflict in PPP. Moreover, it was established in chapter four, Debt Funder objectives in the project pertain to their investment with little relative interest in the service delivery. Principally involved in the contract negotiations with the public-sector, following financial close, Debt Funders have occupied a remote and dormant position in the project (Demirag et al., 2015).

In this regard, the correlation between the 'conflict resolution structures' and the safeguarding of returns may explain the scoring rank.

The highest-ranked PPP collaborative attribute by Equity Shareholders was 'trust and respect' with an RII value of 0.950. In second in terms of importance was 'effective communication' (RII = 0.900), then 'stakeholder commitment' (RII = 0.875), 'skilled leadership' (RII = 0.850), and 'agreement of project brief' (RII = 0.838). Comparatively, the five least important attributes in ascending order were 'processual change' (RII = 0.575), 'Information Technology' (RII = 0.588), 'power sharing' (RII = 0.600), 'innovation' (RII = 0.613) and 'knowledge retention' (RII = 0.688). From this, it was determined the RII value difference from the highest ranked collaborative attribute and the lowest was 0.375 which signifies notable weighted difference in terms of attribute important. In the main, Equity Shareholders perceptions of the attributes for PPP collaboration paralleled other SIS groups. However, of all private-sector SIS, this group deemed 'social-capital and inter-personal relationships' as important for better collaboration, ranking it similar to Authorities.

FMCo ranked the foremost attributes noticeably higher than other SIS groups. The five highest ranked collaborative attributes from this SIS group were in first 'effective communication' (RII = 0.953), followed by 'trust and respect' (RII = 0.941), 'skilled leadership' (RII = 0.929), and 'agreement of project brief' (RII = 0.882), 'stakeholder commitment' (RII = 0.882), 'early, defined and collective stakeholder involvement and consultation,' (RII = 0.882) and 'information sharing and transparency' (0.882) respectively tied in fourth. In contrast, the lowest PPP collaborative attribute was 'Authority in-house resources and skills' with an RII value of 0.659. In ascending order, this was followed up 'Authority experience' (RII = 0.729), 'ProjCo experience' (RII = 0.753) and 'processual change' (RII = 0.753), and equally tied in twentieth 'social capital / inter-personal relationships' (RII = 0.776), 'power sharing' (RII = 0.776), 'innovation' (RII = 0.776) and 'Information Technology' (RII = 0.776). Thus, the RII disparity value was calculated as 0.294, indicating notable differences in the attribute importance. It was also discernible, in general, FMCo displayed greater enthusiasm for these collaborative attributes with an overall higher importance values. Like other SIS, FMCo deemed the salient attributes of collaboration pertain to the governance framework; however, notably they also included 'information sharing and transparency'. With a recorded breakdown in the relationship between the construction and operational phases, many of the prominent FMCo attributes call for greater clarification surrounding roles and responsibilities. Moreover, they promote greater FMCo involvement in the project. Indeed,

several have identified how FMCo have been overlooked in previous PPP ventures already mentioned.

In summary, from this analysis, it was found, that despite the different roles, responsibilities and motivations for entering a PPP project, there were key thematic similarities among SIS in regard to the salient attributes of collaboration. As mentioned as part of the Authority analysis, the most prominent PPP collaborative attributes predominantly related to the governance structures of the project, though the attribute of 'trust and respect' ranked in the top five in terms of salience for all SIS. Interestingly, trust is a collaborative attribute which has been perhaps the most widely explored in the context of collaboration and indeed the importance of this attribute has been reaffirmed through participant responses. Like 'trust and respect', 'effective communication' was also ranked as critical for collaboration. Conversely, 'information technology' was ranked as the least important attribute. These findings are important on the grounds that they establish there are thematic communal collaborative perceptions whereby all SIS have been in agreement. Also, interestingly, the research has identified nuanced opinions between SIS. These findings equally make an important contribution to knowledge in that they provide a direction of travel for future research which can be undertaken in an effort to reconcile these nuanced views.

8.6. Statistical Testing of Collaborative Attribute Perceptions Between Social Infrastructure Stakeholder Groups

Having completed the RII and determined the ranking salience of the collaborative attributes, this section contains the outputs from computation of the statistical tests used to determine significance between SIS groups and across the SIS respondent group holistically.

8.6.1. Analysis of Variance

Stemming from the diversity of SIS perceptions of the PPP stakeholder collaborative attributes, research undertook additional tests to determine if there were statistically significant differences between SIS groups. To do this, the research conducted an analysis of variance (ANOVA). An ANOVA advantageously allows research to consider the scores between groups and in the context of this investigation it was conducted to offer further insights into the perceived differences between SIS categories. The procedure for this is outlined in chapter six.

In chapter six, the research noted that the responses per SIS group were unlikely to be homogenous and therefore the data would not be normally distributed. Hence, the first step

of the ANOVA procedure was to confirm the normality of the replies. To determine if the participant categories were normally distributed, the Shapiro-Wilk W test was undertaken. Table 8.5 displays the outcome of the Shapiro-Wilk W test.

Table 8.5: Shapiro-Wilk Test of Normality

	Shapiro-Wilk		
	Statistic	Statistic	Statistic
Accountability	.809	17	.003
Agreement of project brief	.752	17	.000
Appropriate risk sharing	.733	17	.000
Authority experience	.871	17	.023
Authority in-house resources / skills	.869	17	.021
Balance of stakeholder needs and expectations	.774	17	.001
Clarifying of roles and responsibilities	.733	17	.000
Clear governance structures	.799	17	.002
Collective stakeholder planning and decision-making	.776	17	.001
Conflict resolution structures	.792	17	.002
Contract flexibility	.785	17	.001
Early establishment of collaboration	.752	17	.000
Early, defined and collective stakeholder involvement and consultation	.752	17	.000
Effective communication	.533	17	.000
Financial and technical exchange and support / stipend	.819	17	.004
Identifying individual and shared objectives	.757	17	.001
Information sharing and transparency	.754	17	.001
Information Technology (IT)	.872	17	.023
Innovation	.873	17	.024
Knowledge retention	.829	17	.005
Power sharing	.872	17	.023
Processual change	.848	17	.010
ProjCo experience	.611	17	.000
Skilled leadership	.872	17	.023
Social capital / Inter-personal relationships	.774	17	.001
Stakeholder commitment	.754	17	.001
Trust and respect	.579	17	.000

The null hypothesis (H_0) for the Shapiro-Wilk W test is that datasets are normally distributed, and it is accepted when the P value is greater than 0.05 ($P > 0.05$). Oppositely, when the P is less than 0.05 ($P < 0.05$), the population is deemed not to be normally distributed and the null hypothesis should be rejected. Evidenced in table 8.5, all attributes had a P value of less

than 0.05 ($P > 0.05$). These findings show that the datasets were not normally distributed, and the null hypothesis should therefore be rejected. Failing to satisfy the data normality assumption, the research proceeded to conduct the non-parametric ANOVA, which is not bound by normality distribution. This was carried out through the Kruskal-Wallis H test.

Table 8.6: Kruskal-Wallis H Test

	Kruskal-Wallis		
	Chi-Square	df	Asymp. Sig.
Accountability	3.826	4	.430
Agreement of project brief	3.498	4	.478
Appropriate risk sharing	2.233	4	.693
Authority experience	5.664	4	.226
Authority in-house resources / skills	6.600	4	.159
Balance of stakeholder needs and expectations	5.163	4	.271
Clarifying of roles and responsibilities	8.530	4	.074
Clear governance structures	6.602	4	.158
Collective stakeholder planning and decision-making	7.389	4	.117
Conflict resolution structures	6.894	4	.142
Contract flexibility	6.112	4	.191
Early establishment of collaboration	8.683	4	.070
Early, defined and collective stakeholder involvement and consultation	8.374	4	.079
Effective communication	6.399	4	.171
Financial and technical exchange and support / stipend	2.670	4	.614
Identifying individual and shared objectives	10.421	4	.034
Information sharing and transparency	8.572	4	.073
Information Technology (IT)	14.504	4	.006
Innovation	11.130	4	.025
Knowledge retention	6.194	4	.185
Power sharing	8.069	4	.089
Processual change	9.242	4	.055
ProjCo experience	2.538	4	.638
Skilled leadership	11.099	4	.025
Social capital / Inter-personal relationships	3.262	4	.515
Stakeholder commitment	4.595	4	.331
Trust and respect	13.474	4	.009

The Kruskal-Wallis H test is an extension of the Mann-Whitney U test and is applied to determine if datasets originate from the same population. Like the parametric ANOVA equivalent, Kruskal-Wallis is an omnibus test which is typically complimented with Dunn's

post-hoc test to determine the source of statistically significant differences between and among groups. Table 8.6 displays the findings of the Kruskal-Wallis H test.

As per chapter six, an alpha value below 0.05 indicates levels of statistically significant differences. Identified in table 8.6 above, there were four collaborative attributes with P values less than 0.05, namely: 'identifying individual and shared objectives' ($\chi^2 (4) = 10.421, P = 0.034$); 'innovation' ($\chi^2 (4) = 11.130, P = 0.025$); 'skilled leadership' ($\chi^2 (4) = 11.099, P = 0.025$); and 'trust and respect' ($\chi^2 (4) = 13.474, P = 0.009$). To identify the source of the perceived differences, the research conducted Dunn's multiple comparison post-hoc test on each of the four attributes. The outcome of these tests is contained in tables 8.7 to 8.10 and the statistically significant different opinions are highlighted in red.

Table 8.7: Dunn's Test for Identifying Individual and Shared Objectives

	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Debt Funders / BuildCo	13.281	8.536	1.556	.120	1.000
Debt Funders / Equity Shareholders	-16.469	8.536	-1.929	.054	.537
Debt Funders / Authority	18.083	8.406	2.151	.031	.314
Debt Funders / FMCo	-25.853	8.467	-3.053	.002	.023
BuildCo / Equity Shareholders	-3.188	6.304	-.506	.613	1.000
BuildCo / Authority	4.802	6.127	.784	.433	1.000
BuildCo / FMCo	-12.572	6.211	-2.024	.043	.430
Equity Shareholders / Authority	1.615	6.127	.264	.792	1.000
Equity Shareholders / FMCo	-9.384	6.211	-1.511	.131	1.000
Authority / Equity Shareholders	-7.770	6.030	-1.288	.198	1.000

Evidenced in table 8.7, there was a statistically significant difference between SIS respondents in reference to the salience of 'identifying individual and shared objectives'. The P value of 0.023 shows there was a perceived difference between Debt Funders and FMCo, and the null hypothesis should therefore be rejected. This correlates with the findings of the RII wherein Debt Funders ranked this attribute sixteenth with a value of 0.667; whereas, in comparison, FMCo positioned it ninth with a score of 0.871. This difference between Debt Funders and FMCo may originate from the arms-length involvement usually occupied by Debt Funding institutions. Following financial close, the research found from literature that Debt Funder involvement diminishes, and their participation is reduced unless there is a fear of reduced returns. Allied with this, Debt Funders have the largest up-front financial contribution to the project, and ostensibly opined it was of lesser importance to identify the objectives of others. This commercial perspective on the part of Debt Funders may explain the misaligned views between these two SIS.

Table 8.8: Dunn's Test for Innovation

	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Debt Funders / BuildCo	-10.635	9.661	-1.101	.271	1.000
Debt Funders / Equity Shareholders	17.278	9.513	1.816	.069	.693
Debt Funders / Authority	19.667	9.661	2.036	.042	.418
Debt Funders / FMCo	-27.975	9.583	-2.919	.004	.035
BuildCo / Equity Shareholders	6.642	6.934	.958	.338	1.000
BuildCo / Authority	9.031	7.135	1.266	.206	1.000
BuildCo / FMCo	-17.340	7.029	-2.467	.014	.136
Equity Shareholders / Authority	-2.389	6.934	-.345	.730	1.000
Equity Shareholders / FMCo	-10.698	6.825	-1.567	.117	1.000
Authority / Equity Shareholders	-8.309	7.029	-1.182	.237	1.000

Identified in table 8.8, the null hypothesis for Dunn's test can again be rejected and there was a statistically significant view pertaining to the importance of 'innovation' for PPP stakeholder collaboration. Akin to 'identifying individual and shared objectives', this disagreement derives from Debt Funders and FMCo. This is represented through the *P* value of 0.035. As part of the RII, FMCo ranked 'innovation' twentieth (RII = 0.776), while Debt Funders deemed it of lesser importance, placing it in twenty-sixth (RII = 0.500). This variance may derive from the risk averse nature of Debt Funders who prefer to safeguard their investment through utilisation of established approaches as opposed to unquantified options. In turn, this mindset curtails risk taking behaviour, which may be linked to innovation. In comparison, the research found that most changes in the project stem from evolving stakeholder requirements. Hence, as project requirements transform, FMCo, who are responsible for the services provision, felt innovation was an important enabler for collaboration to manage these manifestations.

Table 8.9: Dunn's Test for Skilled Leadership

	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Debt Funders / BuildCo	-16.719	9.123	-1.833	.067	.668
Debt Funders / Equity Shareholders	17.438	9.123	1.911	.056	.559
Debt Funders / Authority	18.194	8.983	2.025	.043	.428
Debt Funders / FMCo	-29.103	9.049	-3.216	.001	.013
BuildCo / Equity Shareholders	.719	6.737	.107	.915	1.000
BuildCo / Authority	1.476	6.548	.225	.822	1.000
BuildCo / FMCo	-12.384	6.638	-1.866	.062	.621
Equity Shareholders / Authority	.757	6.548	.116	.908	1.000
Equity Shareholders / FMCo	-11.665	6.638	-1.757	.079	.788
Authority / Equity Shareholders	-10.908	6.445	-1.693	.091	.905

Contained in table 8.9, the research was able to determine a statistically significant difference again between Debt Funders and FMCo, this time in regard to the importance of 'skilled leadership' ($P = 0.13$). Debt Funders rated 'skilled leadership' twelfth in the RII (0.700). In contrast, FMCo positioned this attribute in third (RII = 0.929). Aforementioned, with remote involvement following financial close unless returns are jeopardised, the disparate views between FMCO and Debt Funders may stem from the curtailed participation of Debt Funders in the infrastructure construction and the provision of the service. Interestingly, this attribute is often linked with trust, which Debt Funders likewise considered to be of lesser importance than other SIS.

Table 8.10: Dunn's Test for Trust and Respect

	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Debt Funders / BuildCo	23.542	8.484	2.775	.006	.055
Debt Funders / Equity Shareholders	-27.225	8.416	-3.235	.001	.012
Debt Funders / Authority	27.806	8.354	3.328	.001	.009
Debt Funders / FMCo	-28.792	8.484	-3.394	.001	.007
BuildCo / Equity Shareholders	-3.684	6.173	-.597	.552	1.000
BuildCo / Authority	4.264	6.089	.700	.484	1.000
BuildCo / FMCo	-5.250	6.266	-.838	.402	1.000
Equity Shareholders / Authority	.580	5.994	.097	.923	1.000
Equity Shareholders / FMCo	1.566	6.173	.254	.800	1.000
Authority / Equity Shareholders	-.986	6.089	-.162	.871	1.000

The fourth collaborative attribute where there was an opinion difference was in regard to 'trust and respect'. Table 8.10 signifies that Debt Funders significantly disagreed over the importance of 'trust and respect' with Equity Shareholders ($P = 0.12$), Authorities ($P = 0.009$) and FMCo ($P = 0.007$). Indeed, in the RII, Debt Funders ranked this attribute fourth with an RII value of 0.767. Differently, Equity Shareholders and Authorities placed it first respectively (RII = 0.950; RII = 0.944) and FMCo positioned it second with an RII score of 0.941. Although 'trust and respect' was ranked highly by Debt Funders, as noted previously, it is likely this derives from the limited direct involvement in the provision of the infrastructure. Instead, Debt Funder investment is protected by equity and the attributes of 'effective communication', 'agreement of the project brief' and 'appropriate risk sharing' were accordingly considered to be more important for collaboration for this group. From these findings, broadly, it can be inferred that Debt Funders view on collaboration tends to be commercially driven which correlates with literature. Comparatively, FMCo's view of collaboration align with what Blanchard (2012) described as the core values of partnering.

Having completed the RII, in addition to satisfying the Kruskal-Wallis H test, the research will now proceed onto Kendall's Coefficient of Concordance.

8.6.2. Kendall's Coefficient of Concordance

In the literature review, the research discerned that the partnership comprises a diversity of organisations. This diverse network brings with it different values, norms and qualities. As such, the research conducted a RII to discern the relative significance of the collaborative attributes. As part of the RII, it was identified that there were noteworthy nuances relative to the collaborative attributes. Accordingly, to further interrogate SIS responses, the research carried out an ANOVA to investigate for significant opinion differences between SIS groups. These findings have made a valuable contribution to knowledge.

However, the purpose of the research is to determine the attributes of stakeholder collaboration within all key SIS. Hence, as denoted in chapter six (section 6.4.8.2), prior to development of the PPP stakeholder collaborative framework, the research will accordingly also conduct Kendall's Coefficient of Concordance as a precursor to discern if there is appropriate statistical agreement within the SIS cohort to develop the stakeholder collaboration framework. In doing so, the research will safeguard the validity of the Principal Components Analysis (PCA) and ultimately facilitate the development of the framework.

Kendall's W determines levels of accord and/or discordance by dividing the variance over the column total by the maximum possible variance over column totals. Legendre et al. (2005) suggest that where the p value is less than 0.05 ($P < 0.05$), the null hypothesis (H_0) should be rejected and the alternative hypothesis (H_1) is accepted. Oppositely, if the P value is greater than 0.05 ($P > 0.05$), the null hypothesis of H_0 is accepted premised on there being inadequate information by which to support the alternative hypothesis of H_1 . Table 8.11 displays the results of the Kendall's W test.

Table 8.11: Results of Kendall's W Test of PPP Collaborative Attributes

N	73
Kendall's W^a	.223
Chi-Square	424.008
Df	26
Asymp. Sig.	.000

a. Kendall's Coefficient of Concordance

Evidenced in table 8.11, the Kendall's W value was determined as 0.223. Despite an absence of definitive or conclusive agreement pertaining to the codification of values spanning zero to one, generally it is considered, a value above 0.20 indicates fair levels of agreement. Furthermore, a P value of 0.00 ($P = 0.00$) was determined²². This signifies the null hypothesis (H_0) should be rejected and the alternative hypothesis (H_1) should be accepted. By doing so, this value showed there were significant levels of agreement among SIS respondents of the collaborative attributes.

8.7. Summary

In chapter three, the research identified that appetite for UK PPP has markedly eroded since the onset of the Global Financial Crisis (GFC). Comprising a partnership between the public and private-sectors, it was found that nature of PPP arrangements has been contractual rather than collaborative, culminating in poor project performance. Yet, despite the concerns of poor stakeholder collaboration, it was identified that there is a pertinent knowledge gap. To address this knowledge gap, a list of 27 PPP stakeholder collaboration attributes were identified from literature. With this list, in chapter six, the framework for the research design and the framework development was determined. This constituted conducting survey questionnaires to evaluate the salience of these attributes. The results of the survey questionnaire were analysed in chapter eight. This was to fulfil objective four of the research.

A RII was conducted to determine the ranking importance of these 27 PPP stakeholder collaborative attributes. The RII determined the most important attributes for improved PPP stakeholder collaboration was 'trust and respect', followed by 'effective communication', 'skilled leadership', 'agreement of the project brief' and 'stakeholder commitment'. In contrast, the least salient attribute was 'IT', preceded by 'processual change' and 'innovation'. Responses in the main were homogenous and all SIS emphasised the importance of early and collective participation and communication.

The RII was complimented with an ANOVA to investigate statistical differences within the SIS cohort. As part of the ANOVA, four attributes were found to have a statistically significant difference between SIS groups. These attributes were 'identifying individual and shared objectives', 'innovation', 'skilled leadership', and 'trust and respect'.

²² Actual value for Kendall's W is 0.0018528.

Set against these findings, in preparation for the framework development, Kendall's Coefficient of Concordance was conducted to verify the degree of statistical significance among SIS of this collaborative list. A *P* value of 0.000 indicated statistical significance. Having satisfied the Kendall's *W* test, these attributes will therefore be carried forward to the next step of the framework development. The findings in this chapter have made an original contribution to knowledge.

At this juncture in the research, this thesis has identified the salient attributes of PPP stakeholder collaboration and satisfied objective four of the research, this investigation will proceed onto the PCA of these collaborative attributes in chapter nine in order to develop the PPP stakeholder collaboration framework. This is to meet the strategic aim of this investigation, fulfil objective five and offer an additional empirical contribution to knowledge.

CHAPTER NINE

DEVELOPMENT OF THE PUBLIC-PRIVATE PARTNERSHIPS STAKEHOLDER COLLABORATION FRAMEWORK

9. Development of the Public-Private Partnerships Stakeholder Collaboration Framework

9.1. Introduction

Chapter six of this investigation delineated the research methodology to be adopted. Chapter eight; derived from the social infrastructure stakeholder (SIS) survey questionnaire analysis, identified the ranking salience of the stakeholder collaboration attributes by which improve project performance in Public-Private Partnerships (PPP).

Chapter nine, this chapter, comprises the application of the Principal Component Analysis (PCA) to evaluate and test these attributes and present them in a way which is more meaningful. This constituted the analysis of the larger dataset which was determined from literature, to extract the key themes which can accordingly produce more meaningful findings for digestible interpretation.

These findings are subsequently contextualized to literature to produce the PPP stakeholder collaboration framework. To develop this framework, in chapter six, the research defined the framework by which to conduct the PCA. This was comprised from the following criteria:

- Sample size;
- Eigenvalue;
- Scree test;
- Component variance;
- Component retention; and
- Component scores.

By undertaking this component analysis, this enabled the research to achieve objective five.

9.2. Determining Data Suitability

Table 9.1: KMO and Bartlett's Test of Sphericity of Collaborative Attributes

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.826
Bartlett's Test of Sphericity	Approx. Chi-Square	1213.548
	df	351
	Sig.	.000

Initially, to safeguard the reliability and accuracy of the PCA, the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were applied to test the sample size suitability. Tables 9.1 denotes the application of these tests to the PPP stakeholder collaborative attributes.

Premised on the suggestions of Hutcheson and Sofroniou (1999) and Kaiser (1974), the value of 0.826 is considered very satisfactory for PCA. Likewise, the P value = 0.00 indicates the R matrix is not an identity matrix and is highly significant ($P < 0.05$). Together, these tests indicate the datasets are highly appropriate for PCA.

9.3. Principal Components Analysis - Extraction of Public-Private Partnerships Collaborative Attributes

Table 9.2: Communalities of PPP Stakeholder Collaborative Attributes

		Initial	Extraction
1	Accountability	1.000	.718
2	Agreement of project brief	1.000	.699
3	Appropriate risk sharing	1.000	.779
4	Authority experience	1.000	.836
5	Authority in-house resources / skills	1.000	.781
6	Balance of stakeholder needs and expectations	1.000	.590
7	Clarifying of roles and responsibilities	1.000	.676
8	Clear governance structures	1.000	.738
9	Collective stakeholder planning and decision-making	1.000	.562
10	Conflict resolution structures	1.000	.594
11	Contract flexibility	1.000	.664
12	Early establishment of collaboration	1.000	.726
13	Early, defined and collective stakeholder involvement and consultation	1.000	.697
14	Effective communication	1.000	.674
15	Financial and technical exchange and support / stipend	1.000	.494
16	Identifying individual and shared objectives	1.000	.751
17	Information sharing and transparency	1.000	.674
18	Information Technology (IT)	1.000	.702
19	Innovation	1.000	.686
20	Knowledge retention	1.000	.732
21	Power sharing	1.000	.701
22	Processual change	1.000	.806
23	Skilled leadership	1.000	.657
24	Social capital / Inter-personal relationships	1.000	.725
25	ProjCo experience	1.000	.499
26	Stakeholder commitment	1.000	.617
27	Trust and respect	1.000	.689

Extraction Method: Principal Component Analysis.

Table 9.2 shows the findings from the table of communalities for the PPP collaborative attributes. In this table, the amount of variance in each variable is accounted for by the extracted components. Almost 74% of the variance is accounted for in 'clear governance structures', while only 50% of the variance is accounted for in 'ProjCo experience'.

In addition to this, table 9.3 displays all the components which are extractable from the PCA. Evidenced in the table are the component eigenvalues, variation percentages and rotated cumulative variance loading. In total, the PCA identified six components with an eigenvalue greater than one which satisfied the suggestions of both Kaiser (1960) and Jolliffe (1972). The corresponding six cumulative components represented 68.392% of the total variance. Though this figure was below the recommended 70% by Field (2013) and Suhr (2005), this was marginal. Burns and Burns (2008), in their worked example considered a total variance loading of 58.55% as acceptable. Similarly, Li et al. (2005a) accepted a lower total loading value. Therefore, the cumulative components value of 68.392% was deemed satisfactory premised on these findings.

The variance explained by the six principal components were: component one - 39.94%; component two - 8.09%; component three - 6.67%; component four - 5.26%; component five - 4.43%; and, component six - 3.99%. All other components accounted for only a small amount of variance and are not significant. Cumulatively, these components account for 31.61% of the variance.

Table 9.3: Total Variance of PPP Stakeholder Collaborative Attributes

Comp.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Var.	Cumul. %	Total	% of Variance	Cumul. %	Total	% of Var.	Cumulative %
1	10.785	39.943	39.943	10.785	39.943	39.943	4.901	18.150	18.150
2	2.185	8.091	48.034	2.185	8.091	48.034	4.654	17.237	35.387
3	1.801	6.671	54.705	1.801	6.671	54.705	2.671	9.894	45.281
4	1.421	5.263	59.968	1.421	5.263	59.968	2.216	8.206	53.488
5	1.197	4.433	64.402	1.197	4.433	64.402	2.133	7.899	61.387
6	1.077	3.991	68.392	1.077	3.991	68.392	1.891	7.005	68.392
7	.885	3.277	71.669						
8	.860	3.186	74.855						
9	.767	2.842	77.697						
10	.691	2.559	80.256						
11	.633	2.346	82.602						
12	.551	2.042	84.643						
13	.521	1.931	86.574						
14	.489	1.810	88.385						
15	.451	1.672	90.057						
16	.417	1.545	91.602						
17	.370	1.372	92.974						
18	.347	1.284	94.258						
19	.316	1.172	95.429						
20	.243	.900	96.330						
21	.228	.846	97.176						
22	.183	.677	97.853						
23	.172	.638	98.492						
24	.147	.546	99.038						
25	.112	.416	99.454						
26	.082	.303	99.757						
27	.066	.243	100.000						

Extraction Method: Principal Component Analysis.

Figure 9.1 is the scree plot of the component eigenvalues. From the graph, there are two points of inflection or 'elbows'. These occur at components two and seven. Still, as suggested by Cattell (1966), components with an eigenvalue greater than one should be retained. Evidenced in the scree plot, there were six components to be retained.

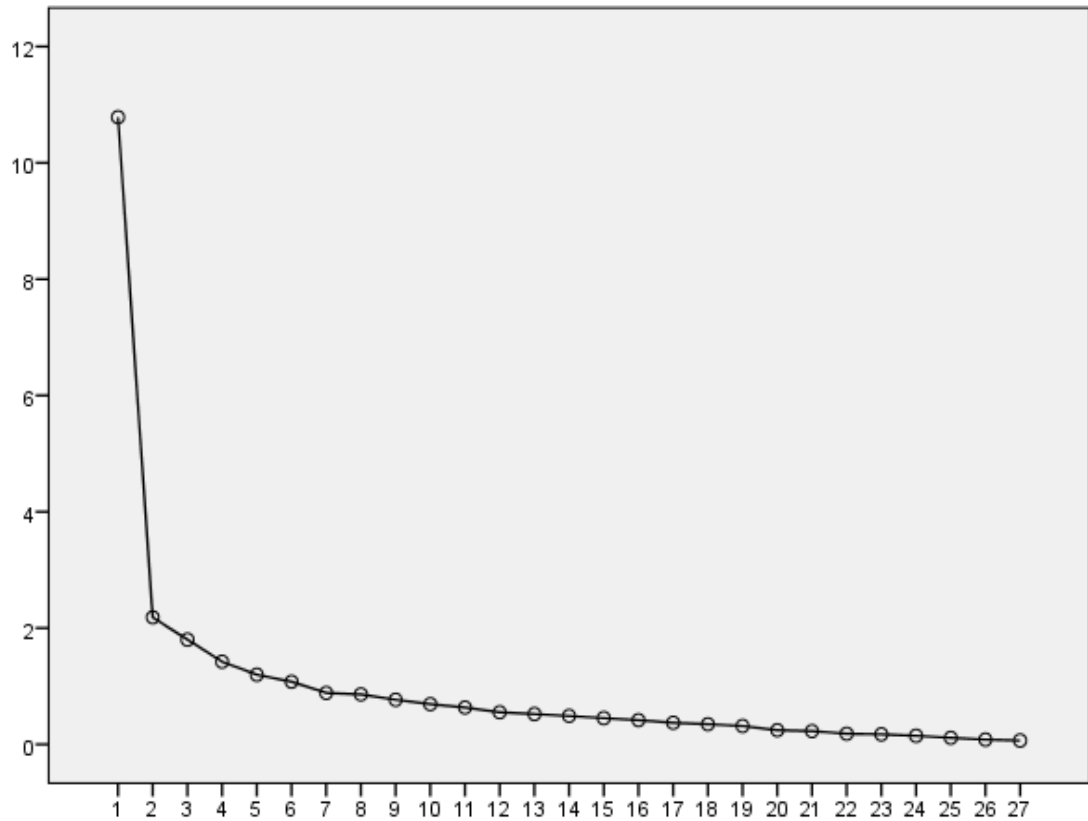


Figure 9.1: Scree Plot of PPP Stakeholder Collaborative Attributes

9.4. Identification of Principal Components for Public-Private Partnerships Collaborative Attributes

As suggested by Norusis (2006), the final step of the PCA procedure is the computation of the rotated components. Table 9.4 depicts the rotated component matrix of the PPP collaborative attributes. The variables were rotated using an orthogonal varimax method as per Field (2013). Components with loadings less than 0.45 were suppressed as explained in chapter six (6.4.9.7), ensuring the weighted strength of the components.

Table 9.4: Rotated Component Matrix for PPP Stakeholder Collaborative Attributes

	Component					
	1	2	3	4	5	6
Knowledge retention	.799					
Processual change	.766					
Power sharing	.741					
Information Technology (IT)	.731					
Innovation	.718					
Early establishment of collaboration	.624					
Early, defined and collective stakeholder involvement and consultation	.492		.488			
ProjCo experience						
Social capital / Inter-personal relationships		.755				
Trust and respect		.699				
Identifying individual and shared objectives		.695				
Skilled leadership		.668				
Effective communication		.665				
Information sharing and transparency		.660				
Stakeholder commitment		.650				
Balance of stakeholder needs and expectations		.462				
Clear governance structures			.794			
Contract flexibility	.502		.629			
Clarifying of roles and responsibilities			.510			
Collective stakeholder planning and decision-making			.505			
Appropriate risk sharing				.734		
Financial and technical exchange and support / stipend				.552		
Conflict resolution structures				.548		
Authority in-house resources / skills					.818	
Authority experience					.803	
Accountability						.762
Agreement of project brief						.686

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

9.5. Analysis of Public-Private Partnerships Stakeholder Collaborative Principal Components

Table 9.5 exhibits a summary of the extracted principal components, the attributes which constitute each principal component, and the percentage of variance explained by each

component. By doing so, the research has been able to distil this larger list of variables into the key themes of PPP stakeholder collaboration.

Table 9.5: Extracted PPP Stakeholder Collaboration Principal Components

Principal Component	Attributes	% of Total Variance
Component one	Knowledge retention; processual change; power sharing; Information Technology (IT); innovation; early establishment of collaboration; early, defined and collective stakeholder involvement and consultation	39.94%
Component two	Social capital / inter-personal relationships; trust and respect; identifying individual and shared objectives; skilled leadership; effective communication; information sharing and transparency; stakeholder commitment; balance of stakeholder needs and expectations	8.09%
Component three	Clear governance structures; contract flexibility; clarifying roles and responsibilities; collective stakeholder planning and decision-making	6.67%
Component four	Appropriate risk sharing; financial and technical exchange and support / stipend; conflict resolution structures	5.26%
Component five	Authority in-house resources / skills; Authority experience	4.43%
Component six	Accountability; agreement of project brief	3.99%

While the RII is important for measuring salience, it does not measure the relationship between variables. Through interpretation of the principal components, the research can discern the correlation between variables and the components they are most strongly related to. PCA enables research to identify the clustering effect of variables and has a prominent role in multivariate techniques for exploration and analysis. By conducting the PCA, the research can understand the composite inter-relationships of the collaborative attributes and can be represented as thematic components.

Cumulatively, the principal components encapsulate 68.39% of the latent variance that determines SIS perceptions of PPP stakeholder collaboration. From the list of 27 collaborative attributes, variables with a component loading less than 0.45 were considered to not be significantly importance and therefore not displayed in the rotated component matrix (table 9.4).

Premised on this, one attribute has been suppressed, with 26 attributes remaining in the PCA. This attribute was 'ProjCo experience' (Zheng et al., 2008; Roehrich and Caldwell, 2012; Tang and Shen, 2013). Within literature, it was remarked, rather than inadequate ProjCo

experience, instead, as noted by Grubnic and Hodges (2003), negative ProjCo experiences have been a more significant source of collaborative inertia. In line with this, it is suggested that the nature of ProjCo experience is key for collaboration success. Moreover, ProjCo experience ranked twentieth in the relative importance index (RII), indicating relatively low importance among SIS. Predicated on these considerations, together with the insufficient variable loading (0.387), there were justified grounds on which to exclude 'ProjCo experience' from the PCA.

The research will now interpret the principal components in regard to the loading values deemed significant, which will then be contextualised to the literature review. Components were ranked in order of the total variance explained which indicates the strength of relationships amongst data dimensions.

9.5.1. Component One

Component one accounted for 39.94% of the total variance and strongly correlated with seven PPP collaborative attributes, namely: 'knowledge retention'; 'processual change'; 'power sharing'; 'Information Technology (IT)'; 'innovation'; 'early establishment of collaboration'; and, 'early, defined and collective stakeholder involvement and consultation'. Component loading from highest to lowest, ranged 0.799 to 0.492. The top three highest loading collaborative attributes were 'knowledge retention' (0.799), 'processual change' (0.766) and 'power sharing' (0.741). In terms of the RII, these attributes ranked twenty-third, twenty-sixth and twenty-fourth respectively, signifying they were of very low importance for SIS collaboration²³.

From this component, the PCA reveals that the five highest loading variables are all of similar loading and will vary together. Hence, determined from this component, in line with literature, this component identifies the correlating attributes of long-term sustainable partnering. Indeed, research identifies that the partnership must be dynamic over time and adapt to the changing requirements of the project. Added to this challenge, is the permeable boundary of PPP. To ensure long-term collaboration, Akintoye and Kumaraswamy (2016) suggested there is a need to centralise and retain knowledge capital to inform decision-making. Moreover, this research has shown that the long-term nature of PPP projects has

²³ Interestingly, while these attributes ranked lower in terms of importance in the RII but had the highest loading values, this can be explained on the basis that components are extracted to explain variance of the variables and identify patterns within the dataset. It can hence be discerned that while the RII is used to explain ranking salience, the purpose of the PCA is to explain the distribution and correlation of variables.

been problematic for the sustainability of collaboration as stakeholder involvement shifts over time; conventional SIS organisations may exit from the project, while other new partners may decide to enter. With these transformative dynamics, the partnership must be adaptable as well as sustainable to this fluctuating environment.

Many in literature have likewise pointed to how power asymmetry has culminated in autonomous SIS behaviour (Chen et al., 2013; DeSchepper et al., 2014; Henjeweel et al., 2014; Rwelamila et al., 2014). The perceived ownership of power; often derived out of resource imbalances, has been expressed as an authoritarian attribute enforced by SIS striving to achieve their heterogenous objectives. These findings are consistent with a growing body of PPP and collaboration theory literature which places 'power sharing' as a central attribute of collaborative partnering. Hence, for sustainable partnering, all partners should be able to bring something to the project and should be considered as equals.

9.5.2. Component Two

This component represented 8.09% of the total variance and was composed from eight SIS collaborative attributes. The component loading for these attributes spanned from 0.755 to 0.462 and was constituted from: 'social capital / inter-personal relationships' (0.755); 'trust and respect' (0.699); 'identifying individual and shared objectives' (0.695); 'skilled leadership' (0.668); 'effective communication' (0.665); 'information sharing and transparency' (0.660); 'stakeholder commitment' (0.650); 'balance of stakeholder needs and expectations' (0.462). The three highest loading attributes on this component were 'social capital / inter-personal relationships' with a loading value of 0.755, followed by 'trust and respect' (0.699), and 'identifying individual and shared objectives' accounting for a loading value of 0.699.

In terms of the RII, the importance of these three attributes ran from sixteenth to first, reflecting moderately to the highest degrees of importance. Also, interestingly, of the four attributes which significant differences identified in the Kruskal-Wallis test, three loaded onto this component. The collaborative attribute of 'social capital / inter-personal relationships' was the highest loading variable onto this component. In the main, the majority of these variables were all within a similar correlating range, indicating that as the importance of one variable increases, so too will the importance of the others.

Derived from these constituent loading variables, the research can identify strong correlation between many of attributes which Blanchard (2012) termed as the essence of

partnering. These are the 'softer' attributes of collaboration in that they cannot be measured or formally agreed to. Nonetheless, these attributes should be located at the core of the partnership.

In literature, the recognition of 'social capital and inter-personal relationships' is indeed gaining traction (Tsisis et al., 2015). Inter-personal social capital exists among the personnel entrusted with the daily management of the project. Nevertheless, predicated on the longevity and bundled design of these ventures, PPP is associated with high staff turnover, which is serving to undermine the cultivation of inter-personal social capital (Roehrich and Caldwell, 2012).

In addition to this, the findings of this component are consistent with literature on the basis trust has been identified a central component of collaboration, and hence has been popular in collaboration and PPP literature. Zou et al. (2013) identified trust as an important attribute for relationship management (RM). Similarly, Wong et al. (2015) identified trust as the foremost factor for partnership building in PPP. Still, despite its prominence in ontological investigations, exploratory research concerning trust in PPP has lost momentum over time. The last notable offering identified was a decade ago (see Smyth and Edkins, 2007).

As well as 'trust and respect', communally, a PPP project is a synergy of diverse organisations; each offering unique skills and expertise. Upshot from this, SIS will possess different values, norms, and objectives, which often culminates in the misalignment of objectives serving to engender 'messiness'. Organisations should identify their heterogeneous project objectives but also identify shared commonalities which can be used to foster collaboration through an agreed project aim (Davis, 2016; Leviäkangas et al., 2016). This exchange of information provides an understanding of one another, promoting informed decision-making and an environment of collectiveness (Zou et al., 2013). Greater transparency and dialogue among SIS, facilitated by trust, can cultivate higher performing projects.

9.5.3. Component Three

Component three explained 6.67% of the total variance of the linear components and was constructed from four collaborative attributes: 'clear governance structures'; 'contract flexibility'; 'clarifying roles and responsibilities'; and 'collective stakeholder planning and decision-making'. The component loading ranged from 0.794 to 0.505 and the top three loading variables were: 'clear governance structures' (0.794), 'contract flexibility' (0.629), and 'clarifying roles and responsibilities' (0.510). These attributes were ranked eleventh,

eighteenth and thirteenth respectively in the RII and were therefore considered to be moderately important by SIS respondents. The importance of this component increases with four attributes. The two highest loading variables are 'clear governance structures' and 'contract flexibility' which suggest this component is strongly associated with the formalised framework of PPP.

Indeed, the highest loading variable on component three was 'clear governance structures'. Thomson and Perry (2006) considered governance as the systematic approach to creating a union or 'jointness'. In doing so, this comprised delineation of the decision-making structures and the framework for executing actions.

Still, it has been contended, governance structures conventionally have been contractually orientated rather than collaborative. Akintoye and Kumaraswamy (2016) called for further investigation of PPP governance and the introduction of collaborative contracting. Demirel et al., (2017) asserted, conventionally, PPP governance has been predicated on the contract which itself has been criticised for being incomplete and inflexible. As a result, when disputes arise, the contract has been pivotal in characterising these exchanges. However, rather than supplying a resolution, the incompleteness and absence of sound guidance has fuelled a conflictual dynamic as SIS have defended their own position. It therefore no surprise that one of the primary criticisms of the Private Finance Initiative (PFI) has been poor contract flexibility particularly in the operational phase as Authority requirements have changed. Through the removal of soft services from the contract, Private Finance 2 (PF2) affords greater flexibility than other PPP frameworks.

It is also pertinent that the third highest loading variable on this component was 'clarifying roles and responsibilities'. Roehrich and Caldwell (2012) noted how a failure to collectively include all SIS in the decision-making has been manifest through ambiguity regarding roles and responsibilities in the project. As a result, the failure to define roles and responsibilities has culminated in greater occurrences of dispute which has been exacerbated by the incompleteness of the contract. Thus, through greater clarity, SIS are in an informed position of not only their roles, but also of the responsibilities of others which can be reflected through improved provision.

9.5.4. Component Four

This component was composed of three variables which can be collapsed into: 'appropriate risk sharing'; 'financial and technical exchange and support / stipend'; and 'conflict resolution

structures'. The component loading ranged 0.734 to 0.548 and accounted for 5.26% of the linear variance.

In terms of the RII, SIS ranked these three attributes eighth, nineteenth and seventeenth respectively, indicating these attributes were moderately to very important for PPP collaboration. Discerned from these findings, 'appropriate risk sharing' had a notably higher loading significance than the other two attributes, and hence this component principally relates to risk.

In PPP literature, risk has been a prominent discussion point. On many occasions, the decision to proceed with PPP over conventional provision mechanisms has been predicated on superior risk management allegedly offered in partnering arrangements. In theory, risk should be retained by the SIS best able to manage it to deliver optimal investment impact. However, Li et al. (2001), as early as 2001, noted concerns over the mismanagement and mispricing of risk transpiring in reduced efficiencies and increased project prices. This has permitted the private-sector to have disproportionately gained. Over the course of the following decade, risk continued to be a major concern and was ultimately one of the prevalent criticisms of PFI following a National Audit Office (NAO) investigation in 2011 (NAO, 2011). More recent research suggests, through allocation of risks to the organisation best able to manage it, this will benefit all SIS and improve project performance (Chang, 2013; Loosemore and Cheung, 2015; Xiong et al., 2017).

In addition to this, some have considered the procurement phase as a barrier to collaboration (Tang and Shen, 2013; Demirag et al., 2015; Liu et al., 2016). With little guarantee of project award, the nature of the procurement phase is competitive and uncertain. However, Wong et al. (2015) suggested, by providing support or a stipend, SIS are encouraged to buy into and commit to the project earlier. This exchange early in the project can produce benefits downstream and can also lead to appropriate risk sharing.

Furthermore, unknown indigenous and exogenous factors can influence the project provision. When disputes arise, it is essential, the essential 'conflict resolution structures' are in-situ (Savage et al, 2010). It has been commented that in the wake of dispute, the inability to collectively resolve problems has ended in the fragmentation of the partnership.

9.5.5. Component Five

The fifth component identified contained two attributes with a total variance loading of 4.43%. Both variables had high component loadings: 'Authority in-house resources / skills'

accounted for a component loading of 0.818 and 'Authority experience' similarly had a component loading of 0.803. The RII of the PPP collaborative attributes indicated the SIS sample considered these attributes slightly important, respectively ranking them twenty-second and twentieth. The high loading values indicate there are similar degrees of importance of both attributes on this component and hence this component is significantly related to both 'Authority in-house resources / skills' and 'Authority experience'.

Already, many in literature have presented findings to demonstrate the relationship between skills deficiencies on the part of the Authority and poor collaborative relationships (Roehrich and Caldwell, 2012; Reynaers, 2013). Authorities have relied on advisors to fill expertise gaps and accordingly, these skillset shortfalls have served to undermine the Authority platform. Some have argued greater access to resources can empower Authorities, enabling them to equitably input into the project. Moreover, equal stakeholder platforms can advantageously culture an informal, and more pronounced collaborative environment (Tang and Shen, 2013; Zou et al., 2013).

Allied with this, Authority experience is an important attribute of collaboration. The limited repeatability of projects earlier mentioned in regard to component one, impacts the Authority's ability to develop skills and share knowledge. This has transpired in a partnership between two partners; one which is highly skilled with previous experience, and another who is underequipped to collaboratively deliver project success (Roehrich and Caldwell, 2012; Chen et al., 2013). It is fundamental all SIS are considered equal for collaboration to function.

9.5.6. Component Six

Finally, the sixth collaboration component consisted of two variables which were 'accountability' and 'agreement of project brief'. Together, these attributes explained 3.99% of the total variance. The component loading of the variables respectively were 0.762 and 0.686 indicating this component related most significantly to accountability. Even so, the small margin between the two attributes indicate that the importance of each attribute will almost equally increase in line with the other.

In terms of the RII, these attributes were considered moderately to extremely important. The attribute of 'accountability' ranked fourteenth and 'agreement of project brief' was ranked fourth.

In research literature, Reynaers (2013) remarked how over reliance on advisors and consultants by Authorities has masked ‘accountability’. Demirag et al. (2015) observed how the remoteness and lack of ‘accountability’ of Debt Funders engendered uncertainty among SIS, while DeSchepper et al. (2014) and Reynears (2013) claimed the multiple institutional levels within the public-sector diluted accountability.

Literature has also illustrated how a failure to ‘agree the project brief’ has transpired in poor stakeholder collaboration. Roehrich and Caldwell (2012) described how the failure to collectively agree the project brief early in the project has prevented the establishment of roles and responsibilities. Predicated on an absence of an ultimate project aim, this has undermined the decision-making and project provision. In collaboration theory, Morris and Miller-Stevens (2015) suggested that by sharing a common definition of the problem, partners can define a problem and strategically development a project brief premised on mutually agreed success criteria. By defining the project success criteria, this should prevent autonomous behaviour which has been identified in literature as an outcome of poor stakeholder collaboration. The findings of this component support the suggestions from literature of PPP collaboration.

9.6. Reliability and Validity of PPP Stakeholder Collaboration Components

The PCA procedure determined six collaborative components. Contained within these components, the research identified the salient attributes (variables) with the highest loading values onto these components. Following the identification of the components, the next step in the framework development is to test the validity and reliability of the questionnaire. According to Field (2013), the purpose of testing the reliability is to ensure the consistency of the data over time. As defined in chapter six, this was computed using Cronbach’s alpha ($C\alpha$) function. $C\alpha$ is a measure used to determine reliability or internal consistency of the survey questions against the computed principal components.

Table 9.6: Reliability Analysis of PPP Stakeholder Collaboration Components

Principal Component	Number of Attributes	Cronbach’s alpha ($C\alpha$)
Component one	7	0.91
Component two	8	0.89
Component three	4	0.76
Component four	3	0.63
Component five	2	0.79
Component six	2	0.67
Total PPP Collaborative Components	26	0.78

Table 9.6 display the outcomes of the $C\alpha$ test on the extracted components. As per Doloi (2008), the results of the Cronbach's alpha ($C\alpha$) test indicated the collaboration components were of acceptable values. Overall, the value determined for the PPP stakeholder collaborative components was $C\alpha = 0.78$. This value was deemed acceptable as suggested by Doloi (2008).

Having validated the reliability of the extracted PPP stakeholder collaboration components from the PCA, the research will now contextualise these findings to the PPP project lifecycle in order to produce the PPP stakeholder collaboration framework. This is undertaken in the next section.

9.7. Development of the Public-Private Partnerships Stakeholder Collaboration Framework

In the foregoing, the research extracted six principal components from the PCA. The purpose of this section is therefore to contextualise these findings to the PPP project by applying the findings of the literature review. By doing so, the thesis will name each of the principal components and ultimately produce a PPP stakeholder collaboration framework. This framework therefore is informed from two sources:

- I. Firstly, the findings of the literature review; and
- II. Secondly, best-practice guidance informed by SIS perceptions for policy-makers and industry practitioners.

By doing so, the research provides meaningful empirical results which have been authenticated by experts and contextualised by literature. These findings can accordingly be used to inform both policy and business models and therein improve project performance.

9.7.1. Initiation

There are two defining stages in the initiation phase. This comprises the identification of the project and consideration of the PPP mechanism, and, the project appraisal and preparation of the contract documents. Many of the tasks in this phase pertain to the preparation and development of the project prior to tendering and contract award.

Collaboration should be established early in the project and being the only SIS involved at this point, the locus of responsibility falls upon the Authority to implement the collaborative ethos. The Authority must undertake decisive actions to commit to collaboration and this should be reflected through the preparation of a collaborative governance framework, a

collaborative procurement strategy and collaborative contracting. It is critical that all personnel inherent to the public-sector buy into the collaboration ideology and this agenda should be agreed and established within the Authority as well as across central government. Requiring a cultural overhaul, the collaborative PPP approach must be a top-down commitment which is driven through strong leadership. It is important that the Authority has access to the necessary skills, expertise and resources to participate as a partner, build collaborative capacity, develop a knowledge retention plan and appoint a skilled project manager.

In the initiation phase, an assessment of PPP should be undertaken to determine future resource outlay. These procedures should be overseen and guided by the Infrastructure and Projects Authority (IPA). Being the knowledge-capital hub located in central government, the IPA can provide best-practice expertise and supply additional resources where appropriate to the Authority. This will reduce the need for external consultants and in this regard, it is also pertinent that the IPA procure and upskills their PPP stakeholder collaboration expertise. The importance of component five will accordingly be pronounced in the initiation phase.

9.7.2. Procurement

Proceeding the initiation phase, the PPP will transition into the procurement phase. The development of collaboration in the procurement phase is the lynchpin of collaborative advantage in that for the long-term continuity of collaboration, it is fundamental it is instilled early in the project. This dynamic is expressed through the prevalence of many of the PPP stakeholder collaborative attributes. The procurement phase is comprised of the structuring and drafting of the contract, as well as the execution of the tendering procedures which culminates in contract award.

The structuring and preparation stage, in essence, incorporates the preparation and finalisation of the documentation for the tendering process, and contract award protocols. In this stage, the Authority continues to be the only SIS involved in the project. Key tasks include the structuring and drafting the Request for Quotation (RFQ), the Request for Proposal (RFP) and the PPP agreement. In the preparation of this documentation, the Authority must determine a strategy to incentivise private-sector participation and buy-in. This may be a performance/reward system premised on the commercial objectives of the private-sector, or it may alternatively be a cost reimbursement strategy. Rewards should be designed to benefit and incentivise the collective cohort rather than individual SIS

organisations on the grounds that rewarding a single SIS encourages autonomous behaviour. Also, in the circumstances where the incentivisation policy fails to achieve the desired outcomes, the formalised structures and systems should be embedded within the governance framework as a method to reinforce the collaborative ideology.

Along these lines, it is important to establish the project success criteria predicated on the point that these measures will be used to determine and track the productivity of the partnership. Furthermore, in preparation for the tendering process, the Authority should evaluate potentially offering a form of resource exchange, support or stipend to stimulate wider private-sector participation and remove barriers to entry. This resource exchange encourages earlier stakeholder buy-in to the collaboration. Also, with a limited number of organisations who possess the capacity to undertake a PPP venture, it should be articulated that PPP will be collaborative going forward. Under risk of an uncollaborative reputation, the Authority can use this as a negotiating tool to drive this agenda.

As the project progresses into the tendering procedure, the dynamics in the project will shift premised on intensified activity at the public-private macro partnership interface. In the tendering process, all SIS participate and the prominence of the component two will increase as consultation commences between the Authority and private-sector bidders. The nature of the tendering phase is competitive as private-sector cohorts compete to secure the project. As a result, the procurement strategy and governance frameworks will be instrumental in underpinning collaboration. Moreover, to temper the competitive environment a non-vested third-party collaboration manager with the responsibility of overseeing and steering the procurement process should be appointed. It is important in this stage, that all SIS have opportunities to be involved and are consulted. Likewise, particularly among the Project Company (ProjCo) cohort, collective SIS planning and decision-making is central to enhanced collaborative advantage. In this context, there should be greater consideration of, and participation from the service delivery SIS organisations in the tendering process to improve the integrated solution design.

By treating all SIS with respect and including them in the decision-making process, this can cultivate trust. Also, advantageously, this can offer superior understanding and informed decision-making. This encourages these service provision SIS to buy into the collaboration earlier and therefore they are more likely to commit resources earlier. To ensure transparency and clarity, the argument for collaboration should be explained and promoted by the Authority to the private-sector. By doing so, the core values of collaboration can be

agreed upon, and a base can be established for the long-term arrangement. Each bidding stakeholder will bring their own objectives to the table. It is essential that SIS identify and share their project goals as well as familiarise themselves with the desired outcomes of others during the negotiations as part of the tendering process through dialogue and active engagement. This promotes understanding and informed decision-making among SIS organisations. Moreover, it enables partners to agree mutual and communal goals. By recognising synergistic objectives, SIS can align under these outputs, and jointly drive the project performance. This conducive environment can be unlocked through effective communication, information sharing and transparency.

To ensure collaboration, it is important risk is retained by the SIS best able to manage it; whether this be in either the public or private-sectors. Moreover, in addition to risks already identified, a joint framework should also be agreed among partners as to how unforeseen risks will be managed. These concerns should be addressed, and response approaches should also be agreed at this juncture of the project. Coupled with this, while collaboration ideologically is premised on teamwork and cooperation, the inherent qualities of business dictates that it is inevitable disputes will arise at some point in the contract. Relational conflict resolution structures should be prioritised when this occurs. These mechanisms must focus on identifying solutions rather than apportioning blame, also joint efforts should be undertaken for the early identification of unforeseen events.

In addition to formalised structures, efforts should also be undertaken to cultivate informal relationships as it has been shown that inter-personal relationships can negate the necessity of formalised systems. Collaborative workshops and social events can be instrumental in developing this informal nexus. Ultimately, it is the public-sector who selects the partner to enter the project with and in this vein, it is essential that the Authority selects the partner which fits and buys into to the collaborative agenda.

9.7.3. Commissioning and Contract Management

At financial close, the macro inter-sectoral partnership and micro intra-sectoral partnerships are formalised and the dynamics of the collaboration transform as the project enters the commissioning and contract management phase. This recalibration is reflected through the shift towards the sustainability of the collaborative partnership and emphasis shift towards optimal project performance. Constituting the construction and commissioning, and operations, maintenance and handback, key tasks from this phase include the construction of the infrastructure facility and the long-term management of the service.

In the construction and commission stage, interactions between the Authority, the Construction Contractor (BuildCo) and ProjCo intensify. Under time and cost constraints with significant risk exposure, the construction phase is highly pressurised which coincides with the prominence of the dialogue and engagement components. When designing the integrated solution, it is central to the sustainability of the project, that all SIS contribute to the solution design. Moreover, to avoid disputes after handover, it is important that the Service Provider (FMCo) approves the design and agrees to the defined roles and responsibilities. It is also significant that financial SIS partake in the decision-making processes in construction and continue to do so in the operations. To fully appreciate efficiencies, Debt Funders and Equity Shareholders should remain involved in the service delivery to optimise decision-making particularly in the face of unforeseen circumstances. IT can be integrated to facilitate these processes. Also, BIM is effective in engineering a team environment through information sharing and transparency, defined communication, accountability and encouraging involvement. These protocols should be managed by a BIM champion which may increase the scale of the front-end investment; however, this should ultimately transpire in greater long-term efficiencies across the lifecycle.

As construction completes and the facility is commissioned, the contract enters the operations, maintenance and handback stage. As BuildCo's responsibilities decrease, FMCo takes over the operations and maintenance of the asset. Being the longest stage of the venture, it is critical that many of the core foundations of collaboration have been implemented and cemented at this point of the project. Even so, there are additional distinctive collaborative attributes characteristic to operations, maintenance and handback. In this stage, it is pertinent that the all aspects of the partnership can grow and evolve. This is reflected through the importance of the manage component determined in the PCA. This derives out of several factors. Over time, the objectives of SIS organisations can alter.

Moreover, as new technologies are developed, and business models transform, the partnership must be able to adapt accordingly. A fluid SIS collaboration can lessen the need for conflict resolution and formalised structures. Coupled with this, a flexible partnership can respond to inefficiencies. The performance of the arrangement should be continually evaluated against the predetermined criteria defined by the Authority and agreed to by ProjCo. Where performance is declining, the partnership should be modified where needed to enhance productivity. On going innovation is critical in this regard, to enable the continual development of the partnership as well as to ensure the continuity of value creation; the governance frameworks and contract must be conducive to this. Most likely to be

immediately affected by poor project performance, it is important that FMCo, Equity Shareholders and the Authority work closely to cooperatively deliver the service. Moreover, Debt Lenders should be continually informed of any potential problems as well as the manifestations of potential issues.

As well as the existing partnership, the permeable boundary of PPP means that the organisations which constituted the original partnership may exit the project. As investments are recycled, refinanced and traded in the secondary market, new SIS organisations may enter the project. Typically, these are third-party investors with little direct interest in the day to day service provision. Instead these SIS tend to be involved on a 'by-exception' basis. Nonetheless, it is important to map their involvement and activity. Concerted efforts should also be implemented to align cooperative personnel on projects as well as to retain best-practices knowledge throughout the course of the venture. The final element of the PPP collaborative lifecycle is the termination of the contract and the exit strategy. The contract is central in defining the responsibility boundaries in account of the length of the project lifecycle. This transition can be facilitated through trust and respect and inter-personal relationships.

9.7.4. Component Naming

Consolidating the findings of this thesis, this section applies these findings to the principal components to appropriately name each component according to their relationship with stakeholder collaboration. The outcome of this naming process is informed by the discussion above with the key findings feeding into table 9.7 which is the PPP stakeholder collaboration framework.

9.7.4.1. Component One – Dynamic Partnering

Previously, it was determined that collaboration is dynamic. In order to ensure long-term collaboration, it is important that collaboration is fostered early in the project and that this ideology carries through to the remainder of the project life. Research indicates that it is difficult to develop collaboration later in the project and as a result, the procurement phase has been identified as the lynchpin of a sustainable partnership. This is reflected through the discussion above which recorded that, derived from the long-term nature of these projects, the dynamics and requirements of the project will evolve according to the changing needs of the organisations involved. It is fundamental that the partnership can grow concomitantly. Hence, with the loading attributes of component one pointing towards the need to establish

collaboration early, combined with the attributes which enable the partnership to evolve overtime, component one has been called 'dynamic partnering.

9.7.4.2. Component Two – Partnership Core Values

Literature suggests that for collaboration to be effective, it should be a dyad of formal and informal structures. With this in mind, many of the attributes loading onto component two can be considered as 'softer' collaborative attributes. Blanchard (2012) characterised these attributes as the core values of collaboration in that they should form the essence of the partnership. Being central to the partnership, many of these loading attributes emerge in the procurement phase as ProjCo enters the project and will thereon carry forward into commissioning. Set against this backdrop, component two has been labelled 'partnership core values' on the basis these attributes should embody the ethos of the partnership.

9.7.4.3. Component Three – Formal Governance Structures

In line with component two, for the partnership to function collaboratively, a critical aspect of this is the formalisation of institutional structures. Akin to component two, these loading attributes fundamentally will increase in importance in the procurement phase. They will be instrumental in defining the nature of the engagement between SIS and should define the collaborative relationship for the duration of the partnership. The research identified that governance structures are a key component of this and indeed this is the highest loading attribute onto component three. Equally, the contract historically has been critical in defining the nature of the partnership. Derived out of its incompleteness and rigidity, many problems have emerged; however, by increasing contractual flexibility, this should lead to a stronger partnership whereby SIS subsequently becomes less dependent on the contract. For these reasons, component three has been identified as 'formal governance structures' and has been accordingly termed so in table 9.7.

9.7.4.4. Component Four – Risk Management

Based on the contextualisation of literature to the extracted components, component four is particularly prevalent in the procurement phase. In literature, it was identified that risk and its allocation to the SIS best able to manage it, has been a key justification for the use of PPP over other procurement strategies. It is hence no surprise that the attribute of 'appropriate risk sharing' is the highest loading variable on component four.

Indeed, risk is prevalent throughout the entire lifecycle of a PPP project and its appropriate allocation is a fundamental determinant of VfM. This risk sharing process is determined

during the procurement phase. Accordingly, although this component should be a key area of focus across all phases, risk sharing, and risk allocation will be decided as part of the procurement process.

As part of this negotiation process, to optimise risk sharing and therein maximise VfM, decision-making can be facilitated through a 'financial and technical exchange and support / stipend'. By doing so, this encourages buy-in into the collaborative philosophy.

Moreover, just as risk allocation is prominent in the procurement process, risk is also prevalent across the lifecycle. Hence, when unforeseen risks manifest, it is important that these issues are addressed collaboratively through cooperative 'conflict resolution structures'. With these attributes all correlating to risk and the salience of risk management in PPP literature, component four has been termed 'risk management'. These findings have been depicted in the PPP stakeholder collaboration framework below.

9.7.4.5. Component Five – Authority Leadership

From the findings above, the research identified the prevalence of component five early in the project. Being the only SIS involved in the project at this point of the project, emphasis is placed on the Authority to promote the collaborative agenda in the initiation phase, and the attributes of 'Authority in-house resources / skills' and 'Authority experience' are fundamental to this. For this reason, component five has been labelled 'Authority leadership'.

9.7.4.6. Component Six – Mission Statement

Wicked problems are those whereby there is no true consensus on the true nature of the problem, nor is there any agreement of how to resolve it. Collaboration has been extolled for its capacity to address wicked problems through a combined effort of organisations. However, in the context of PPP, this network of SIS has served to blur the boundaries between SIS which has detracted from the accountability within the project. As a result of having multiple organisations involved, there are a number of different potential approaches by which to collaborate in an effort to resolve wicked problems. This culminates in no clear project aim. Nevertheless, the research has shown that by agreeing the project brief through a mission statement, this ensures there is a singular outlook on the problem and a unilateral approach can be defined by which to resolve the problem. In turn, this enables SIS to agree roles and responsibilities and therefore can improve accountability.

Akin to the other components, component six is particularly important in the procurement stage as the contract is signed which determines the future path of travel for the project. Derived from this, component six has been determined as 'mission statement' on the grounds it is the banner which enables all SIS to define the ultimate goal of the project and equally establish accountability in achieving this project brief.

The findings from this section are reflected in table 9.7. This table shows the dynamism of the 26 collaborative attributes, together with their loading correlation onto each component. The table also displays the partnership boundary specification and how this changes across all phases of the PPP project.

Table 9.7: PPP Stakeholder Collaboration Framework

Project Phase	Initiation		Procurement		Commissioning	
	<i>Identifying project and consideration of PPP mechanism</i>	<i>Appraisal and preparation of contract documents</i>	<i>Structuring and Preparation</i>	<i>Tendering and Contract Award - Competitive negotiations</i>	<i>Construction and Commissioning</i>	<i>Operations, maintenance and handback</i>
Key Stages and Project Objectives						
PPP Partnership Boundary Specification	Auth.	Auth.	Auth.	All SIS	Auth. / ProjCo / BuildCo	Auth. / ProjCo / FMCo / Finan.
Component 1 – Dynamic partnering						
Knowledge retention	✓	✓	✓	✓	✓	✓
Processual change					✓	✓
Power sharing				✓	✓	✓
Information Technology (IT)	✓	✓	✓	✓	✓	✓
Innovation					✓	✓
Early establishment of collaboration	✓	✓	✓	✓		
Early, defined and collective stakeholder involvement and consultation				✓		
Component 2 – Partnership core values						
Social capital / inter-personal relationships				✓	✓	✓
Trust and respect				✓	✓	✓
Identifying individual and shared objectives				✓		
Skilled leadership	✓	✓	✓	✓	✓	✓
Effective communication			✓	✓	✓	✓
Information sharing and transparency				✓	✓	✓
Stakeholder commitment	✓	✓	✓	✓	✓	✓
Balance of stakeholder needs and expectations				✓		
Component 3 – Formal governance structures						
Clear governance structures	✓	✓	✓	✓	✓	✓
Contract flexibility			✓	✓	✓	✓
Clarifying roles and responsibilities				✓	✓	
Collective stakeholder planning and decision-making				✓	✓	✓
Component 4 – Risk management						
Appropriate risk sharing	✓	✓	✓	✓	✓	✓
Financial and technical exchange and support / stipend			✓	✓		
Conflict resolution structures				✓	✓	✓
Component 5 – Authority leadership						
Authority in-house resources / skills	✓	✓	✓	✓	✓	✓
Authority experience	✓	✓	✓	✓	✓	✓
Component 6 – Mission statement						
Accountability	✓	✓	✓	✓	✓	✓
Agreement of project brief				✓	✓	

9.8. Summary

The purpose of this chapter, chapter nine, was to develop the PPP stakeholder collaboration framework. This comprised reducing the larger number of 27 stakeholder collaboration attributes into smaller, more meaningful components through the application of PCA.

Extracted from the PCA, six components were identified which constitute PPP stakeholder collaboration. These components were 'dynamic partnering', 'partnership core values', 'formal governance structures', 'risk management', 'Authority leadership', and 'mission statement'. The highest-loading component was 'dynamic partnering' which underpinned the necessity for continuous and on-going cultivation of collaboration. Moreover, the constituent variables of this component emphasised and promoted the need for early establishment of collaboration which historically has been absent, premised on the competitive nature of the procurement phase. This component highlighted the importance of on-going review and continual assessment.

With these findings, the research contextualised the extracted PCA components to PPP literature to produce the PPP stakeholder collaboration framework. As part of this development process, the research provided a discussion which can be used to inform policy and industry. The findings from this chapter have fulfilled objective five of the research. Furthermore, through the application of PCA, this research has made an empirical contribution to knowledge.

Having done so, the research will proceed to chapter ten where it will discuss these findings along with the implications of this investigation and how it has contributed to knowledge.

CHAPTER TEN

CONCLUSIONS

10. Conclusions

10.1. Introduction

This thesis set out to develop a framework for Public-Private Partnerships (PPP) stakeholder collaboration in United Kingdom (UK) social infrastructure provision. To meet this research aim, five objectives were strategically determined which were centred around the infrastructure investment challenge, the role of PPP as a 'more and better' provision framework, and the development of a PPP stakeholder collaboration framework for improved project performance. These objectives have been comprehensively addressed in the foregoing chapters. By doing so, the research has made an empirical contribution to knowledge to enhance stakeholder collaboration in UK PPP social infrastructure provision.

The final chapter, chapter ten, revisits and presents the key findings from this investigation ascertained from both the critical literature review and the empirical research. Moreover, drawing together the outcomes of the work, this chapter considers the implications of the research both for policy, academia and industry alike. To finish, the study concludes with a discussion of the research limitations and the potential areas for future investigation.

Chapter ten is framed as follows:

- Key findings from the research;
- Knowledge contribution and research implications;
- Recommendations;
- Research limitations; and
- Further research.

10.2. A Reflection on the Key Findings from the Research

The aim of this investigation was to investigate stakeholder collaboration in UK PPP social infrastructure provision and therein develop a PPP stakeholder collaboration framework. Underpinning the development of this stakeholder collaboration framework, this research considered the *infrastructure concept*. Objective one was premised on critically appraising infrastructure as a vehicle for socio-economic development. When investigating objective one, it was determined that infrastructure can be classified as social or economic. Notwithstanding this dichotomy, the research unearthed that infrastructure systems are symbiotic and therefore should be considered holistically. Moreover, this investigation served to detail the magnitude of the multiplier effect on investment and conveyed a consensus that infrastructure provision has a positive output in terms of GDP growth.

This research established social infrastructure is a myriad of explicit and implicit contributors, and thus the benefits can be much more latent and tacit. As well as this, the research found that infrastructure investment has been used as a catalyst for socio-economic development in response to the Global Financial Crisis (GFC). Infrastructure investment can be beneficial in the short-term through job creation, and influential in the medium to long-term through the wider benefits and externalities derived from its provision. In this regard, infrastructure investment is a cornerstone of a functioning and vibrant society. Yet, despite its significance, the research highlighted how a legacy of underinvestment has meant governments have failed to keep pace with investment demands. Moreover, it was determined that in the context of acute capital retrenchment, future infrastructure investment is confronted with the need for more alternative sources of finance as well as the pertinence of improving the performance of existing frameworks for better provision. To alleviate these demands and therein provide 'more and better' infrastructure, it was found there is now greater appetite for increased private-sector participation in infrastructure provision.

A procurement framework which has been extolled for to meet the infrastructure investment challenge is PPP. Although only constituting a marginal portion of infrastructure provision in the UK, circa 10 to 14%, overall, PPP has already played a pivotal role in social infrastructure provision. Objective two of this investigation was predicated on critically evaluating the role of PPP as a vehicle for social infrastructure provision in the UK. This investigation found that since the onset of the GFC, the UK PPP marketplace has exhibited a significant decline in terms of activity attributable to the acute transformations in the financing markets as well as forthcoming concerns over the true extent of VfM for the taxpayer premised on inherent framework inefficiencies. The UK government has undertaken steps to strategically reform UK PPP arrangements. Notwithstanding these nuances, the research identified that these changes have failed to address the inherent inefficiencies of these mechanisms. In total, the research determined 19 inefficiencies which continue to confront the mobilisation of PPP. To address these inefficiencies, the concept of collaboration has been touted throughout PPP literature and was identified as a pertinent knowledge gap.

In these long-term arrangements where the cross-sectoral partnership is the fulcrum of project success, there is now the collective realisation that these frameworks must operate under a banner of communal problem-solving and collectivism; all of which equates to stakeholder collaboration. Notwithstanding this, the research unearthed weaknesses in the current understanding of how to best foster PPP stakeholder collaboration. The literature

review found that rather than being a collaborative partnership, traditionally PPP has been equivocal to a contractual outsourcing arrangement. Furthermore, the research highlighted how the permeation of new organisations, derived out of the necessity for alternative sources of finance, has transpired in a need for greater collaboration to unlock these additional capital resources.

Against this backdrop, objective three was premised on examining collaboration among PPP social infrastructure stakeholders (SIS). The research found that collaboration has evolved over the previous thirty years; however, despite noteworthy progress, there remains a prominent knowledge gap. The research found that a key component to fostering collaboration is the establishment of a *boundary specification*. Despite being central to collaboration, it was determined that an approach by which to determine the boundary specification has yet to be defined in the context of PPP. In response to this, the research considered *stakeholder theory* and the constructs of *legitimacy*, *power* and *urgency* to identify and understand key social infrastructure stakeholder (SIS) involvement in UK PPP social infrastructure provision. Premised on legitimacy and an organisations relationship with the contract, the research proposed a nomenclature of PPP stakeholder organisations comprising normative, derivative and non-stakeholders. The key PPP SIS for collaboration were found to be the Authority, Debt Funders, Equity Shareholders, Construction Contractors (BuildCo) and Service Provider (FMCo). While all other stakeholders were still considered worthy of inclusion, the research argued a stakeholder management approach would be more appropriate on the grounds these bodies have no contractual authority.

Having identified the SIS, utilising the constructs of power and urgency, the research set about understanding the involvement of these organisations and how their positions transitioned across the PPP project lifecycle. It was identified that SIS involvement is transient and fundamentally shifts at financial close, construction completion and in the operations. This was reflected through two partnership dynamics. The first was the macro public-private inter-sectoral partnership which transitions at financial close through the formalising of the agreement. This exists between the Authority and the Project Company (ProjCo). Secondary inter-sectoral micro partnership derived out of the transforming roles and responsibilities inherent to ProjCo and the relationships between these constituent private-sector SIS, the Authority, and ProjCo. A critical examination of this level of the partnership unearthed 23 inherent PPP collaboration gaps. It was found there were collaborative gaps both within and between sectors. Moreover, sources of poor

collaboration emanated from all phases of the project. These findings were used to inform the identification of the PPP collaborative attributes.

Predicated on this PPP SIS boundary specification, the research examined *collaboration theory* to determine the attributes of PPP stakeholder collaboration for improved partnering and to engender enhanced performance in the project. The research considered the motivations to partner and likewise identified that it is a complex concept. As part of this consideration, the research also recognised the importance of formalised structures as well as informal constructs in fostering collaboration. For long-term arrangements such as PPP, the research identified that collaboration is fundamental to the long-term sustainability of the partnership. Collaborations must be flexible to evolve over time as the inherent project dynamics change. Likewise, equal power-sharing should be reflected through the sharing of roles, risks and responsibilities. Ultimately, from this examination, a list of 27 PPP stakeholder collaborative attributes were identified for empirical investigation.

The purpose of the empirical phase was to develop the key findings from the literature into a more meaningful PPP stakeholder collaboration framework premised on the inputs from SIS organisations and therein meet objectives four and five. The research design for this framework development consisted of quantitative electronic survey questionnaires which were disseminated to PPP SIS organisations, coupled with a Principal Components Analysis (PCA) which was conducted on the collected data to extract the principal components to inform the PPP stakeholder collaboration framework.

However, prior to this, the research undertook a contemporary analysis of the UK PPP social infrastructure market. The purpose of this quantitative analysis was to provide transaction clarity around the PPP social infrastructure investment paradigm and thereby set the contemporary context of the research. To inform this analysis, the research utilised datasets sourced from *Infrastructure Journal (IJ)* Online Database. From this analysis, the research identified that Health and Education continue to be the two preferred social infrastructure sectors which mobilise PPP. Of the four jurisdictional markets, all have been acutely impacted by the GFC and despite policy reformations, activity in the main remains relatively muted; though there are burgeoning signs of growth in Scotland.

In accordance with objective four, survey questionnaires were conducted to have SIS organisations evaluate the salience of the collaborative attributes identified from literature and therein furnish the research with the empirical data by which to develop the PPP stakeholder collaboration framework. The data gathered as part of this methodological

approach was analysed to determine the ranked salience of the PPP stakeholder collaborative attributes by means of a Relative Importance Index (RII). Equally, statistical analysis conducted by the Kruskal-Wallis H test identified significant levels of disagreement between SIS organisations in regard to four of the collaboration attributes. Nevertheless, there was significant levels of agreement among the cohort of the collaborative attributes to carry forward into the framework development. This was determined through Kendall's Coefficient of Concordance. Ultimately, from these statistical tests, the research was able to determine how the attributes were ranked by the respondent sample as per the cohort, as well as per SIS category. These findings have made an original contribution to knowledge by indicating attribute salience.

PCA was utilised to reduce the larger number of attributes into a smaller number of more meaningful constructs. In doing so, this enabled the research to meet objective five. Through the PCA, six PPP stakeholder collaboration components were determined, which were subsequently contextualised to the literature review to produce the PPP stakeholder collaboration framework. The attribute of 'ProjCo experience' fell below the minimum loading value benchmark and was excluded from the PCA. The remaining 26 attributes collectively represented 68.39% of the latent variance and were categorised into: 'dynamic partnering', 'partnership core values', 'formal governance structures', 'risk management', 'Authority leadership', and 'mission statement'.

1. Dynamic partnering - accounted for 39.94% of the total variance and was comprised of seven attributes. These were: 'knowledge retention'; 'processual change'; 'power sharing'; 'Information Technology (IT)'; 'innovation'; 'early establishment of collaboration'; and 'early, defined and collective stakeholder involvement and consultation'. Notably, despite representing the most variance, 'knowledge retention', 'processual change', 'power sharing', 'Information Technology (IT)', and 'innovation' all were considered of relatively lower importance for collaboration, ranking from twenty-third to twenty-seventh. Comparatively, 'early establishment of collaboration' and 'early, defined and collectively stakeholder involvement and consultation' ranked sixth and seventh respectively. Literature signposts that the dynamic partnering component was particularly prevalent in the commissioning stages of the project after the partnership has been formalised at financial close.
2. Partnership core values - represented 8.09% of the total variance and was composed from eight SIS collaborative attributes, namely: 'social capital / inter-personal relationships'; 'trust and respect'; 'identifying individual and shared objectives'; 'skilled

leadership'; 'effective communication'; 'information sharing and transparency'; 'stakeholder commitment'; and 'balance of stakeholder needs and expectations'. The salience of these attributes ranged from sixteenth to first which indicated moderate to foremost importance. Highlighted in chapter nine, the partnership core values component is fundamental in the tendering stage of procurement, especially to facilitate a shared vision of the project requirements and solution.

3. Formal governance structures - explained 6.67% of the total variance of the linear components and was constructed from four collaborative attributes: 'clear governance structures'; 'contract flexibility'; 'clarifying roles and responsibilities'; and 'collective stakeholder planning and decision-making'. The collaborative attributes ranked eleventh, eighteenth and thirteenth respectively and were accordingly considered to be moderately to very important. This component was determined to be central in defining the governance structures and participation frameworks when executing actions. In this regard, the PPP stakeholder collaboration framework discussion stressed that the governance structures and contract must be instrumental in driving the collaborative policy and requires strong leadership from the Authority in the promotion of this ideology.
4. Risk management - accounted for 5.26% of the linear variance and contained three variables: 'appropriate risk sharing'; 'financial and technical exchange and support / stipend'; and 'conflict resolution structures'. These three attributes were rated eighth, nineteenth and seventeenth respectively suggesting they were moderately to very important for PPP collaboration. Throughout PPP and construction literature, risk and uncertainty are prevailing discussion points. However, for collaboration to be successful literature reveals that risks should be allocated to the SIS most capable of managing them. Moreover, when unforeseen risks arise, resolution structures should focus on a solution rather than apportioning blame.
5. Authority leadership – represented 4.43% of the total variance and was constituted from two attributes: 'Authority in-house resources / skills'; and 'Authority experience'. In the RII, these attributes ranked twenty-second and twentieth respectively; however, the Authority considered them sixth and twelfth respectively; much higher than other SIS groups. Identified in collaboration theory, to foster collaborative advantage, all stakeholder organisations must be considered equal, contribute and share power. For collaboration to be engineered across the lifecycle, the Authority must be well equipped

to lead from the front, drive the collaborative ideology and participate as a collaborative partner.

6. Mission statement – encapsulated 3.99% of the variance and constituted: ‘accountability’; and ‘agreement of project brief’. These attributes were ranked fourteenth and fourth signifying they were of moderate to extreme important. The research has shown accountability must span all organisational levels and is a prominent consideration in governance strategies. Also, by agreeing the project brief, this promotes other attributes such as stakeholder commitment and buy-in as well as a mutual understanding of the project goals and a shared mission statement.

The production of this PPP stakeholder collaboration framework has made an empirical contribution to knowledge. It has determined the salience of these collaborative attributes informed by SIS organisations. Moreover, this thesis has extracted key themes from this list of attributes and reconstructed them to produce more meaningful components for easier interpretations. These findings have been discussed in the context of the PPP project lifecycle and can be beneficial to both policy-makers and private-sector PPP organisations alike.

10.3. Knowledge Contributions and Research Implications

At a time when the cash strapped governments continue to promulgate private financing of infrastructure as a means to alleviate the gap between demand and supply, it is anticipated PPP will continue to be utilised in the current global economic climate. UK PPP is regarded as a pioneer internationally both in terms of sophistication and maturity. Undeniably, it has been an international pioneer and has provided much of the institutional and regulatory foundations for many others. Thus, this research will have an impact internationally as well as domestically. In essence, the research has made six theoretical and practical contributions:

1. The research has contributed to the infrastructure paradigm. It has identified and considered the salient socio-economic implications derived from infrastructure provision. Moreover, it has examined the infrastructure investment paradigm as well as underpinned the necessity for a holistic perspective towards infrastructure provision. As well as this, while many have focused on economic infrastructure provision, differently, this research has added to the infrastructure stock of knowledge by considering and raising awareness pertaining to the need for social infrastructure provision.

2. Using *IJ* datasets, the research has conducted a state-of-the-art investigation into the UK PPP social infrastructure market. The findings from this offer contemporary insights into the UK PPP market in terms of deal number, capital value, regional market trends, deal structure and financial composition, and sectoral breakdown. From this investigation, it was determined that health and education continue to be the preferred social infrastructure sectors for PPP provision. Moreover, it was identified that the newer PPP frameworks which were introduced to improve productivity have been subject to low levels of roll-out. In doing so, the research has underpinned the importance of addressing shortcomings in UK PPP. Moreover, it also suggested that despite the efforts to improve stakeholder collaboration in newer modalities, low market activity may indicate these nuances have failed to reconcile the inherent inefficiencies. These findings are important on the grounds they underpin the importance of improving collaboration therein to improve project performance and return confidence to UK PPP as a credible framework for social infrastructure provision. Also, the findings of this assessment can be beneficial to industry in that it offers transaction clarity of the UK PPP marketplace which is currently unavailable elsewhere in the public domain.
3. Grounded in *stakeholder theory*, this investigation has developed a theoretical boundary specification framework for PPP SIS. This PPP framework enables research to identify and understand SIS involvement across the PPP lifecycle. Predicated on an organisation's relationship with the contract, PPP stakeholders can be categorised as normative, derivative or non-stakeholders. Furthermore, through the adoption of the *power* and *urgency* attributes, the dynamics of the partnership can be delineated across the PPP project lifecycle. Utilising this partnership boundary specification, this research has identified two dynamics or levels of the partnership as well as determined 23 collaboration gaps inherent to these partnerships. This contribution provides the essential building blocks to inform future research. Also, by incorporating attributes as opposed to the production of a definitive list, this boundary specification can accommodate future changes. Moreover, advantageously, the usage of attributes means this framework can be applied to economic infrastructure as well as international PPP ventures.
4. This investigation has determined the salient attributes of PPP stakeholder collaboration. Combining the 23 PPP collaboration gaps together with additional PPP literature and *Collaboration theory* literature, the thesis has determined 27 PPP

stakeholder collaborative attributes which have been evaluated by SIS organisations by means of survey questionnaires. Empirically, through the application of the RII, the research has presented a salience list which ranks these attributes in terms of their importance for improved PPP stakeholder collaboration. The research has equally investigated for statistical significance between SIS groups by conducting the Kruskal-Wallis H test. Thus, the importance of these attributes has been considered both in terms of the SIS collective cohort sample as well as per SIS classification. In doing so, these findings have made an original contribution to knowledge.

5. The research has extracted six principal components of stakeholder collaboration through the application of PCA. These six collaborative components which fundamentally encapsulate PPP stakeholder collaboration again have made an empirical contribution to the PPP stock of knowledge.
6. Finally, the empirical findings of the extracted stakeholder collaboration components have been applied to literature to develop a PPP stakeholder collaboration framework. By delineating the shifting dynamics of PPP stakeholder collaboration through the six principal components, along with the list of 27 collaborative attributes, the research has contributed best-practice recommendations which have been informed by SIS organisations. Through the application of these findings, stakeholder collaboration can be improved in partnering mechanisms for both policy and practice. This can enhance productivity in provision frameworks and therein return confidence to PPP frameworks. Potentially, this can lead to future provision and delivery of social infrastructure in the UK through PPP which enable the UK government to enhance socio-economic development.

This research is also important on the grounds that while the future of PPP in the format of PFI may be uncertain, this does not detract from the growing appetite for greater private-sector participation. This means that there remains a need for better understanding of collaboration between the public and private-sectors whether it be in the format of PFI or whether it be via other cross-sectoral partnering arrangements which have emerged into the PPP sphere. Accordingly, this research is important in that it offers greater understanding of the organisations involved in partnering and provides insights into what specifies collaboration in the broader context of PPP.

Similarly, premised on the limited number of organisations with the wherewithal to undertake PPP projects, many of these stakeholders abridge both social and economic assets

in the UK and abroad. Hence the findings of this research are transposable beyond strictly social infrastructure provision in the UK. Rather, these findings are equally valuable for economic infrastructure partnering as well as other cross-sectoral arrangements in UK and international jurisdictions.

10.4. Application of Public-Private Partnerships Stakeholder Collaboration Framework

This research has made several empirical contributions to knowledge though ultimately it has produced a six component PPP stakeholder collaboration framework for improved partnering. The PCA extracted components and the corresponding PPP stakeholder collaboration framework can be beneficial to both public and private-sector organisations to enhance PPP stakeholder collaboration. The research now reviews the relevance of these findings and how they can contribute to the enhancement of PPP policy and industry practice.

10.4.1. Policy

Already the UK government has undertaken strategic steps to improve collaboration in PPP frameworks. Thus, this research comes in a timely manner for policy-makers. The key findings from this research should serve as a framework to inform and enhance PPP policy across the UK. The developed PPP stakeholder collaboration framework can act as a guide or roadmap for policy-makers as to how collaboration transforms throughout the course of the project. Moreover, the framework and attribute list additionally offer understanding of the nuanced opinions among SIS organisations. Policy-makers can utilise this information to calibrate and align the contract and governance frameworks to SIS perceptions of PPP stakeholder collaboration. Furthermore, this research acts as a bridge between central government policy-makers such as the Infrastructure and Procuring Authority (IPA) and local Authorities directly involved in the infrastructure delivery. Hence, as the notions of relationships, relationship management (RM) and collaboration continue to gather momentum, this research provides a rich foundation for further policy and academic development.

In addition to this, this research has important implications for central UK government as well as for Authority stakeholders in that it emphasises the importance of the public-sector in participating as an active and engaged partner in these arrangements as opposed to a client who outsources a service; which has been the case in previous ventures. Moreover, it

raises awareness of the importance of the Authority in promoting, implementing and driving the collaborative ideology, through both formal and informal systems.

10.4.2. Industry Practitioners

This research also has several important implications for industry practitioners. Firstly, the research serves to highlight and elevate collaboration in mainstream discussion boards. This is pertinent because generally industry is motivated by financial and commercial gains and the benefits and motivations of collaboration are often lost and convoluted in the built environment. Furthermore, the high staff turnover and elongated nature of PPP means it is difficult to develop best-practice solutions. This research acts as a knowledge centre on the grounds it encapsulates the entirety of a PPP venture from the initiation phase through to facility handback. Moreover, it comprises input from all the key SIS organisations. In this regard, this investigation is beneficial in that it considers and promotes collaboration not just between sectors but also inherent within sectors, and more specifically; ProjCo.

10.5. Recommendations

Predicated on the findings from this investigation, the following recommendations are proposed by the research for implementation to enhance the delivery of PPP social infrastructure:

- Shown in chapter seven, there continues to be low levels of market activity. Following acute transformations in UK PPP in the wake of the GFC, there is low confidence in the ability of partnering frameworks to deliver VfM. This has been reflected through the limited number of projects which have emerged into the marketplace. Consequently, this has generated uncertainty among key SIS as to the future of PPP in the UK. To alleviate these concerns, there is a need for the development of a transparent pipeline of social infrastructure projects. This display of commitment to PPP on the part of the government should increase confidence in the market and therein bolster investor confidence as well as augment the willingness of SIS to engage in collaboration. This will enable SIS to build capacity as well as act as a flagship to the wider business community and public of the importance of infrastructure.
- One of the prominent findings of the literature review was that of those projects which have emerged onto the market, there are several barriers blocking the stream of private capital from alternative financing sources into infrastructure. There is thus

a pertinent necessity for innovative financial vehicles capable of leveraging the requisite capital into the market. The research advocates for greater engagement and collaboration between policy-makers and the financial community to align interests to develop bankable and mutually equitable projects for all SIS organisations.

- It is further recommended that the findings from this thesis are made known to all SIS organisations. The dissemination of these findings can facilitate a shared understanding of the salient attributes of collaboration. Moreover, they also provide insights into the nuances between SIS groups. The PPP stakeholder collaboration framework developed through the course of this thesis should be used to inform business models and policy.
- An additional recommendation made by this research is the appointment of a collaboration champion; similar to that of a Building Information Modelling (BIM) champion. This champion should be a disinterested or non-vested third-party to the venture and is appointed with the remit of implementing and overseeing collaboration across the project. Their involvement will be essential in the earlier phases particularly in the tendering process which is highly competitive.
- The research suggests that to underpin and promote the importance of collaborative partnering, efforts should be undertaken to gauge and benchmark the added benefits of collaboration for both the public and private-sectors. This should comprise a combination of quantitative measures such as time, cost and quality indicators as well as wider holistic qualitative metrics including transparency, accountability, communication in addition to other considerations such as would the infrastructure be available through other mechanisms.
- An additional recommendation the research offers for PPP social infrastructure provision is that the UK government must fundamentally improve its systems when dealing and engaging with the private-sector as a means to improve efficiencies and decision-making. As far back as the 90s, the importance of strong client leadership in procurement was noted. Despite this, institutional capacity remains a prevailing concern in PPP and the built environment.
- Now heavily politicised and discredited, the final recommendation the research advocates for repackaging of the Public-Private Partnerships concept. This rebranding should reflect and promote cross sectoral collaboration and

collectiveness. Thus, the research suggests the name of the 'Collaborative Stakeholder Provision Strategy' (CSPS).

While there is still much work to be done to return confidence to UK PPP frameworks, if this mechanism is to continue to play an instrumental role in social infrastructure provision, this research believes through the adoption and implementation of these recommendations, this will enhance project performance in partnering mechanism in the UK.

10.6. Limitations

Despite concerted efforts to safeguard holistic representation and accuracy, the research was not without its limitations. The research will now discuss the limitations encountered:

1. The permeable boundary of a PPP projects means that it is impossible to ensure that all SIS organisations were included in the // datasets. Until there is a comprehensive database produced and maintained by the UK government accessible to interested parties, this will continue to be an issue for academics.
2. Comprising multiple phases coupled with the high staff turnover in PPP, perceptions of collaboration may differ inherent to SIS organisations across the project lifecycle. To negate this issue, the research implemented participation criteria which targeted strategic level management.
3. The negative connotations currently associated with PPP in the UK meant that in some instances SIS organisations were unwilling to participate in the survey questionnaire despite being assured full confidentiality.

Though there were limitations encountered in the study, strategic steps were undertaken in response to minimise or mitigate their impact on the research. Regardless of these limitations, this have not impacted the accuracy of the investigation nor the original contribution of the study.

10.7. Further Research

Funded as a three-year project, this PhD was bound by time and resources constraints. As such, throughout the course of this investigation, the research has identified several additional prominent areas which justify further research. These potential areas include:

1. A PPP transaction is associated with a matrix of stakeholders and interested organisations including the supply chain, facility users, staff and so on. Premised on the stakeholder nomenclature presented in chapter four, a stakeholder

management model should be developed to identify the mechanisms and success factors to understand derivative stakeholder involvement, participation and influence in a PPP venture.

2. Research could benefit from an exploration of how collaboration can be developed between the key stakeholders and the supply chain. With a wide range of sub-contractors involved in the solution provision, research could consider how collaboration can be constituted between these sub-contractors, suppliers and the key stakeholders for improved project performance.
3. One of the principle changes implemented through Private Finance 2 (PF2) has been the introduction of a public-sector co-investor into the equity. This includes positioning a manager on ProjCo board of directions. Yet, with muted operationalisation, there is still limited information and understanding as to how this innovation will affect the dynamics of ProjCo. Research should consider this, including an exploration of how this stakeholder's objectives align with the Authority, and what are the dynamics of this relationship.
4. Discussed as part of the PPP stakeholder collaboration lifecycle checklist, the research emphasised the importance of the governance structures and the contract in underpinning collaboration. Considering this, further research should consider the concept of collaborative contracts, and how they may be implemented within the confines of PPP.

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Appendix A – Table of SIS Identification Summary

Social Infrastructure Stakeholder	Identified Population	Deduct Pilot Study	SIS Percentages	Sample Size	Responses	Percentage Coverage
Authority	189	188	36.43%	80	18	25%
Debt Funders	52	51	9.88%	22	6	8%
Equity Shareholders	146	145	28.10%	62	16	22%
BuildCo	54	53	10.27%	23	16	22%
FMCo	81	79	15.31%	34	17	23%
Total	522	516	100.00%	220	73	100%
Margin of Error		5%				
Confidence Level		95%				
Sample Size		220				

Appendix B – Electronic PPP Stakeholder Collaboration Survey

Stakeholder Collaboration in UK Public-Private Partnerships (PPP) social infrastructure projects.



Welcome to my survey on **PPP social infrastructure provision in the UK**. Thank you for participating in my expert survey. Your feedback is critical to the success of this study. This survey has been designed to elicit from you, information to develop a **stakeholder collaboration model for the provision and delivery of 'more and better' UK Public-Private Partnership (PPP) social infrastructure**. The purpose of this model is to engender better understanding between stakeholders on the salient attributes of collaborative relationships, necessary for improved project performance.

Please note, all questions pertain to UK PPP social infrastructure provision. Social infrastructure comprises municipal, education, emergency services, health, housing, justice and recreational assets which facilitate human development, quality of life and living standards.

Public-Private Partnerships (PPP) are defined as the Private Finance Initiative (PFI) or nuanced modalities whereby a private-sector partner is responsible for the long-term service provision; capitalising on private-sector management and finance resources. This includes concessions and franchises where a private-sector partner is responsible for some, or all of the constructing, redevelopment and maintaining of a public service infrastructure.

PPP stakeholder collaboration is a specific relationship dynamic whereby stakeholder organisations work together to achieve a shared objective, combining interests, varied skills, resources and experience in a coordinated effort to deliver a mutually beneficial outcome that could not be achieved otherwise, by a solitary organisation.

This survey has been designed in five sections:

- A. Stakeholder Demographic
- B. PPP Social Infrastructure Provision
- C. PPP Stakeholder Collaboration
- D. Survey Results

Full anonymity is guaranteed. All participant information will remain **confidential** and **stored securely**. This survey will take approximately 10 to 15 minutes. There are 37 questions. I would be obliged if you could complete **all sections** as soon as possible. Should you wish, findings from this survey will be available after the completion of the study.

Section A: Stakeholder Demographic

Section A is designed to ascertain participant background information, and experience with social infrastructure Public-Private Partnerships (PPP).

Predicated upon the application of *stakeholder theory*, this investigation defines a PPP stakeholder as the private-sector ProjCo, and its constituent members: financiers (Debt Funders and Equity Shareholders), Construction Contractors (BuildCo), and Service Providers (FMCo); and the public-sector Authority.

- 1. Organisations may fulfil several stakeholder roles within a project, for example, an organisation may be the contractor and an equity shareholders. With this in mind, please select a stakeholder role typified by your involvement capacity.**

- Authority
- BuildCo
- Debt Funders
- Equity Shareholders
- FMCo

- 2. In which PPP social infrastructure sector(s) do you have experience?**

- Education
- Emergency and Response services
- Health
- Housing
- Justice
- Leisure and Recreational
- Municipal

- 3. Of which PPP initiatives / programmes, do you have experience?**

Not at all experienced	Slightly experienced	Moderately experienced	Very experienced	Extremely experienced
---------------------------	-------------------------	---------------------------	------------------	--------------------------

- Building Schools for the Future (BSF) scheme
- NHS Local Improvement Finance Trust (LIFT) and eLIFT
- Not-for-Profit Distribution (NPD) model
- Priority School Building Programme (PSBP) programme

- Private Finance Initiative (PFI)
- Private Finance 2 (PF2)
- Scottish Futures Trust (SFT) Hub Initiative

Section B: UK PPP Social Infrastructure Provision

Section B is designed to elicit from respondents their opinions and perceptions on UK PPP as a vehicle for 'more and better' social infrastructure provision.

4. Does the UK possess the necessary policy guidance and legislative framework for PPP projects?

Strongly disagree Disagree Unsure Agree Strongly agree

5. Does the UK possess the necessary political support for PPP arrangements?

Strongly disagree Disagree Unsure Agree Strongly agree

6. Does the UK economic climate facilitate PPP utilisation?

Strongly disagree Disagree Unsure Agree Strongly agree

7. What is your perception of PPP as a social infrastructure provision mechanism?

Very poor Poor Unsure Good Very good

8. Do you intend to participate in future UK PPP social infrastructure projects?

Not at all interested Slightly interested Moderately interested Very interested Extremely interested

9. In your opinion, which sectors of social infrastructure are best suited to be delivered via PPP?

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
Education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Emergency and Response services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Housing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Justice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leisure and Recreational	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Municipal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section C: PPP Stakeholder Collaboration

To reiterate, this investigation defines PPP stakeholder collaboration as a long-term partnership between the public-sector Authority and the private-sector ProjCo and its constituent members whereby equal partners share risks, rewards and resources to deliver infrastructure in a cooperate and joint working manner.

10. Are UK PPP models conducive to the formation of collaborative stakeholder relationships?

Not at all conducive Slightly conducive Moderately conducive Very conducive Extremely conducive

11. In your opinion, is it possible for PPP stakeholders to develop effective win-win relationships whereby all organisations collectively benefit?

Extremely unlikely Unlikely Neutral Likely Extremely likely

12. In your opinion, through the adoption and integration of these collaborative attributes, can PPP stakeholder relationships be improved?

Strongly disagree Disagree Unsure Agree Strongly agree

13. By engendering greater stakeholder collaboration, would this improve PPP social infrastructure provision?

Strongly disagree Disagree Unsure Agree Strongly agree

14. If stakeholder collaboration was improved, would this increase the likelihood of your involvement in PPP social infrastructure provision?

Extremely unlikely Unlikely Neutral Likely Extremely likely

15. From literature, a list of 27 collaborative attributes have been identified for improved PPP social infrastructure stakeholder collaboration. This question is designed to elicit from you, your perceptions and opinions on these attributes and their saliency by which to improve PPP stakeholder collaboration. Please rate the saliency of each attribute for PPP stakeholder collaboration.

	Not at all important	Slightly important	Moderately important	Very important	Strongly agree
Accountability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agreement of project brief	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Appropriate risk sharing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Authority experience	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Authority in-house resources / skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Balance of stakeholder needs and expertise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clarifying of roles and responsibilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clear governance structures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collective stakeholder planning and decision-making	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conflict resolution structures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contract flexibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Early establishment of collaboration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Early, defined and collective stakeholder involvement and consultation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effective communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Financial and technical exchange and support / stipend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Identifying individual and shared objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information sharing and transparency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information Technology (IT)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge retention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Power sharing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Processual change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Skilled leadership	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social capital / Inter-personal relationships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ProjCo experience	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stakeholder commitment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trust and respect	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section D: Survey Results

16. Would you like to receive the results of this survey after completion?

Yes

No

Appendix C – Kendall's Coefficient of Concordance

N	73
Kendall's W ^a	.223
Chi-Square	424.008
df	26
Asymp. Sig.	.000

a. Kendall's Coefficient of Concordance

Appendix D – Survey Principal Components Analysis Data

```

FACTOR
/VARIABLES Accountability Agreementofprojectbrief
Appropriaterisksharing Authorityexperience
    Authorityinhouseresourcesskills
Balanceofstakeholderneedsandexpectations
    Clarifyingofrolesandresponsibilities Cleargovernancestructures
    Collectivestakeholderplanninganddecisionmaking
Conflictresolutionstructures Contractflexibility_A
    Earlyestablishmentofcollaboration
Earlydefinedandcollectivestakeholderinvolvementandconsultation
    Effectivecommunication
Financialandtechnicalexchangeandsupportstipend
    Identifyingindividualandsharedobjectives
Informationsharingandtransparency InformationTechnologyIT
    Innovation Knowledgeeretention Powersharing Processualchange
Skilledleadership
    SocialcapitalInterpersonalrelationships ProjCoexperience
Stakeholdercommitment Trustandrespect
/MISSING LISTWISE
/ANALYSIS Accountability Agreementofprojectbrief
Appropriaterisksharing Authorityexperience
    Authorityinhouseresourcesskills
Balanceofstakeholderneedsandexpectations
    Clarifyingofrolesandresponsibilities Cleargovernancestructures
    Collectivestakeholderplanninganddecisionmaking
Conflictresolutionstructures Contractflexibility_A
    Earlyestablishmentofcollaboration
Earlydefinedandcollectivestakeholderinvolvementandconsultation
    Effectivecommunication
Financialandtechnicalexchangeandsupportstipend
    Identifyingindividualandsharedobjectives
Informationsharingandtransparency InformationTechnologyIT
    Innovation Knowledgeeretention Powersharing Processualchange
Skilledleadership
    SocialcapitalInterpersonalrelationships ProjCoexperience
Stakeholdercommitment Trustandrespect
/PRINT INITIAL KMO EXTRACTION ROTATION
/FORMAT SORT BLANK(.45)
/PLOT EIGEN
/CRITERIA MINEIGEN(1) ITERATE(25)
/EXTRACTION PC
/CRITERIA ITERATE(25)
/ROTATION VARIMAX
/METHOD=CORRELATION.

```

Table 1: Rotated Component Matrix for PPP Stakeholder Collaborative Attributes

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.826
Bartlett's Test of Sphericity	Approx. Chi-Square	1213.548
	df	351
	Sig.	.000

Table 2: Communalities of PPP Stakeholder Collaborative Attributes

		Initial	Extraction
1	Accountability	1.000	.718
2	Agreement of project brief	1.000	.699
3	Appropriate risk sharing	1.000	.779
4	Authority experience	1.000	.836
5	Authority in-house resources / skills	1.000	.781
6	Balance of stakeholder needs and expectations	1.000	.590
7	Clarifying of roles and responsibilities	1.000	.676
8	Clear governance structures	1.000	.738
9	Collective stakeholder planning and decision-making	1.000	.562
10	Conflict resolution structures	1.000	.594
11	Contract flexibility	1.000	.664
12	Early establishment of collaboration	1.000	.726
13	Early, defined and collective stakeholder involvement and consultation	1.000	.697
14	Effective communication	1.000	.674
15	Financial and technical exchange and support / stipend	1.000	.494
16	Identifying individual and shared objectives	1.000	.751
17	Information sharing and transparency	1.000	.674
18	Information Technology (IT)	1.000	.702
19	Innovation	1.000	.686
20	Knowledge retention	1.000	.732
21	Power sharing	1.000	.701
22	Processual change	1.000	.806
23	Skilled leadership	1.000	.657
24	Social capital / Inter-personal relationships	1.000	.725
25	ProjCo experience	1.000	.499
26	Stakeholder commitment	1.000	.617
27	Trust and respect	1.000	.689

Extraction Method: Principal Component Analysis.

Table 3: Total Variance of PPP Stakeholder Collaborative Attributes

Comp.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Var.	Cumul. %	Total	% of Variance	Cumul. %	Total	% of Var.	Cumulative %
1	10.785	39.943	39.943	10.785	39.943	39.943	4.901	18.150	18.150
2	2.185	8.091	48.034	2.185	8.091	48.034	4.654	17.237	35.387
3	1.801	6.671	54.705	1.801	6.671	54.705	2.671	9.894	45.281
4	1.421	5.263	59.968	1.421	5.263	59.968	2.216	8.206	53.488
5	1.197	4.433	64.402	1.197	4.433	64.402	2.133	7.899	61.387
6	1.077	3.991	68.392	1.077	3.991	68.392	1.891	7.005	68.392
7	.885	3.277	71.669						
8	.860	3.186	74.855						
9	.767	2.842	77.697						
10	.691	2.559	80.256						
11	.633	2.346	82.602						
12	.551	2.042	84.643						
13	.521	1.931	86.574						
14	.489	1.810	88.385						
15	.451	1.672	90.057						
16	.417	1.545	91.602						
17	.370	1.372	92.974						
18	.347	1.284	94.258						
19	.316	1.172	95.429						
20	.243	.900	96.330						
21	.228	.846	97.176						
22	.183	.677	97.853						
23	.172	.638	98.492						
24	.147	.546	99.038						
25	.112	.416	99.454						
26	.082	.303	99.757						
27	.066	.243	100.000						

Extraction Method: Principal Component Analysis.

Table 4: Component Matrix for PPP Stakeholder Collaborative Attributes

	Component					
	1	2	3	4	5	6
Early establishment of collaboration	.777					
Identifying individual and shared objectives	.750					
Processual change	.747	-.472				
Information Technology (IT)	.746					
Information sharing and transparency	.722					
Balance of stakeholder needs and expectations	.718					
Power sharing	.710					
Early, defined and collective stakeholder involvement and consultation	.695					
Clarifying of roles and responsibilities	.689					
Innovation	.685					
Stakeholder commitment	.671					
Conflict resolution structures	.659					
Collective stakeholder planning and decision-making	.653					
Knowledge retention	.635					
Social capital / Inter-personal relationships	.615					
Skilled leadership	.599	.472				
Agreement of project brief	.597					
Contract flexibility	.573					
Authority experience	.561		.508			
Effective communication	.561	.472				
Financial and technical exchange and support / stipend	.553					
ProjCo experience	.545					
Please rate the saliency of each attribute in contributing to PPP stakeholder collaboration. Accountability	.520					
Appropriate risk sharing	.511				-.462	
Trust and respect	.461	.606				
Authority in-house resources / skills			.738			
Clear governance structures	.517			.584		

Extraction Method: Principal Component Analysis.

a. 6 components extracted.

Table 5: Rotated Component Matrix for PPP Stakeholder Collaborative Attributes

	Component					
	1	2	3	4	5	6
Knowledge retention	.799					
Processual change	.766					
Power sharing	.741					
Information Technology (IT)	.731					
Innovation	.718					
Early establishment of collaboration	.624					
Early, defined and collective stakeholder involvement and consultation	.492		.488			
ProjCo experience						
Social capital / Inter-personal relationships		.755				
Trust and respect		.699				
Identifying individual and shared objectives		.695				
Skilled leadership		.668				
Effective communication		.665				
Information sharing and transparency		.660				
Stakeholder commitment		.650				
Balance of stakeholder needs and expectations		.462				
Clear governance structures			.794			
Contract flexibility	.502		.629			
Clarifying of roles and responsibilities			.510			
Collective stakeholder planning and decision-making			.505			
Appropriate risk sharing				.734		
Financial and technical exchange and support / stipend				.552		
Conflict resolution structures				.548		
Authority in-house resources / skills					.818	
Authority experience					.803	
Accountability						.762
Agreement of project brief						.686

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Table 6: Component Transformation Matrix for PPP Stakeholder Collaborative Attributes

Component	1	2	3	4	5	6
1	.584	.548	.371	.319	.241	.246
2	-.624	.696	-.203	-.094	.105	.257
3	-.076	-.380	-.172	.069	.805	.408
4	-.472	-.233	.698	.386	-.163	.246
5	.093	-.025	.415	-.850	.000	.310
6	.181	-.125	-.363	.117	-.506	.742

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Appendix E – List of Publications from the Research

- McClements, S., Haran, M. & McErlane, A. 2016, *Potential of social infrastructure investment to enhance social development and economic growth in Northern Ireland*, Knowledge Exchange Seminar Series, Northern Ireland Assembly.
- McErlane, A., Heaney, G., Haran, M. & McClements, S. 2016, "The application of Stakeholder Theory to UK PPP Stakeholders", *Proceedings of the 32nd Annual ARCOM Conference*, eds. P. Chan & C. Neilson, Association of Researchers in Construction Management, Manchester, 5-7 September, pp. 911- 920.
- McErlane, A., Haran, M., McClements, S. & McCord, J. 2017, "A conceptualisation of the UK Public-Private Partnerships (PPP) social infrastructure paradigm", *2017 American Real Estate and Urban Economics Association International Conference* Amsterdam, 3 - 5 July.
- McErlane, A., Haran, M., McClements, S. & McCord, J. 2017, "Stakeholder collaboration in UK PPP social infrastructure investment and provision" [Poster], *2017 American Real Estate and Urban Economics Association International Conference* Amsterdam, 3 - 5 July.